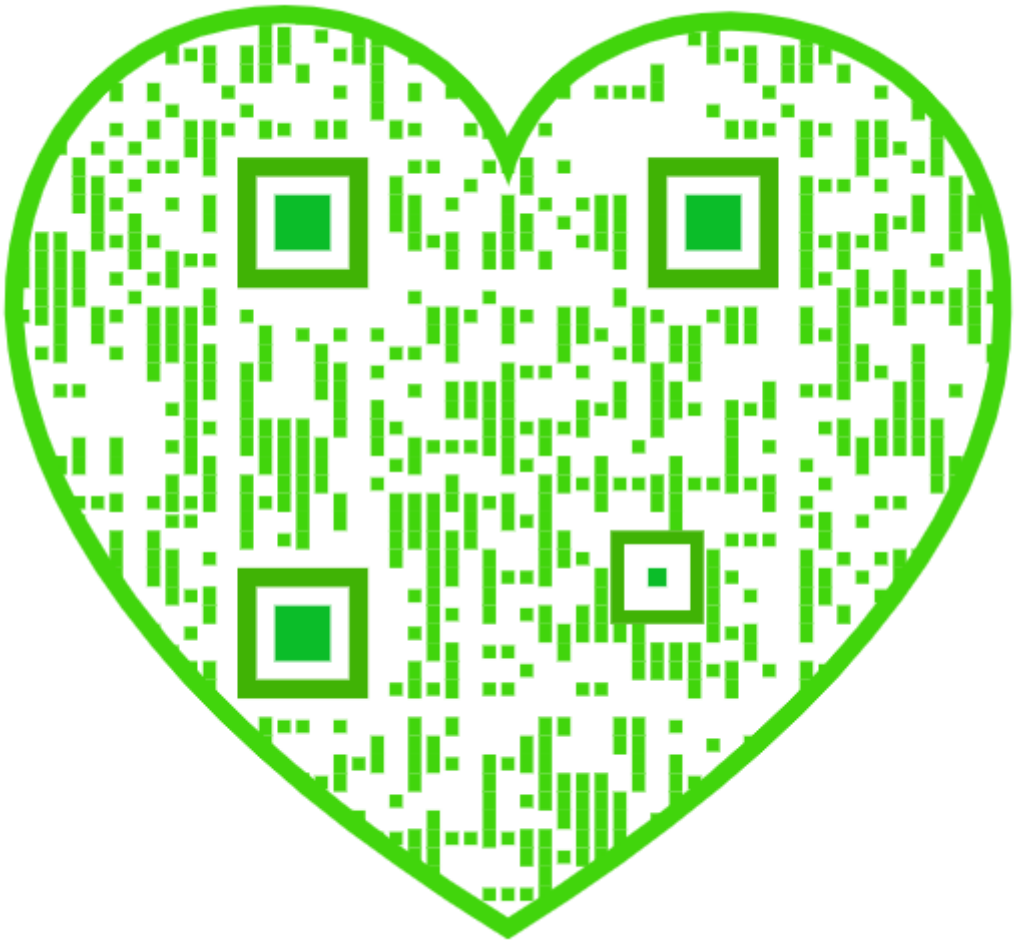

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COAL AGE

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The End and the Means

IS anyone wise who hopes to attain the end without the means? Success in some degree is the chief object each of us is seeking. Education is the means whereby we may reach this goal of our ambition. We cannot be too well equipped for our life work, and by increased knowledge we not only earn more, but we can serve our family, our country and our generation with higher efficiency.

Education is of two kinds—one which we receive from others, and one which we give to ourselves. We refer here to the latter brand. Its office is to call forth power of every kind—power of thought, affection, will and outward action; power to observe, to reason, to judge, to contrive; power to adopt good ends firmly, and to pursue them efficiently; power to govern ourselves and to influence others; power to gain and to spread happiness.

And education should not cease when we leave school; or later, when we have succeeded in lifting our head a little above the crowd. It is no shame for a man to learn that which he does not know, whatever be his age. The two principal difficulties attending the education of people who are "on in years" is their proneness to believe the task hopeless, because of their handicap in age and their obstinate conceit.

Many people who were unknown at fifty have died famous. No one is ever beaten unless he is discouraged, and this latter feeling never helped any man over a difficulty, and never will. Despondency is a disease that saps manhood and produces complete paralysis of effort. Industry pays debts, while despair only increases them.

The conceit of age referred to above is really a species of false vanity, which is less ashamed of being ignorant than of being instructed. Pride is commendable when it dwells in a man's principles, but objectionable in his demeanor. Of course, we all agree that the man who undervalues himself will undervalue others, and he who undervalues others will oppress them.

Many old men are like old trees—past bearing themselves, they will suffer no young plants to flourish beneath them. However, this slight feeling of antipathy between youth and age is reciprocal. Young men think old men are fools, and old men know young men to be so. It is to be hoped that some day both classes will unite in the common belief that "ignorance is a voluntary misfortune, and that wisdom is to the mind what health is to the body."

An oak is not felled at one blow; Edison was not a master inventor the first day. No man was ever born wise, or was wise by chance. Wisdom is neither inheritance nor legacy. Other things may be seized on by might, or purchased with money, but knowledge is to be gained only by long continued study. Simple wishes never mined coal, and mere hoping never started a bank account. The man who cultivates hoping as an employment will find that "like our shadows our wishes lengthen as our sun declines."

When we call on our mind today for its highest efforts, and stretch it to the uttermost in our power, we have done ourselves a kindness. The mind will be all the better for it. Tomorrow we may do it again; each time it will answer more readily to our call. And it is not the quantity of study, or the amount of reading that makes us wise, but the advantage of the study to the purpose for which it is pursued. Mental, like physical faculties, are developed by exercise. It does not matter how bright a mind we have; if we do not use it, we will lose it.

Therefore, if the end of all human effort is honest success, and if this latter can only be realized through knowledge conquered by labor, then no man can afford to neglect training the mind to think and to discriminate between truth and error, which is the real object of education. The desire for knowledge, like the thirst for riches, increases ever with the acquisition of it. We should always remember that no talent comes unasked; no grace of mind stays unurged. There never was a man who reached a point where he could afford to abandon study and live altogether on his past reputation.

A Matter of Co-operation

In obedience to the whispers of the small voice within, we will state a few of our plans for this new year. Conscience forbids our working in the dark, so long as we profess to follow methods of co-operative procedure. Our aim and desire have been to judge matters from the point of view of all, and not of one. We have adhered to the belief that everything is right which tends to the happiness of mankind, and everything is wrong that increases the sum of human misery.

On the preceding page, we called attention to the necessity of gaining an education. Here we intend to outline briefly just how Coal Age can help in the accomplishment of that end. Everyone knows that even a skilled workman can't turn out a master job if his tools are lacking in completeness or quality. Preparation is half the battle. A great occasion is valuable to us, just in proportion as we have prepared ourselves to make use of it.

Last year the publishers of this paper expended more than a hundred thousand dollars getting together valuable data and printing Coal Age each week. The individual subscriber could not have purchased this same information for a penny less. Is it not the essence of wisdom, therefore, for each reader to take the fullest advantage of the opportunity offered? In other words, we are desirous of furnishing you with proper tools by way of a practical education. Resolve to spend two evenings, say six hours a week, carefully reading Coal Age, and at the end of one year you will know a lot more about actual mining than the young fellow who has just dropped in from a nearby college, with a sheepskin diploma locked up in his trunk.

We are not writing this with the idea of securing new subscribers; it is a plain talk directed solely at those readers whose $3 we have already banked. Of course, we might let it rest there, but we don't intend to. Education is one thing every man wants and is willing to pay for, but won't carry away with him. It's the same old story—with a staircase before us, we look for a rope to go down by.

Getting down to facts—The best way to determine what will be is to consider what has been. Last year we published 1776 pages of editorial matter. During the coming twelve months we will better this record both in quantity and quality. Not every page will interest each person, but if only one-half the articles appearing are read and digested, the result will be highly beneficial. Don't forget the old proverb—"A young man negligent, an old man necessitous."

The manufacture of coke will come in for greater attention this year than heretofore, and we will start a "Power Section" in our paper commencing Feb. 1. Our idea is to subdivide coal mining into its special phases, placing each department in the hands of an engineer, expert in the particular field he is to cover.

As a concrete example of what is to come, here are a few articles soon to appear: Electric Locomotive Practice; The Testing of Mine Air; Scientific Management; Early History of the Smoke Problem; Modern Strip-Pit Mining; Points from British Coal Mine Inspectors' Reports; Relation between Subsidence and Packing; Distribution of Producer Gas; Haulage Systems in European Collieries; *Series on* First Aid to the Injured; Occurrence of Coal in Alaska; *Series on* Economy in Colliery Power Plants; Compressed Air Troubles in British Mines; Strength and Size of Coal Pillars; Electric Mine-Signaling Systems; Shotfiring by Electricity; *Series on* The Preparation of Bituminous Coal; The Psychology of the Illegal Strike; Belgian Methods of Underground Development; The Engineering Aspects of Diamond-Drill Prospecting; The Use of a Refrigerating Plant for Cooling and Drying the Air in Deep Coal Mines; Modern Plans for Shaft Bottoms; Recent Developments in Byproduct Coke Ovens, and dozens of other articles now being prepared for us by coal men in all parts of the world.

In conclusion: We want you to co-operate with us, and get your money's worth. Don't be content simply to read what the other fellow says, write something yourself. There is no difference between buried treasure and concealed knowledge. We are judged, not by our intentions, but by the result of our actions.

Reducing Ventilation When Firing

By J. T. Beard

That there are always two sides to every debatable question goes without saying. The truth of this statement has been amply proved by the previous discussions in Coal Age, but by none more so than by the one just closed.

While there are doubtless still some ardent advocates of the doctrine that no mine ventilating fan should be built reversible; there are many other, equally practical, mining men who have been converted, by the last discussion, to the belief that no mine is fully equipped without this important feature.

All contend, rightly, that a reversible mine fan possesses possibilities that make for either *safety or destruction*, depending on the use to which it is put; and this, in turn, has been shown to depend on the intelligence, experience and accurate knowledge of conditions, on the part of the man in charge. But, while a few men see greater safety in excluding this feature of mine equipment from the list, because of its possible misuse; others claim that the fan should be built reversible so as to increase the chances for safety; and its use safeguarded by suitable restrictions and regulations.

We may ask: Is safety more assured by the absence of weapons of defense, on the ground that where there is no shotgun around there can be no accidental shooting? Is the theory correct that the nation's peace and safety are better assured and the chances of war minimized by the absence of the munitions of war? Most men, now, agree that it is the prevailing possibilities of action that speak for safety and success, in every sphere of life.

We are now facing another important subject for discussion. Although we do not realize it at present, there are perhaps fewer subjects fraught with greater possibilities of safety or danger, in coal mining, than the question: *Shall the normal circulation of air in the mine be reduced during the time of firing shots?*

This practise has been tried, in some mining districts, and the success claimed has won a few adherents; while on the other hand, by far the large majority of practical mining men have always considered it unsafe to reduce the air circulating in the mine, at the time of firing. In many districts, in the East and Middle West, it has been customary to speed up the fan, at such time.

The question is fairly a debatable one. Let it be understood from the start that this is not a question of high velocities, at the working face, which we all agree are both objectionable and dangerous. Neither is it a question of humidity or temperature of the mine air, except as these are incidental. It is not a question of whether the shots face the current or otherwise.

Let it be assumed that the mine, under normal conditions, is well ventilated by a current of pure air that sweeps the entire working face with a moderate velocity, sufficient for the removal of what gas, if any, is generated. Suppose, under these conditions, from 400 to 500 shots are to be fired; either by shotfirers, after the men have left the mine, or by a well-established system of rotation, in which the men fire their own shots in regular order, beginning on the last of the air, at a fixed time, and proceeding regularly against the air.

Now, ask the question: Will there be less danger of a gas or dust explosion occurring and developing into a mine explosion when the air has been short-circuited at some point, so as to reduce the circulation in the workings to a low ebb or cut it off completely? This is the question for debate.

It is the aim of Coal Age to confine the discussion of each subject, as far as practicable, to one month; except where the interest is such as to call for an extension of the time. Let every practical mining man help to decide this question, by giving his experience and conclusions.

SNAP SHOTS IN COAL MINING

Views at Anthracite Mines in Northern Pennsylvania Field

Fig. 1—Electric motor hauling trip to slope in hard-coal mine near Scranton. Shows the hard sandstone roof so common in the anthracite region.

Fig. 2—Miner and laborer working in mine at Pittston. The miner is drilling a hole preparatory to shooting.

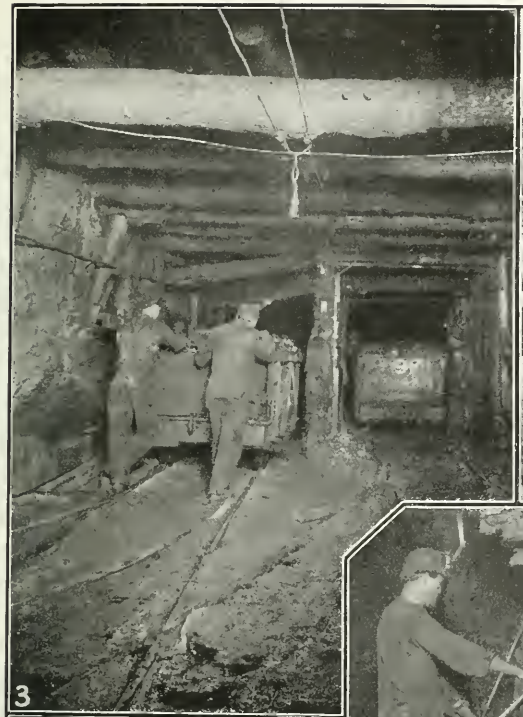
Fig. 3—Pushing cars onto cage previous to hoisting, in Erie Mine No. 6, at Dunmore. The entire bodies of the cars in the anthracite region are built to overhang the track, giving them a large capacity.

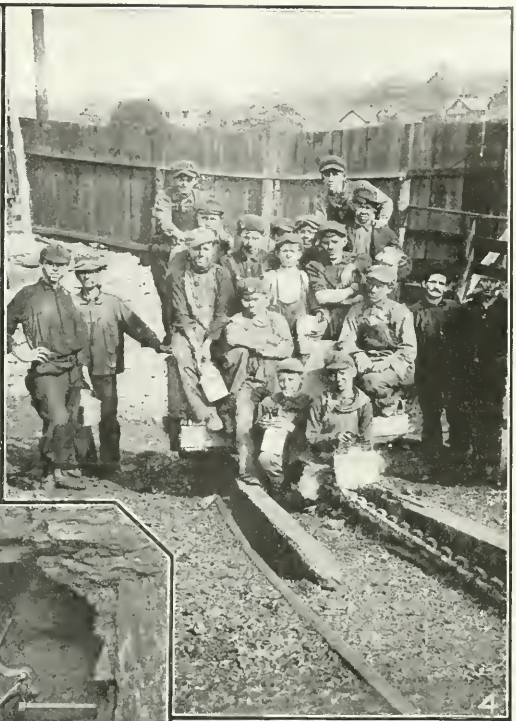
Fig. 4—Miners and breaker-boys ready to go home after a hard day's work in mine near Scranton. They hardly exhibit the "distressing effects of child labor," of which we have often read.

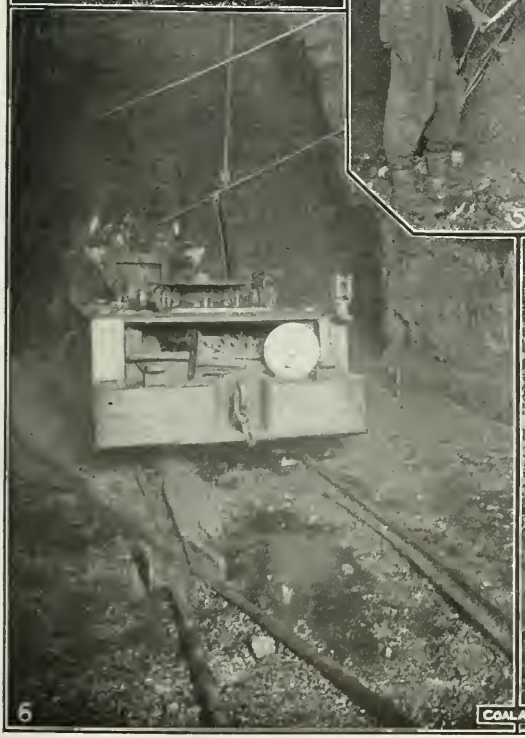
Fig. 5—Miner drilling hole at face in an anthracite mine. Practically all the coal is shot from the solid, without preliminary under-mining.

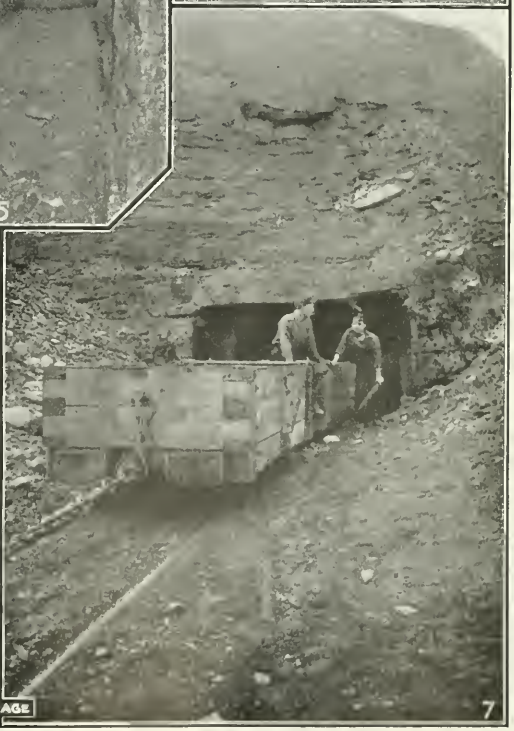
Fig. 6—Electric motor pulling trip of loads to shaft in mine at Dunmore. Exhibits method of suspending trolley wire from roof by long rod, thus avoiding use of a cross timber.

Fig. 7—Empties ready to go down slope in mine at Pittston. The drift mouths of the anthracite mines are rarely of an imposing character.








COALAGE

IDEAS AND SUGGESTIONS

When Times Are Good and Men Are Scarce

By A. W. Hesse*

When times are good, cars are scarce and so are men. When the trade is poor, men and cars are plentiful, but the mine work drags along like "a ship without a sail." For this reason, the superintendent and mine foreman are between the "devil and the deep sea," most of the time.

It was hunger that drove the Germans across the Rhine. The high cost of living and the desire to live near a city is causing a good many shifts in the mining population. Behind every such change we find an economic fact.

During these times of heavy tonnage demands, the order to rush everything is passed. Places are provided in the mine, on headings that ordinarily would not be worked until the pillars could be extracted at once. The "green" man, on the other hand, must have a solid place. Suppose you get a gang of men and place them on these headings. They labor two or three days shooting or digging the places to "death," and then the car shortage strikes you. A day or two of "no cars" and the men disappear like scared rabbits.

Either the use of that persuasive coin in some other fellow's hand, or the sight of some other mine's car allotment is sufficient to take your men away in droves; and it is done very frequently in these days.

If there is any time at which a mine superintendent longs for winter, it must be when men are scarce—in the hope that cold weather will drive in the miners for at least a few months.

To escape that scathing criticism, so freely given by conservationists, care must be taken not to overdevelop the mine. Most of us know that once a mine is established, the recovery of heading, room and pillars should be properly proportioned in order to avoid that loss of coal so frequently due to falls in standing rooms.

Quite frequently a mine is overdeveloped because of the inability of the men working therein to turn the trick of robbing. This is getting to be a very important factor. Pick miners are becoming scarce and, unless pillars can be cut by machine, the return on this work is very slow.

A remedy often resorted to when men are scarce is known as concentration. The labor must be thoroughly systematized in order to give a high production.

A driver will handle coal from eight men on a single heading much easier than he will from three men on one heading, two men on another and three men somewhere else. Likewise, a motor will make quicker trips when hauling from a concentrated operation than when running all over the mine.

There are any number of mines right now struggling along with fewer miners, notwithstanding the demand for coal, and it is safe to say that these mines will show a higher ultimate percentage of recovery than those mines in which systematic work is thrown to the winds and the mine filled with men.

It is now a question whether it is more profitable to take advantage of the present demand and run the risk of losing a quantity of coal in pillars, or to keep the work properly lined up in the hope that with a high percentage of recovery and a consistent market the returns will far offset those of the former method.

*Assistant chief engineer, Consolidation Coal Co., Fairmont, W. Va.

Inadequacy of Many Return Airways

By Francis Glover*

In these days of modern progress, when most problems seem so thoroughly understood, it is really appalling that mine explosions should come around as regularly as the "Hardy Annual." For 20 years or more, after every explosion, an inquiry has been made as to its cause, and the usual result has been to place the blame on an ignition of gas caused by a defective lamp, a blown-out shot or the negligence of someone.

Rarely has any further inquiry been made. In looking for ultimate causes, it is remarkable that the condition of the return entry has not been duly considered. For at many mines today which have a fine equipment on the surface and adequate haulage airways, you will find the other ventilating passages incapable of performing the work demanded of them without excessive resistance.

In some cases they were not large enough to carry the air when first driven, but frequently they are large enough but too crooked, and the air is much impeded in its progress. It has not appeared necessary to drive them straight because, as soon as a section is completed, the rails will be removed.

This fact not only explains why we permit the heading to be crooked, but also why it is allowed to become full of fallen rock. Once the road is torn up, it becomes impossible to clear up the heading without excessive expense. It therefore fast becomes full of a mass of broken slabs of roof, through which the air cannot find its way at any speed.

In some mines where such caves have occurred, it has been customary to break up the rock into smaller sizes, with dynamite, so that it will lie smoothly on the floor and give the air an opportunity to travel without obstruction over it. But in many mines even this is not done, and the airways not being used for haulage, traveling or piping, and so not used or open for inspection fill with rock, yet, because the airways are not explored, the reason why the air is hard to move is not easily apparent.

A larger water gage is used and much of the air is lost which would otherwise go to the face. The practice of leveling the rock by dynamite, to which I have referred, is dangerous and not to be encouraged, because

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a body of gas in a gaseous mine might come along the heading at any time and be ignited by the open shots.

At a colliery in England, of which I was the assistant general manager for a long time, the output for the last 30 years has been from 2000 to 3000 tons per 8-hr. day. The depth of the lowest bed at the shaft is about 2250 ft., and as the present workings are about 3000 ft. from the shaft bottom and the seam is dipping 1 ft. in 7, the depth from the surface is about 2680 feet.

The bottom seam is very gassy and at different times had been ignited at most of the adjoining collieries, but at this particular mine during the whole period of 30 years, not the slightest mishap has occurred. Mueseler lamps were used, and this light, while not perhaps one of the best from an illuminating standpoint, is more than ordinarily safe, because it goes out when held a little out of the perpendicular. Thus, lamp glasses are not often cracked.

No shotfiring was allowed while the men were in the mines, and the rules and regulations were strictly enforced. All coal dust was removed from the main roads and the auxiliary gangways.

But I do not attribute the safety of that mine to any of the above conditions and safety regulatations. I have no doubt that occasionally a defective lamp *had* been used during that 30 years, and that some shots *had* blown out. Its safeness from gas explosions was due to the efficient and systematic way in which the mine was laid out and had been worked from its commencement, to its splendid airways, so designed and maintained that any gas which was liberated speedily found its way to the surface, accompanied by sufficient air to dilute it.

During my employment at this mine, one of the overmen and myself were sent to a near-by colliery, which had been working about six years, and where they had all the latest "tackle." We went to inspect a fine endless-rope haulage, which had recently been installed. On the surface, the colliery was well laid out, and there was a fine ventilating fan.

But when we got down to the bottom of the main-haulage incline, we noticed traces of gas. In the workings, we found quite a body of it and, suspecting the cause, we inspected the return airway and found it not at all what it should be. Some three or four years later this mine exploded and killed between 200 and 300 men, and everyone seemed to wonder how it happened, for the mines in that district are not subject to spontaneous combustion.

It takes two things to cause an explosion, the fire and the fuel. If you remove the fuel, the explosion cannot take place, even if the fire is applied.

Producer Gas from Low Grade Coal

It may be of interest to American firms making use of producer gas for different purposes to know that within the last two years several French inventors have taken out patents for, and are now putting into actual operation, a system of forced-draft furnaces, burning even the poorest grades of coal and coke. These furnaces are employed in the production, by a method also patented, of producer gas from low-quality coal containing up to 65 per cent. of cinders.

With one exception, however, all of these inventors have confined their experiments and operations to small "gazogènes," as these furnaces are called, producing sufficient gas to drive only low-power engines, etc. The one exception to this is a company (whose name may be had from the Bureau of Foreign and Domestic Commerce, Washington, D. C.), capitalized at $240,000, which manufactures apparatus sufficiently large and powerful to produce gas for machinery of nearly 1000 hp. per "gazogène." As a matter of fact, the inventor informs the consulate that there is no limit to the power of the machine, it being merely a matter of construction.

These "gazogènes," or producers, in addition to the generation of gas, are so constructed as to recover the ammonia and coal tar and other byproducts of coal. This is done, however, only in the larger sizes. The coal or coke used for the production of gas in these machines is not broken up or crushed in any way.

A Unique Haulage System

In these days of high-efficiency electric locomotives, which haul trips of 40 to 50 loaded mine cars at a relatively rapid speed, it seems strange that a coal mine depending entirely upon dogs for haulage trips can operate profitably, yet such is the case.

For the past 27 years, W. A. Werner has depended solely upon dogs of various breeds, from rat terriers to Newfoundlands, for haulage power in his mines, at Zanesville, Ohio. The average output of this mine is 2000 bu. (80 tons) per day, which is loaded on wagons and delivered to Zanesville. The entire output is consumed locally.

Dogs Hauling Coal from a Zanesville, Ohio, Mine

The vein is about 3 ft. in height and no roof is taken down. Some of the entries are driven to a distance of 2500 ft., and the rooms are from 300 to 400 ft. deep. Each miner mines his own coal, loads it into cars, which hold about 1800 lb. run-of-mine, and assists the dogs in hauling it to bins on the outside. The car wheels are without flanges and run upon wooden tracks. From one to three dogs haul each car, assisted by the miner, who rides on a "lazy-board," which projects behind the car. Sitting on this "lazy-board" the miner helps the dogs by pushing with his back against the car and his feet on the mine floor.

Upon reaching the bins outside, the miner tips his coal and then rides back into the mine, the dogs taking him back to the face of his coal.

The miners prefer dog haulage, as in this way they do not require anyone to assist them and can do their own loading, hauling and tipping of coal.

A Model Plant in the Coke Region

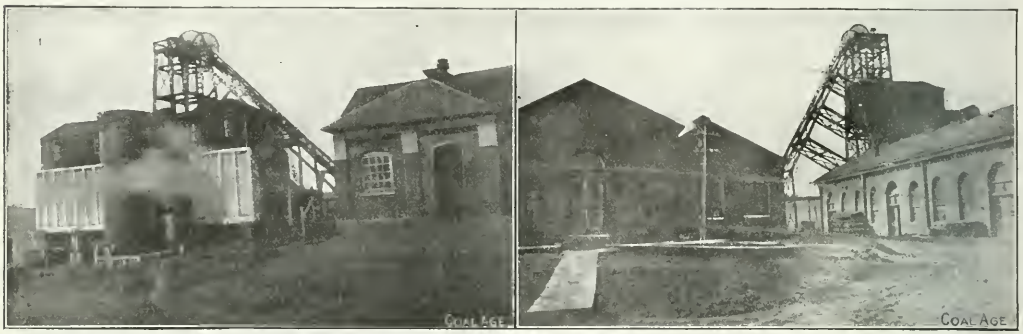
By Sim Reynolds*

SYNOPSIS—Some notes on one of the important Connellsville coke plants. It is estimated that the life of this operation will exceed that of the district as a whole. Mining is conducted along broad and comprehensive lines and unusual attention is devoted to welfare work.

East of the Monongahela River, in that part of Pennsylvania known as the Coke Region, a great deal has been done in late years to bring coal mining, coke washing, and the living conditions of the employees of these industries up to the perfection they now present. In some cases this has been a settled and persistent policy on the part of the companies, rather than any sudden outburst of zeal in coke manufacture and mining ethics, and the subject of this sketch, the Oliver-Snyder Co., is an example of this kind.

This company has been in the coke-making business for about 20 years, and it is stated on the authority of one of its chief officials that at the time recently set by an eminent mining engineer for the exhaustion of the coal in the Connellsville Region, this concern fully expects to still be engaged in the business of mining coal and making coke, so extensive are their properties. The company operates three plants known as the "Oliver No. 1," "Oliver No. 2," and "Oliver No. 3." In all they employ about 1500 men and operate 1100 coke ovens. The coal acreage consisted originally of 3300 acres, and of this perhaps only about 50 per cent. has been exhausted up to the present time.

The company's present workings are reached by three main hoisting shafts about 400 ft. in depth. Near the middle of their property there is a central pumping station which takes care of all the water made by all three mines. The power plants are practically identical, of approximately 1000-hp. capacity and equipped with Parsons' Coke-Breeze Burning System of heat-generation under the boilers. Transmission of coal to the shafts underground is by rope on the main entries, the loaded cars being gathered by horses. Ventilation of the mines is obtained by steam-driven fans of the Capell type, sizes 10x18 ft., producing now 150,000 ft. each with a 2-in. water gage. Shipments are made from all three mines over the B. & O. and the Pensylvania Lines, both systems running through the properties. The company operates 400 private cars.



Two Views of the Surface Plant at the Oliver No. 2 Mine

Welfare Work of the Company.

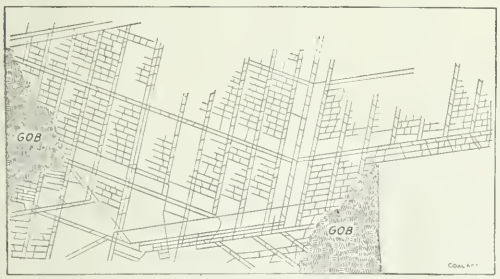
As an example of the interest the Oliver-Snyder Co.

Typical Miners' Houses at the Oliver No. 2 Mine, Oliver, Penn.

*Mt. Braddock, Penn.

shows in the welfare of its employees it may be noted that 44 miners' houses are being moved from their present site to a position where they will be totally free from the coke-smoke environment. The miners' houses owned by this company present an unusually attractive appearance, being painted a slate color and trimmed with white, with neat fences and outbuildings and ample room for gardening and grass plots. Obviously much care and thought have been given to the living conditions at these three plants, as is readily seen by the well graded streets, lined with rows of large shade trees planted years ago. This is something which costs the company owning the new mining town, practically nothing except a little trouble and thought and yet which in years to come will pay great dividends in accrued benefits to the health and happiness of the employees. Also these miners' homes are supplied with running water and electric light. One of the dwellings has been fitted up as a Y. M. C. A. building, where sociological work and a mining class is kept up under the direction of Robert Ainsley, one of the foremen of No. 2 mine.

The first aid work of the three plants, which consists of five trained crews, is managed by Clyde Brehm, Chief Electrician for the company. The managing head of



Map Showing System of Working in the Coking Region

the Oliver-Snyder Co., Mr. Fred C. Keighley, is vitally interested in all that concerns the welfare of the company's employees as well as the product of the mines, taking an active interest in the living conditions and the home life of his men, not a few of whom have been with the company as long as Mr. Keighley himself, and that is nearing the quarter century mark. This fact alone speaks well for the relations between this company and its workers.

In a celebration at Uniontown recently, termed "Old Home Week," a profile map of Oliver No. 2 Mine on exhibition there created quite a great deal of interest. This was not due alone to the excellent method of work shown, but because of the unique construction of the map. The plan of the workings had been etched out on black leather, and later traced in with white enamel. The idea originated with the General Superintendent Keighley, and the map was made under his direction. It has since been presented to the Mining Department of the School of Mines, State College, Pennsylvania.

First aid hospitals in the interior of the mines of this company are an interesting feature of their work. They are installed near the foot of each shaft, and are replete with rescue and first aid apparatus, are well lighted by electricity, have hot and cold running water, etc. Injured workmen can there receive attention before being conveyed to the surface.

Anthracite a Luxury

Anthracite coal was at one time an important factor in blast-furnace practice, but its use in that line of industry has now almost entirely ceased, according to E. W. Parker, of the United States Geological Survey, as it has been supplanted by coke made from bituminous coal. The principal demand for anthracite will be in the future, as it has been in the more recent past, restricted largely to domestic trade, for which such sizes as furnace, egg, stove, and chestnut are required. The breaking down of the lump coal, which was formerly a marketable product, for the preparation of the domestic sizes results in a much larger proportion of the small or undesirable sizes, all of which are sold at less than the cost of production. All the profits on the mining operations must be obtained from the prepared domestic sizes, for the revenue obtained from the smaller sizes, which are sold largely in competition with bituminous coal for steaming purposes, serves only to reduce the cost of the domestic sizes. The conditions under which the anthracite mines are operated, the greater depths to which the workings are carried, the consequent increased expense of mining, and the increasing cost of labor all contribute to make anthracite fuel more and more a luxury.

During recent years the anthracite operators have adopted the policy of making an allowance of 50 cents per ton from circular prices for domestic coal purchased in April of each year, with an advance of 10 cents per ton for each succeeding month until the schedule prices are restored in September. This has had a more salutary effect in steadying the anthracite trade than any other action taken by those controlling the anthracite industry. Its purpose is to encourage the purchase of coal in the spring and early summer, making the cellars of the consumers the storage places for the following winter, and at the same time to cause the mines to be operated more regularly, thus giving steadier employment to miners throughout the year.

Price of Government Maps Increased

After Jan. 1 the standard topographic maps of the United States Geological Survey will be sold at 10 cents a copy or 6 cents wholesale, an order amounting to $3 or more entitling the purchaser to the reduced rate. These maps have heretofore been sold by the Director of the Geological Survey, under authority of Congress, at 5 cents retail and 3 cents wholesale, but for some time it has been recognized that this price has been too low considering the cost of their preparation.

The Director of the Survey at Washington will be glad to furnish an index map, covering any area desired, which shows the particular quadrangles, as they are called, which have been surveyed and the corresponding maps issued for sale. This index-map circular also contains a list of special maps of the United States, of states, and of national parks, mining camps, etc., with the prices, and a list of available geologic reports on any part of the area shown.

Strip Pit Mining with Steam Shovels

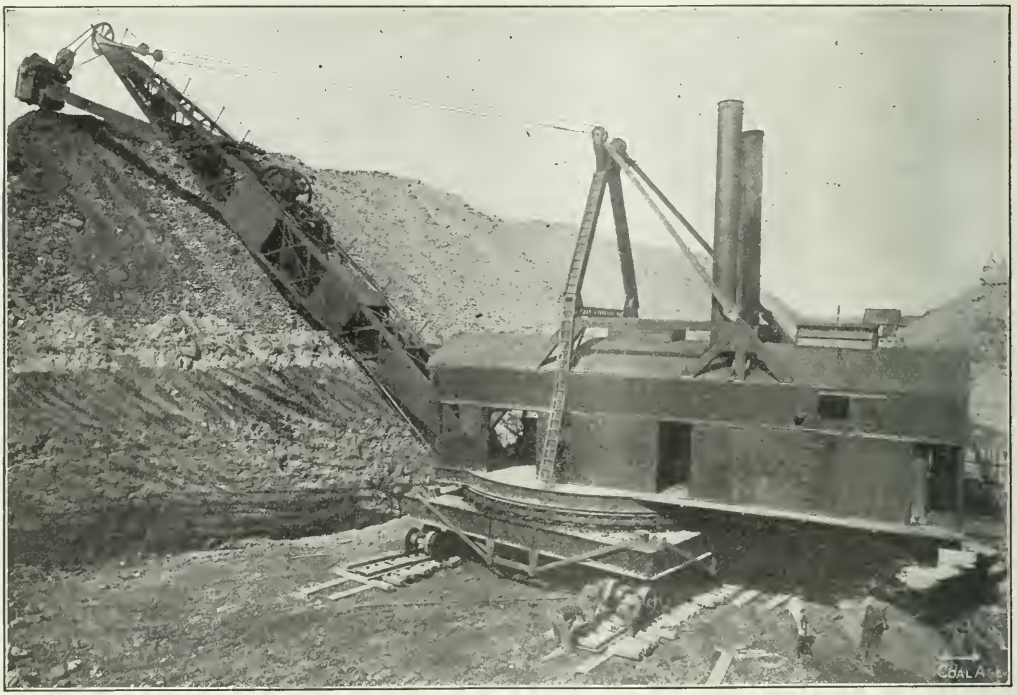
By C. M. Young*

SYNOPSIS—The recovery of coal adjacent to the outcrop is often difficult to effect in the mine, due to the disintegration of the roof, and in such areas stripping must be resorted to. Modern development in methods of stripping has also brought with it some remarkably low costs. This article describes an operation in Kansas where the largest shovel in the world is in use.

The coal fields of southeast Kansas now present a spectacular illustration of the application of machinery to mining. This is strip-pit work, in which the overburden is removed by the largest steam shovels yet constructed.

In this part of the state the coal outcrops and the strata dip gently to the west and north. Most of the coal is extracted from shaft mines, worked by the room-and-pillar method, but near the outcrop the roof is too poor to permit underground work without prohibitive expense for timbering. The coal has been worked back from the outcrop by stripping for many years, but only ordinary slip scrapers were employed until recently.

There is a considerable area of coal land, lying between the shaft mines on one side and the limits of profitable scraper stripping on the other, which can be worked by steam shovels. Within these limits the overburden will vary in thickness from about 10 ft. to 30 or 35 ft. Considerable coal has been stripped by scrapers to greater depths than 10 ft., but large quantities remain with less cover than this which will be stripped by shovels. There is coal of greater depth than 35 ft. which cannot well be handled under cover, but this is probably the limit of profitable stripping under present conditions, though an advance in the price of coal may make it profitable to strip to greater depths.



Photograph of the World's Largest Steam Shovel on a Stripping Operation in Kansas

The Marion Shovel

There are now working in the district about twenty shovels, having an average dipper capacity of about 3½ cu.yd. The most spectacular work is being done on the land of the Central Coal & Coke Co., where there are two firms operating near together under contract. One of these is now erecting the third of three Bucyrus shovels, and the other has just completed the second of two Marion shovels.

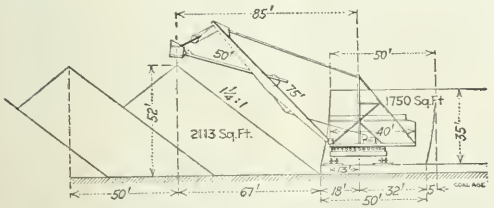
These shovels are impressive in size and capacity. The Marion machine has dimensions as follows:

Dipper capacity	5 yd
Boom	90 ft
Dipper handle	54 ft.
Height of dump above rail (boom 45°)	65 ft.
Radius of cut at 40 ft. elevation	103 ft.
Radius of cut at bottom of pit	71 ft.
Reach from pivotal center to center of dump	95 ft.
Size of hoisting engine (double)	14x16 in.
Size of rotating engine (double)	10x11 in.
Size of crowding engine (double)	9½x9 in.
Size of hoisting cable	1¼ in.
Size of boom hoist cable	1 in.
Approximate working weight	525,000 lbs.
Ballast	30,000 to 40,000 lbs

* Associate Professor of Mining Engineering, University of Kansas.

This machine was shipped in nine cars and about three weeks' time was required for erection. It is carried on four 4-wheel trucks. In this type of shovel the boom does not turn, but the upper frame carrying the machinery rests on forty-five 12-in. rollers. The Bucyrus shovels are mounted in a similar manner and this fact makes it unnecessary to turn the shovel at the end of the cut. Instead of this the whole upper part is swung around on the lower frame and digs backward on a line parallel to the first cut. The foot of the boom is vertically above one side of the roller track, so that the weight is transmitted directly to the lower frame.

To make it possible to move the machines over uneven tracks, they are provided with track equalizing devices. These are hydraulic cylinders placed at one end of the frame, and transmitting the weight from the lower frame to the trucks. They are provided with a pump and with a



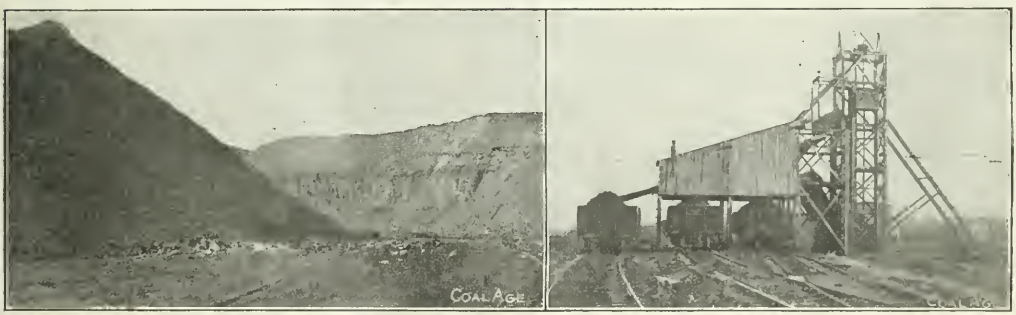
Working Range of a 3½-yd. Shovel

or 34 to 35 ft. of overburden from 50 ft. of coal, dumping 85 ft. from the center of the turntable. The position of the shovel and the cross-sectional area of the overburden and spoil bank when stripping 35 ft. of overburden are shown in the line drawing supplied by the Bucyrus company. They will dig their way to the coal on an 8 per cent. grade. Some machines are provided with electric generators and lights for night work.

It is stated that the cost of handling the ordinary overburden of the district will be from three to four cents per cubic yard. Probably these figures are slightly low, as the wage scale has been raised since they were given. The present scale is: Shovel runner, $150 per month; craneman, $110 per month; fireman, $75 per month.

The 3½-yd. shovel, removing 20 ft. of overburden, will uncover about 6000 tons per month of coal 3 ft. thick at an expense of about $1075. This does not include the handling of the coal.

The uncovered coal is easily handled. Vertical holes are drilled with augers and squibbed with 2 to 3 in. of dynamite to remove moisture. The dynamite, with lighted fuse, is dropped into the hole and the blowing out of the fuse removes danger of premature ignition of the black powder, which is immediately poured in. This is fired by a short length of fuse, which is dropped down a pipe, acting like a fuse. The coal is then loaded by hand and hauled to the tipple. The simple type of tipple



Scene in a Strip Pit About 90 Ft. Wide, and Type of Tipple Used for Screening the Coal

bypass, so that the fluid may flow from one cylinder to another or to the pump reservoir. This device permits the moving of the machine on tracks laid on the surface of the uncovered coal with almost no ballasting and without torsional strain on the frame.

One Marion machine has excavated a pit 92 ft. wide and 24 ft. deep, piling the excavated earth on the top of the bank at one side. This gives an idea of the magnitude of the machine.

The Bucyrus Shovel

The Bucyrus shovels are similar in general design to the Marion, but the company using them has not employed any of the extreme size mentioned above, though the manufacturers are prepared to build them. The largest now used in this field have 3½-yd. buckets, 75-ft. booms, and weigh about 175 tons in working condition. Assuming coal 3 to 4 ft. thick, these shovels will remove 15 to 20 ft. of overburden from 80 ft. of coal, used is shown in the accompanying photos. It is in fact little more than a frame for the screens.

One company expects to haul cars to the tipple with an endless rope. Another will lay track into the pit on a 3 per cent. grade and haul with locomotives. The tipple is located opposite the middle of the pit on the side toward which the stripping is progressing. There are several thousand acres of coal suitable for stripping and the operation as now carried on should add considerably to the output of the district.

When using rescue apparatus which contains caustic soda, remove the soda from the bag as soon as the apparatus is taken off or it will cake and have to be dissolved with warm water and a fresh supply procured. If removed at once it may be washed, dried or melted, recast and used again. India rubber regenerating and breathing bags should be washed out with warm water and thoroughly dried before the apparatus is recharged unless it is needed immediately, in which case washing is not necessary. Masks and rubber mouthpieces should be washed with soap and water, not only for cleanliness, but to preserve the rubber.

The Reforestation of Mining Areas

Special Correspondence

SYNOPSIS—In the Midlands of England, the tree found desirable for reforestation of ground which is covered with mine refuse is the black alder, which also is highly resistant to smoky atmospheres. Instead of popular interest in tree planting being confined to the setting of individual trees on land around schoolhouses or bordering on roads, it should be extended to the growth of forests planted largely for the purposes of social betterment.

The problem resulting from the general destruction of forests assumes a serious aspect in the more important mining and metal-working centers of the world. A large extension of the movement for reforestation has taken place in the Midlands of Great Britain.

Figs. 1 and 2. Fever Hospital Mound, Bilston, South Staffordshire. Planted 1907-1908. The Alders Are About 10 Ft. High. Photographed in Sept., 1912. Sycamores in Foreground Are Spindling, Owing to the Seasons Not Having Favored Their Growth

The areas adjacent to Birmingham and surrounding industrial cities are not called without reason the "Black Country," and there is no doubt that until quite recently the predominant features of the scenery were furnace slag, mine heaps and dreary looking waste lands interspersed with seething industrial activities.

Mine Waste Is Suitable Soil for Trees

To correct this, an association was formed in 1903 as a result of a public meeting held in Birmingham, to promote the reforestation of waste ground in the Midlands and particularly in the parts of Staffordshire and Worcestershire known as the "Black Country."

Once this area was forest, but at the time of the founding of the association, a large area lay wholly waste, no attempt being made to conceal the shaft dumps and spoil banks. This area, at the least computation, contained considerably more than 11,000 acres and was wholly occupied by heaps of rubbish.

In order to restore this land to its former beauty, forests were planted and developed according to the principles in practice in France, Belgium, Germany and Austria. It was found to be possible to grow thriving trees in such unpromising situations as the soil formed of mine waste, furnace slag and even the ash of burned shale.

The deterrent effect of a smoky atmosphere on the growth of trees was argued, but it was found that smoke was not so harmful as sulphur, which was emitted solely by certain industries only found in a few localities. Moreover, the increasing use of power or producer gas and the utilization of waste products of combustion in the industries of the area present a factor of hope which should become more and more predominant as economy is practiced in industrial operations.

Manner of Planting Trees

No manure or imported soil was found necessary to make the trees take root, and the only preparation made was to dig pits about 1 ft. cube, the top soil being placed at the bottom. Trees two to four years old were then planted 4 ft. apart in such pits, or 2722 trees per acre. In the older plantations the trees were spaced 5 ft. apart, or 1742 per acre, but these did not do so well as with the closer spacing.

It was found that almost all the work of planting could be done satisfactorily by unskilled labor. It was early realized that plantations, even of infant trees, were better neighbors than unsightly waste heaps, and the presence of each plantation added enormously to the value of building land in its vicinity.

The first two plantations were finished before Christmas Eve in 1904, and arrangements were pushed forward to increase the work of the association, which, it should be remarked, was supported by voluntary contributions.

Fig. 3. Fever Hospital Mound. Willows in Foreground, Alder and Wych Elm Higher Up. The Piece of Shale Ground in the Rear Has Small Alders on It, Which Are Stunted Owing to the Severity of the Wind. Photographed, Sept. 12, 1912

At the present day, there are 21 plantations with a total area of 73 acres holding about 150,000 trees.

Various methods of forestry have been attempted and experiments have been made with various species in order to determine the most suitable methods and trees for the area under consideration.

The Black Alder

Of all the trees which have been tried, the black alder has done the best. Fig. 1 shows a typical tree planted in the winter of 1907. It is now 10 ft. high. The sticks in the foreground are sycamore, planted at the same time. The white alder, as used for mine banks on the Continent, does not as yet complete on equal terms with the native tree.

It may be pointed out that the alder has three distinct advantages in this connection. In the first place it grows fast and has a high resistance to the effects of smoke. In the second place it fertilizes the soil, the action being due probably to fungoid colonies at its roots. As a third advantage, its wood is readily salable at an early age.

It will be seen that the Midland Association has had a somewhat different experience from some other forestry organizations, where it has been found that conifers, notably, Corsican pine and Sitka spruce have been the most advantageous trees to plant in reforestation schemes. Possibly the preference of other foresters has been due to the fact that conifers grow faster than oak, ash, beech or elm, and in the forester's mind, conifers always have the first place.

Birch, alder and poplars are much needed in the lumber market and are quick growers. Corsican pine and Sitka spruce are not much used in Great Britain.

Fig. 4. As Seen in January, 1912

Fig. 5. As Seen in April, 1912

Black Wagon Mound, Old Hill, South Staffordshire, England. Alders on North Side in Bare Shale, 2½ Years After Planting

although there is no reason for their being neglected. The trees actually preferred are Scotch pine instead of Corsican, and Norway spruce instead of the Sitka variety. It is proposed in the plantations under the care of the Midland Reafforesting Association to try the Corsican and Sitka varieties when they obtain an opportunity of doing so in more or less smokeless districts.

These trees, however, do not flourish very well where there is much smoke and the alder, therefore, appears to be preëminently the tree which is adaptable for planting on mine-waste heaps and in similar localities in the vicinity of large works, where there is a smoky atmosphere.

Where Timber Has a Large Money Value

Fig. 2 shows alders four years old planted 5 ft. apart. It has been found that the poplar grows freely. Under normal conditions timber is a crop which, although yielding a good profit in the course of the years, has a slow turn-over and consequently locks up much capital. With the woods of quick growth, however, and especially with a local demand, one of the great difficulties in the way of reforestation is removed.

It is reasonable to surmise that it may be possible to develop sufficient planting to enable a colliery to obtain its own supply of mine props. Alder and birch have a ready sale as young trees. In Great Britain, larch and similar wood for mine props, after about 25 years of growth, are worth $3.69 per short ton; alder for turning, of 18 to 20 years' growth, costs $6.51 per short ton.

Fig. 3 shows a general view of plantation No. 14 of the association; this was planted four years ago. In the foreground are willows, and behind are alders and wych elms. The alders on the patch of shale seen in the illustration are too small to be discernible, the slow growth being largely due to wind which strikes that point.

Reforestation as a Feature of Village Betterment

Recently the association has reached a stage where it has been publicly recognized by a municipal corporation as the proper authority to deal with waste lands and the action of the corporation has been approved by the Local Government Board. After considerable negotiation, the Town Council of West Bromwich leased, at a nominal rent, 10 acres of mine-waste heaps to the association for 21 years, with power of renewal.

On Jan. 12, 1912, an Arbor Day was held at which the mayor and many members of the Town Council, members of the association and teachers and children from the elementary schools in the town, assembled on the waste heaps and planted trees. Ultimately the area will accommodate 13,000 plants. So great was the success of this function that since that day six Arbor celebrations have been held, and another has been arranged for the coming season.

In addition to this, there have been ceremonial plantings in which children took no part because the distance was too far away from any schools. Fig. 4 shows a view of the "Black Wagon" mound at Old Hill, Staffordshire, taken in mid-winter. The view is well chosen, as by the exercise of a little imagination an idea can be gained of the desolate appearance, these pit mounds presented in the days before anything was attempted to make them attractive, while on the other hand the transformation effected when the trees are in leaf over this area can be readily imagined.

Fig. 6. Photographed in January, 1912

Fig. 7. Photographed in April, 1912

Black Wagon Mound. Fire under Foreground in Left Picture. Mostly Alders Growing on Bare Shale

Figs. 6 and 7 show the two other views of the "Black Wagon" mound. The former shows the north side, planted in 1907-8, while the latter shows the top of the mound looking north. The trees are mostly alders. The larger trees on the left were planted on Arbor Day, Dec. 17, 1909, while the smaller trees were located on January, 1908. The foreground is on fire underneath, so that there are only one or two trees growing there.

Trees Around as Well as In the Village

While it is impossible in an article of this nature to enter into all the details of this valuable scheme, it forms a useful text for an inquiry as to whether in connection with the waste lands in the United States adjacent to the mammoth iron and steel industries and mining centers, some attempt could not be made along similar lines. Arbor Day is recognized as a national institution, but it is time that attention should be focused more directly

on this phase of welfare work among our colliery and allied branches of industry.

It is pleasing to record the advance which has been made in Great Britain in this direction, an advance, the good effects of which will be felt in increasing strength as the years go on. With the example of the European nations above mentioned before us, and the widespread opinion in our own country that serious inroads are being made upon our forests by the advancing forces of industry, it is surely a wise proposal to consider whether a similar system to that described above could not with advantage be adopted here.

Storage Battery Locomotives in Belgium

Storage-battery locomotives, similar to those which run on the 1666-ft. level, have recently been installed on the 1916-ft. level in part of the workings of the Chaumonceau mine of the Amercoeur collieries, Belgium. They are housed and charged in a room constructed of iron and ventilated by a separate air current.

Separate Tracks for Locomotives and Cars

The tracks have a grade of 0.3 per cent. The locomotives run on 24-lb. rails set at 20-in. gage and the cars run on a separate track, the rails of which are 17 in. apart. Oak ties, measuring 32x6.4x3.6 in., support the tracks. The ties are set at 20-in. centers. The trips consist of 24 cars, weighing 550 lb. when empty, 1430 loaded with coal, and 2090 lb. loaded with rock.

The charging of the batteries, being done at constant potential, requires no supervision. The current is led from the surface by a cable with two conducting wires, each of about 0.11 sq.in. section. As the junctions are male and female, it is impossible to interchange the poles in charging.

Description of the Locomotives

Each locomotive is about 14 ft. long, and 43 in. wide and 17 in. high. Its weight is 13,200 lb., the storage batteries themselves weighing 6160 lb. The motor is formed of a rigid frame surmounted by a casing containing the storage batteries. The side sills, with crossbars, end at the front and back in cast-steel buffer frames. These carry the bumpers which are cushioned with hempen cords.

The battery, composed of 40 elements, is inclosed in casings lined with lead and provided inside with lead pipes to drain off the acidulated water which may be spilled from the cells.

Each locomotive is equipped with two 5-hp. series motors, the speed reduction being accomplished by gears which run in a case filled with grease.

The housing of the motor, which forms at the same time the yoke connecting the poles, is of soft steel; it completely incloses the magnets, the armature, the commutator and the brushes, thus protecting all parts from dust and moisture. This housing is in two parts, connected by hinges which afford easy access to the interior. The motors, which are placed between the wheels, rest on springs, which themselves are partly sustained by the axles and partly by the frame.

Note—Translated by E. P. Buffet from a report by M. Ledouble in the "Annales des Mines de Belgique."

Controller

The controller is of the parallel type, permitting reversal of motion and the braking is electrical. The locomotive has, moreover, a mechanical brake, operated by a ratchet crank, and it is equipped at front and back with a 16-cp. electric lamp and reflector. An ampere meter and a voltmeter indicate the current consumption and state of the battery.

The accumulators, which are made at the mine, are composed of 40 elements of six positive plates and seven negative oxide plates. A positive plate weighs about 9 lb. after pasting and 5 lb. before. The plate measures 12x8x0.4 in. The negative plate weighs about 4½ lb. before pasting and 7 lb. afterward and measures 12x8x0.28 in.

The capacity of the battery is 350 ampere-hours. The locomotive consumes about 100 amperes when running and from 150 to 180 amperes when starting. The cost of hauling is about 3.35c. per short ton per mile.

Increased Value of Ashes

Recently a Berlin inventor, S. Sborowitz, read a paper in the Exhibition Palace, in the "Spree-Athens," on a new process of his own invention, for making a new material out of ordinary coal and briquette ashes. According to his statement, this material has properties ranging from those of marble to those of india rubber, according to the method of treatment.

Sifted coal ashes, preferably those from briquettes, are mixed with water glass, copal varnish, and asbestos. The mixture is dried either in the air or by artificial heat.

To give the material the appearance of marble, the desired coloring material is added to the mass. Before drying, the material may be molded into any desired form. It is claimed, therefore, that the substance is highly resistant and may be chiseled, planed and sawed. Aside from being fire-, water- and acid-proof, it is a good insulator, and so hard that it will break marble.

It may be used for wall surfacing and for floors, for table tops, etc. It is said that a Berlin company has been formed to exploit the invention, and that 50 pfg. (12c.) per bucket of briquette ashes are being paid by this company.

Why Sulphur is Found in Coal

E. E. Sommermeier, professor of metallurgy, Ohio State University, in the introduction to his book on "Coal, its Composition, Analysis and Valuation" makes the following remarks:

"If coal contained only the constituents which were present in the original vegetable matter, it would be uniformly low in both sulphur and ash. But during the early stages of its formation and when underneath the surface of swamps or lakes, streams or rivulets carried silt and sediment over the decomposing bed of vegetation, which sediment settled down and became an integral but varying constituent of the coal.

Sulphur in solution in the water, coming in contact with salts of iron and reducing organic compounds resulted in the formation and precipitation of pyrite, while other reactions not clearly understood produced variable quantities of organic compounds of sulphur as a constituent of the coal.

The Science of Good Management

By A. J. Reef*

SYNOPSIS—The answer to the problem of the "time-and-motion" loss in any industry is the one word "system." Methods employed in the various shops today may, with but little alteration, be applied to coal mining. The bonus system may be introduced with advantage to both employer and employee.

The claim advanced by Mr. Brandeis before the Interstate Commerce Commission that the application of scientific management to the railroads of this country would result in economies of $1,000,000 a day, and that this same science of management could be applied to practically every business endeavor, has directed public attention to a new propaganda in management and a new body of specialists in engineering.

The daily press and the popular magazines, which take no notice of technical matters except of a startling nature, have given much space to this movement.

Inquiry as to what this new element in management is, tends at first to confusion, for nomenclature and definitions of essentials and statements of principles still vary even with the recognized experts, and there are even those who deny that there is anything new about it.

What is Scientific Management

The name adopted by most of its advocates is "Scientific Management," not meaning that there is a science rather than an art of management, but referring to the use of scientific methods in management as opposed to "rule of thumb" methods. These methods are largely derived from a study of the science of physics and psychology.

In popular discussion we hear much of time-and-motion studies, and nearly every one is familiar with those studies, by which unskilled workmen, under skilled direction, are enabled, without frantic exertion, to load into cars four times as many tons of pig iron per day as had been the record before. How is it accomplished? The answer is by eliminating all useless motion, wasteful expenditure of energy and by taking rest for fixed lengths of time at fixed intervals.

One hears also of routing of work and material through factories, so that one department is not waiting on another; of systematizing the giving out of tools and materials by the use of requisitions and orders on a clerk of stores; of schedules of work for each machine or operative in a shop so that the least possible time may be lost changing from one job to another; of scheduling the work of the shop crane to fit this first schedule so that a tool and operative may not be idle waiting for crane service; of systems of daily reports; of cost and efficiency records; of standards of performance; of bonus systems of payment of workers; of planning functions being segregated in a separate organization.

All these things have part in scientific management in certain cases but not necessarily all of them in one individual case.

The essence of the new idea seems to be in attacking management problems in that same scientific spirit that has heretofore prevailed in the design of automatic machinery and engineering structures—by the methods of research, experiment and detailed study.

The Principle of "Transference of Skill"

The Subcommittee on Management of the American Society of Mechanical Engineers, in its recent report on this subject says, "A basic principle in the rise of industry is that of 'transference of skill'", meaning thereby the transference of the skill of the trained craftsman to the automatic machine tool. Careful study will convince one that this principle of transference of skill together with its concomitant, division of labor, has been largely if not wholly responsible for our present era of low-cost manufacture.

For years every large manufacturing concern has employed a designing and engineering force to work out this transference of human skill to a machine. The men of this force were the best talent obtainable and well paid. They used research in all sciences, experiment and detailed study to aid them. But usually the operating department was allowed to run the machines and turn out the product as seemed best to the operative or at most to the foreman.

Application of this Principle to Management

This new idea in management is merely the application of these same methods of operation, to the workmen, as well as the machinery.

Does it sound futile? Are you sure that the laborer, skilled though he may be with the traditional art of his craft, knows and practices the best and least laborious method of performing his task?

If one were attempting to design a machine to lay brick in a wall he would not hesitate to study long on the motions necessary. He would experiment with his machine, even at considerable expense, and would not balk at continued study to improve it. It is only rational then for the man who employs a human brick-laying machine to study and experiment how to lay them in the least time and with the least expenditure of energy.

One contractor made such a time-and-motion study and by applying its results cleaned up millions. His masons, instructed by him, and with scaffolding arranged to the best advantage, laid three times as many bricks per man as those of his competitors.

This furnishes a clean cut example of skill; not traditional skill of the craft, but real skill based on scientific research and experiment.

The report, above alluded to, renames this movement labor-saving management and draws the parallel with labor-saving machinery.

The Fundamentals of Scientific Management

Fundamentally then scientific management means three things: for every oft repeated operation, study in detail of all good methods of performing it; deciding on the best method; establishment of that method in practice.

*Victor-American Fuel Co., Denver, Colo.

Many other things follow from these. To the first and second steps we may add a bit of caution. A time-and-motion study is not always necessary to the decision. Even if necessary it should not be wastefully carried beyond the stage needful to a decision; neither should it be thoughtlessly applied to an occasional operation where the total saving would not justify it. The establishment of this best method as a standard, involves many of the auxiliary features of scientific management.

If a standard method is set up, standard conditions must obtain. The arranging of work to give standard conditions for the various operations for which the standard method is being taught is frequently a problem of no mean importance. The solution, however, will carry its own collateral benefits.

Workmen dislike change and particularly dislike being taught how to do their work. To obtain the establishment of new methods, particularly when these promise to turn out more work per man, usually calls for schedules of average work and payment of bonus for performance above that.

The maintenance and carrying into effect of these matters frequently calls for systems of reports, and always temporarily and sometimes permanently for additional clerical and supervising force.

There is no question also but that it means more work for the managing force, for in order to transfer skill, the manager must first acquire skill himself.

Application of Scientific Management to Coal Mining

No particular part of scientific management is new; time-and-motion studies were made in industries a hundred years ago; profit sharing is nearly fifty years old; but the scientific spirit in management which applies this principle of transference of skill to all activities in the industry consistently is at least recent.

Can we apply it to coal mining? The laying of a room switch on an entry is an oft repeated operation and so worth considering. How long does it take a track-layer and helper to lay one? Some managers may know. How long *ought* it to take them to lay one? I doubt if any of them know, and necessarily under ordinary operating practice they cannot know, because the conditions are so variable. The men may have to cut a rail to put in the frog or they may not. They may have to carry their tools a half mile to the job or not. They may have to wait for materials to be delivered or not. Laying a room switch is not a standard operation.

What is Meant by a Standard Operation

The first step in labor saving management is to make it one. Lay the main-line track so that the joints will come right for the room frogs. This will of itself partially standardize the laying of the entry track. Give the track-layer a schedule when he reports for orders in the morning, to cover his work for the day so that there is a minimum of moving between jobs.

Knowing how much moving there is to be done a definite time allowance for it can be made. See to it that the extra driver on the preceding day or night shift has hauled to the same schedule of places the track materials needed at each. Then so far as the variables mentioned are concerned the laying of that room switch is a standard operation.

Then begin a time-and-motion study and decide and formulate in writing the best method of doing it. Determine a reasonable time to do it by this method; teach your track-layer that method until it becomes habit. Make out a schedule for him for the day based on this determined time, and the moves to be made, and by means of a bonus payment for performance according to schedule keep him up to such performance.

Right here an attendant or incidental advantage is manifest. The workman of course cannot expect to equal that schedule and obtain his bonus unless conditions are up to standard and a spur to the management to keep them so is thereby automatically provided.

Not All Operations Can Be Standardized

Admittedly there are many operations in coal mining which can not be standardized even though oft repeated. Thus, although the basic idea cannot be carried to completion, some careful study and experiment may even here prove helpful.

If the making of the time-and-motion study seems inexpedient or if it should develop that the present method is the best that can be devised, advantage may still be taken of the knowledge that can be obtained of a standard time in which the work should be performed. In this way a schedule of daily tasks may be intelligently made up and used, without any bonus system.

This will afford an easy method of detecting any soldiering on the job. With conditions really made standard and the schedule intelligently made out, based on what a man ought to do, the superintendent will have a right to insist on the schedule being completed.

Many minor points in management which can be used will develop from the attempted application of scientific management even though it be found that the system as herein outlined is not applicable in its entirety to all the various operations of the industry.

The great essential to success in applying scientific or labor-saving management lies in the scientific, experimental attitude of the managing forces toward their problems, and making all the activities of the industry their problems.

Employment of Outside Experts

A word as to the employment of experts. Scientific management is not something that can be grafted onto an industry by an outsider. It begins in the spirit of the management forces, and belief in it and enthusiasm for it must reside there continually, if its application is to succeed. Nevertheless an outsider, granted managerial ability, coming fresh to the problems of the particular industry, can frequently see far more than those who are in it every day. His point of view is different. Also the work of making time-and-motion studies is best done by one with special training and their results are best evaluated by one with experience in using them.

The whole idea is so big that its ardent advocates seem unduly enthusiastic and from some of their writings one would imagine the movement a cult or religion. Like every new movement with worth it has its fakers; but these things should not detract from the real value in "labor-saving management."

CURRENT COAL LITERATURE

Relation of Subsidence to Packing

By Geo. Knox*

SYNOPSIS—Where flushing is used instead of pack-walling to support the mine roof, the miner is exposed to less risk at his work. The roof subsides over the pillar from one-tenth to one-eighth of the depth of the seam in room-and-pillar working. With flushing, the subsidence extends over the pillar more than one-third of the depth of the seam. Flushing reduces the emission of gas and cools the workings. It costs from 9 to 21c. per ton mined. The Krupps are extracting all the coal beneath their works and protecting them by flushing.

In extracting coal seams, there are two distinct types of supports to be considered, namely: (a) those left in the mined area for regulating the subsidence of the overlying strata; and (b) the temporary support between the permanent packing and the working face for preventing any sudden movement of the descending mass from breaking off, without warning, pieces of the lower roof strata. Attention has centred largely on the need for some system for the latter type of support.

Roof Support in Rear Has Bearing on Safety at Face

After personal investigations of the methods adopted at the Courrières and other continental collieries, I am of opinion that the careful attention paid to the packing of the worked-out areas, which accompanied the systematic timbering, had quite as much effect in reducing the accident rate as the timbering at the face.

When a layer of coal is being removed, it is subject to two forces, one, that of gravity acting downwards, and amounting roughly to about 1 lb. per sq.in. for every foot the coal is below the surface, and the other acting horizontally in a direction opposite to that of the workings. If the packing is inefficient, the downward weight acts suddenly and irregularly, breaking the roof strata by a series of "slip-faults," as shown in Fig. 1, and throwing a large amount of extra pressure on the edge of the solid coal at the face.

The resultant of the two forces, to which reference has been made, acts toward the region of least resistance, the area of extraction, thus forming planes of strain projecting over the solid coal. The area of subsidence on the surface, is, therefore, always greater than the area of extraction below it, and will vary according to the rate of advance of the working face, the nature of the overlying strata, the presence of faults, etc.; but the obliquity of the resultant of the two components forming these planes seems to be determined chiefly by the efficiency of the packing (Fig. 4).

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Note—Abstract of paper entitled "Relation Between Subsidence and Packing, with Special Reference to the Hydraulic Stowing of Gouves," read before the Manchester Geological and Mining Society, at a session held at Manchester, England.

Horizontal Draw

The distance that surface subsidence extends in advance of the working face (that is the amount of "horizontal draw") varies with the efficiency of the method of packing adopted. In room-and-pillar workings, where the roof is allowed to fall in as the props are withdrawn, the draw appears to be about a tenth to an eighth of the total depth; in longwall mines with good pack-walling, a quarter to a third of the depth; and where hydraulic packing is used, an even greater distance.

Where the draw is short, gravity acts freely, breaking the roof strata along the line of the coal face. Where it is increased, by the packing of the extracted area, the vertical force is partly arrested by the pressure of the horizontal force projected against the subsiding zone, which throws a greater proportion of the weight forward on to the solid coal, allowing gradual settling, with the roof unbroken (Fig. 5 and 6.)

The Change From Compression to Tension

As the coal at the face is being undercut, and the roof strata above leave the "solid" and enter the mined zone, a change of strain, from compression to tension, must take place in the rock particles. The nearer to the vertical, the line of strain approaches, the more sudden and violent will the reactions become between these forces in the roof strata at the face. To minimize this, the plane of strain should be thrown as far back as possible, as shown in Fig. 4, thereby increasing the horizontal pressure and allowing the reactions to take place slowly and evenly.

In opening out the workings in a partly packed seam, the only evidence of strain as the workings advance beyond the shaft pillar, is that of "thrusting" (Fig. 3) until a sufficiently large area has been mined to permit of the huge rock lever breaking through to the surface.

When this "first-weight" takes place, the strata will cut through at the face, up to the surface, as shown in Fig. 4. As each undercut is made, new fractures parallel to the first will be produced and the roof, instead of subsiding solidly and evenly on the packs, will probably come down in a series of jerks between the fractures.

The maximum subsidence is obtained when the packing is wholly inefficient. Under this condition it ranges from 30 to 70 per cent. of the thickest part of the seam. The minimum subsidence is from 5 to 10 per cent., this value being frequently obtained where the opened spaces are filled by flushing. When the subsidence is reduced to the lower figures and the roof strata allowed to subside gradually and evenly on the packs without fractures, better results may be expected from the application of systematic timbering than is obtained in present day practice.

With complete packing, this subsidence would also tend to prevent the drainage of large volumes of gas (and in many cases water) from the overlying strata

into the mines and thus another danger encountered in gaseous workings would be removed. Where the roof is completely packed, all the coal can usually be extracted, but even in cases where coal of a poor quality is left behind, it is impossible for gob fires to take place where flushing is used. Seams up to 40 ft. thick, in which gob fires formerly occurred with frequency when only partial packing was in use, are now being worked and completely packed by flushing without the slightest risk from gob fires.

Importance of Manner of Working

Large areas of coal have been lost through lack of attention to the cause of subsidence. Fig. 7 is an example where a series of pillars in a 9-ft. seam, covering an area measuring about 1200 yd. in length by 400 yd. in width, was rendered unworkable through the extraction of the pillars on the rise sides of the basin, allowing the strata to break to the surface, thus forming a huge rock pyramid which rested directly on the coal seam.

Fig. 8 is another example where a 6-ft seam was being worked from two different shafts towards each other. When the faces approached within 200 yd. it was found impossible to keep the strata from cutting along the faces, and filling up the roadways through the longwall.

In Upper Silesia over a hundred collieries have installed the hydraulic packing system in seams varying from 4 to 40 ft. in thickness, and have thus reduced the subsidence from 30 to 70 per cent. down to 0.3 to 7.8 per cent. of the total thickness of the seam. Spontaneous combustion (which accounted for the loss of 25 per cent. of the total area of coal) has been entirely prevented; surface damages have been considerably reduced, and a great saving effected in timber. The cost of packing varies from 9c. per short ton of coal extracted at Myslowitz, to 13c. per ton at Florentina colliery, and 14 to 16 per ton at the Kattowitz collieries.

In my opinion, the problem of safety in coal getting is largely that of regulating the subsidence of the strata and the same may be said concerning the saving of coal supplies. It is evident that the regulation of subsidence is largely determined by the efficiency of the packing used, and that the most complete system of support known is that provided by flushing.

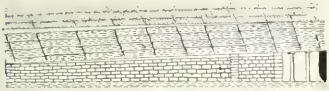


FIG. 1 - ROOF FRACTURES DUE TO IRREGULAR AND UNEVEN SUBSIDENCE

FIG. 2 - HORIZONTAL MOVEMENT OF FLOOR CAUSING "CREEP"

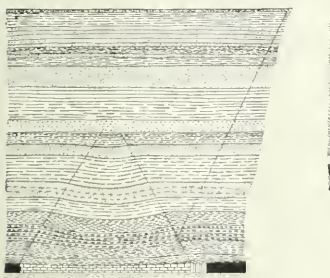


FIG. 3 - FRACTURES IN STRATA WHEN "FIRST-WEIGHT" TAKES PLACE

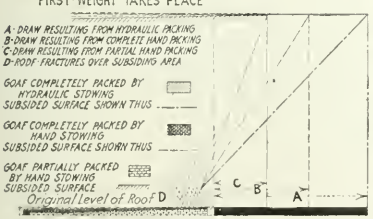

A-DRAW RESULTING FROM HYDRAULIC PACKING
B-DRAW RESULTING FROM COMPLETE HAND PACKING
C-DRAW RESULTING FROM PARTIAL HAND PACKING
D-ROOF FRACTURES OVER SUBSIDING AREA
GOAF COMPLETELY PACKED BY HYDRAULIC STOWING SUBSIDED SURFACE SHOWN THUS
GOAF COMPLETELY PACKED BY HAND STOWING SUBSIDED SURFACE SHOWN THUS
GOAF PARTIALLY PACKED BY HAND STOWING SUBSIDED SURFACE
Original level of Roof
D
C
B
A

FIG. 4 - RELATION OF SUBSIDENCE, RELATIVE DRAW, AND EFFICIENCY OF PACKING

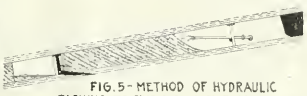


FIG. 5 - METHOD OF HYDRAULIC PACKING TO THE DIP OF THE COAL-FACE

FIG. 6 - METHOD OF HYDRAULIC PACKING IN FLAT WORKINGS

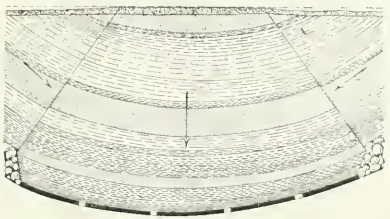


FIG. 7 - LOSS OF COAL CAUSED BY SUBSIDENCE, RESULTING FROM BAD ARRANGEMENT OF WORKING

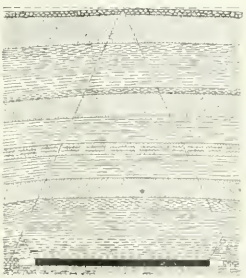


FIG. 8 - PYRAMID OF STRATA RESTING DIRECTLY ON TOP OF COAL

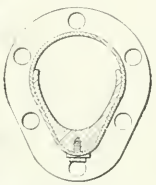


FIG. 9 - OVAL PIPE WITH LINING

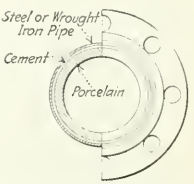


FIG. 10 - PORCELAIN LINED PIPE

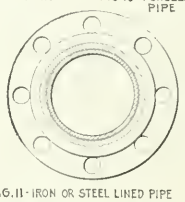


FIG. 11 - IRON OR STEEL LINED PIPE

FIG. 12 - SECTION OF JOINT OF LINED PIPE

FIG. 13 - METHOD OF WORKING BY LONGWALL AND PANELLING

It may not be altogether out of place to meet some of the more common objections against the introduction of flushing, which roughly resolve themselves under the following headings:—

Cost of Providing Packing Material

In newly opened coalfields, in the absence of a plentiful supply of material for packing, this might be a costly difficulty. Where mining has been in progress for many years, the huge refuse heaps provide a sufficient supply of suitable filling.

Where this is plentiful, it forms the cheapest and most

efficient packing material, costing in Upper Silesia from 6c. to 8c. per ton of coal raised; but where local weathered pit heaps are available the cost is said to be from 10 to 14 c. per ton.

In Essen and other thickly populated centers, the money saved in ground rents by getting rid of refuse heaps, and the saving of 7 to 9c. per ton for surface damages, reduces the total comparative cost of packing by flushing to a very small sum compared with the old system.

Where slag or other refuse has to be transported for considerable distances by rail, as at Saarbrücken, the cost may become as high as 18 to 21c. per ton—about 5c. per ton higher than for hard packing, but the difference is made up in the saving effected in the timber required.

Packing Flat and Unfavorably Inclined Workings

It is not so hard to pack flat or unfavorably inclined workings despite the accepted opinion. With a dip of 5 deg. or more (Fig. 5) and the flushing shaft on the rise side of the property, there is little difficulty experienced in carrying the packing material into the extracted area. In fact the material can be carried on a level grade a distance equal to from three to five times the pressure head according to the percentage of water used. Because of the excessive volume of water needed it is not advisable to force the material in the pipes uphill, although this is frequently done for a distance of 90 to 120 feet.

In flat seams, the flushed fill is kept in position by temporary timber dams, as shown in Fig. 6. These are raised sufficiently high across the pack area to prevent the flushed material from spreading too far forward. These boards are laid loose between two lines of props, and moved forward as the goaf becomes filled up.

Objections to Flushing Invalid

It has been objected that the use of large volumes of water underground, (a) would cause creep, (b) increase the cost of pumping, (c) be injurious to the health of the miners. It was also thought that in cold weather flushing would be difficult.

(a) Creep is the result of the movement of the rock particles in the floor from the point of greatest pressure which is under the pillar or pack, towards the point of least pressure which is the roadway or open excavation. The packs are forced by the weight of the overlying strata into the floor, the rock particles being translated horizontally towards the open roadways (Fig. 2.).

In flushing, the primary cause of creep can be reduced by the greater amount of support left in the mined area and the more even distribution of the total weight on the rock, as only a few roadways in longwall are necessary. Being usually applied to retreating methods of working, the wet floor is left behind.

As the old roadways are usually fitted with rubbish dams, and the water from the packing area is turned into them, they act as filter ponds and become silted up, thus completely packing all the mined area and reducing the tendency to creep.

(b) Where very little water is met with in the lower workings of the deep mines, the extra pumping would be a disadvantage, but the advantage already suggested, and the increased safety due to the damping of all coal dust in the vicinity of the working faces, would more than counterbalance the extra cost for pumping.

Flushing Lowers Mine Temperatures

(c) Regarding the question of health, hydraulic packing produces a cooling effect. It neutralizes the heat caused by the grinding of the coal in the pillars or of coal left in the extracted area. It prevents the rapid oxidation and heating of the fine coal dust which is produced by the crushing action of subsiding strata.

(d) There is no great difficulty in Great Britain, even in the coldest weather, in providing a water supply sufficient to make up any slight loss due to evaporation. The only other difficulty arises when the flushing is intermittent. In this case, the water in pipes near the surface is liable to become frozen when the flushing current is stopped; but this can be avoided by lowering the water in the pipes to a point where the temperature is high enough to prevent freezing.

Packing Very Thin or Very Thick Seams

In Essen, the Krupp firm is successfully extracting from underneath their railway works, railways, and large public buildings, 8 seams, varying from 20 in. to 5½ ft. in thickness. They are enabled to do this with impunity, owing to the completeness with which the workings are filled with flushed *debris*.

In Silesia, seams up to 40 ft. thick are being worked and completely packed, sometimes by panel-slicing the whole 6 thicknesses of seam and sometimes by longwall layers. Working is commenced from the bottom upwards and the goaf packed in each layer as it is extracted. The only disadvantage in thin seams, compared with thicker ones, is the frequency with which the flushing pipes have to be moved for a given amount of packing.

Maintenance of the Pipe Lines.

The greatest difficulty which had to be surmounted in hydraulic packing arose from the excessive cost of maintaining pipe lines and it has taken several years of experiment and practice to devise a suitable conduit capable of resisting the grinding action of the *debris* in the horizontal pipes.

There are practically only four types of pipe now in use, namely: (a) mild ungalvanized-steel pipes; (b) mild steel or cast-iron pipes lined with hard wood or steel (Figs. 11 and 12); (c) steel pipe lined with porcelain (Fig. 10); and (d) the Stephan system of oval steel pipes, with steel lining, or the Busch system with iron linings (Fig. 9).

Wood Lining Costs 52c. per Yard and Porcelain Pipes $3

The first system is still used in many continental mines where the plant was installed some years ago, and the second is utilized most successfully in Silesia and the Transvaal the cost of wooden lining being about 52c. per yd.; but in all new installation types (c) and (d) are adopted.

Porcelain-lined pipes will pass from 180,000 to 200,000 tons of material before they require renewal, and iron-lined oval pipes will pass 14,280 cu.yd. per hundredth inch wear of surface. The latter system would seem to be the most satisfactory yet adopted, the cost of lining being about $3 a yard.

There is a difficulty in adapting the system to mines now using hand-packing, especially where the workings are well advanced.

EDITORIALS

Watch for our statistical number next week. This special annual issue of COAL AGE will contain a complete review of all that has occurred in each state during the past year. Read it, and file it for future reference.

Special Power Number

On the first of February, the entire issue of COAL AGE will be devoted to the question of power at coal-mining plants. All of our readers are invited to contribute articles and letters adapted for publication in this special issue. If there is an uptodate power equipment at one of the mines in your vicinity, send us some photographs and a description of the most interesting points connected with this particular installation.

The Air Current a Factor in Mine Explosions

No one doubts for a moment that a strong current of air is an important factor in the initiation and propagation of a mine explosion, when the conditions in the mine are favorable for explosion of either gas or dust.

No one would essay to question the potency of a high velocity of pure intake air to augment the combustion of gas or dust in mine workings. A high velocity represents an energy that may, under favorable conditions in the confined space of mine workings, be transferred to and become a part of the energy of an explosive blast.

When, however, one reads the account of such experiences as are unfolded in the letters of Alexander McAllister, COAL AGE, Nov. 16, p. 692; Dec. 14 and 21, pp. 838 and 881; and again in this issue, p. 24, one is forced to the conclusion that the narration is simply phenomenal. It is more than remarkable. The question to be decided, and which we hope will be clearly discussed in the coming issues of COAL AGE, is: To what extent is this experience, as given by Mr. McAllister, of general application in coal mining, today?

The Mining Engineer

What constitutes a mining engineer? This question is often asked, because of the confusion growing out of many practical mining men styling themselves "Mining Engineers," after a few years' experience in making mine surveys and maps, or in planning and superintending the construction of mining plants and equipment. The idea seems to have gained some prevalence that all that is required to make a competent engineer is an experience of a certain length of time in the mines, in the line of work generally performed by the mining engineer.

The sub-committee of the Commission to revise and codify the present anthracite mining laws of Pennsylvania, in its report just made to the Commission, define the term "mining engineer" as follows:

> The term "mining engineer" means any person who is competent to survey and plot accurately the inside workings of a mine, and who has had ten years' practical experience at such work; or one who is a graduate of a school of mines or some similar institution, and who has had five years' practical experience in the mines.

While it goes without saying that there are many practical men, untrained in book knowledge and unacquainted with the theory and principles of mining but whose practical experience in the operation of mines has fitted them to successfully perform many of the duties that belong to a mining engineer, it still remains that these men are only specialists in particular lines of practical work. They are incompetent to design new machinery; plan new equipment calling for the intelligent application of known laws and principles; or to estimate accurately the efficiency of the ventilating system in the mine or the power plant on the surface. These duties require a mining engineer, who is *more* than a thoroughly practical and experienced man. He must be a man who combines in his personal equipment both the theory and the practice of coal mining.

We would suggest that the enactment into law, of such a definition of the term "mining engineer," would operate to weaken mine management and, incidentally, lower the standard of efficiency of all certified mine officials, because of the tendency, on the part of such practical engineers to eliminate theory and principles from mining examinations. The result would be to rapidly impair the conditions in the mine relative to the health and safety of the men employed and the security of property.

We would suggest that every mine examining board should include at least one graduated mining engineer of not less than five years' practical experience in gaseous mines. We cannot safely eliminate from mining practice the knowledge of the theory and principles of mining; these are essential to all branches of mining if economy and safety of operation are to be secured.

Class Legislation

All the coal-mining laws which have been passed in the United States have been written for the good of the miner. Except the provision that the operator may condemn rights-of-way over the lands of others, which is probably unconstitutional in most states, we do not recall any parts of the law which were or are favorable to the operator.

The law reads that he should do this and supply that and failing to do and supply these things, certain penalties are threatened against him and his agents. Perhaps some provisions do not cover all the dangers in the mine, some are perhaps not duly severe, some, it may be, bring too much force to bear on the foreman and too little on his employer.

But this is not the matter we have in mind. The main truth is that all the legislation hitherto passed has been in the interest of the workman and not in the interest of the operator. The laws were proposed and passed to

promote the safety, health, comfort and happiness of the miner, mainly at the expense of his employer. These laws were expected to put the mine owner to considerable expense and no one can deny that at least the charge for safety is large.

But we do not find that the workman is prepared to back up the laws provided for his sole advantage by insisting on their enforcement. He does not condemn openly those firebosses who fail to make inspections, he does not demand the discharge of men who leave mine doors open, he fails to hound those men who put in overheavy charges, who tamp with slack, who mix powders, who make tight shots in dusty mines and who fill cartridges with pipe in mouth or lamp on hat.

In fact, if men are discharged or arrested who do such things, the miners as a body go on a strike. The burden of enforcing these laws invariably is placed entirely on the operator and his officials. The workingman is either indifferent or hostile. Who cares? Not the men who are likely to be injured or killed, it is nothing to them. It is the operator's business, they think, to protect them, even though they will not obey the law.

When the first man to carry a safety lamp went into an English mine, he met a miner who, resenting the fancied foolhardiness of the stranger who would venture to carry a lamp of any kind into a mine, so gaseous that all lights were prohibited, prepared to brain him with his pick. Perhaps this British "coal hewer" had a better conception of a miner's need to enforce obedience to common sense than is found among many miners today.

The miners should be prepared to see that the law is obeyed. Morality and penalties restrain the operator, to the miner there is a third and larger restraint—personal interest. It is a foolish man who is blind to his own advantage and to his own safety.

We would expect to find that the workers who did not value safety would be driven from camp to camp as marked men and that official guardians of the miners who habitually neglected duties, they were hired to perform, would be drummed out of the society of the men whom they had betrayed and whose lives they had risked.

But we do not find any such disgust and dislike on the part of their fellows. After a while an accident occurs and then the operator and his unfaithful employee are visited with resentment. The men who have been well aware that the careless fellow was always indifferent to all laws and regulations are often over ready to blame an official who has had far less opportunity to observe the work of his subordinate than the men who make loudest complaint, and who was paying the man to do his work well, possibly not at all for the good of the company, but for the sole advantage of the men employed.

Roof Control

We publish today an article by George Knox, on the "Relation of Subsidence to Packing." It is reproduced because of the valuable facts relative to roof settlement, gob walling and flushing which it contains and not because we are impressed with the train of reasoning by which roof fracture is explained.

Perhaps the fear of the German technical training has overcome English discretion and has caused Great Britain to multiply her colleges unduly. This unhealthy growth may explain to us many of the obscurities in diction and much of the unsoundness in theory in an author who is styled lecturer in mining at an English college.

Wherever we were unable to understand what the author intended to convey, we left his wording in its pristine incoherence. Even when he talks the almost universal language of pure science, he is as hard to understand, because he is as severely involved, as our own Mary Baker Eddy of muddled memory.

Mr. Knox must surely pardon us if we do not believe that the roof breaks along the lines he suggests. We cannot grant him that peculiar tilted L fracture which he favors and we fancy he will find it hard to conjure the roof to follow the extraordinary course of breakage he has laid out for it.

He appears, from his drawings, to think that a measure will lie flat on a bed of coal and then bend down at maximum curvature along a given line. The whole theory of flexure is opposed to such a conception. All bendable bodies flex under load into continuous curves, the continuity being only broken when the elastic bodies break.

Every evidence points to the fact that a theoretical treatment of roof breakage is needed accompanied by experimental work in the mines and the stressing of rocks and models in a laboratory. The matter is one of great complexity, as the stresses vary not only with the movement of the face, but also with progressive demolition.

Before the coal in one part of the mine is even opened up, it is subject to variations of pressure due to the undulations of roof which mining in other parts of the workings create. The load on the coal must thus be greater or less than the immediate overburden provides. Where the roof, in bending, forms a trough, the burden is increased, where it forms a ridge the weight declines.

Then again comes a change when the coal tends to tear from the roof and form no longer a part of that composite beam. Later long rents form from the surface at the head of the primary undulation and underground at the center of the span. As the extension of these rents would involve their becoming wider, they cease to extend.

The beam across the opening and over the adjacent pillars becomes an arch from a structural point of view, and then various forces come into play, probably some tensions arising from the line of pressure leaving the middle third, longitudinal shears, which permit the measures to distort into such shapes that the arch can fail, overturning actions on the coal pillars and thrusts on other sections of the mine roof, causing greater subsidence in these than their own weight would occasion. Now and again, perhaps, the arch will fail a little and then the beam strains reassert themselves. Then the roof will crack further and the arch strength once more come into play.

Thus at last demolition occurs and a number of forces thus deprived of their balances tend to work havoc on other parts of the mine roof. If the nature of the roof's resistance did not change in the course of its demolition, the first break would be the last, as rapid as the failure of a girder in a testing machine.

The mine roof is in need of its Navier, Saint-Venant and Clerk Maxwell, and both theory and nomenclature call for development. The use of the word "draw," for instance, to cover both the area affected by tension and the tension itself, is even more confusing than the early indiscriminate use of "stress" and "strain."

COLLIERY NOTES AND COMMENTS

The use of animals for haulage purposes underground is generally unprofitable if the distance to be covered exceeds 2000 feet.

If an electric mine locomotive is not giving the best results, examine the overhead work, as upon the character of this work depends to a great degree the success of the locomotive.

Borehole explorations have shown that the Appalachian coal basin has an area from 50 to 75 miles wide, barren of commercial coal. This begins north of Pittsburgh and extends through Ohio, West Virginia and into Kentucky; in the latter state it is 25 miles wide.

Increasing the life of mine timbering not only saves the value of the timber, but also saves on labor needed for frequent resettings, and eliminates the worry and risk incident to such operation. Only timber so situated as to be free from the danger of crushes can be profitably treated with preservatives.

When choosing a rescue apparatus give consideration to the following points: Weight of apparatus, capacity, strength and durability, liability to derangement in use, simplicity of construction, comfort in wearing, regulation of supply, facility of communication, safeguards for return, ease in cleaning, initial cost, and cost of operation per hour.

Under no circumstances should a miner be allowed to enter his place until it has been examined. All miners and laborers, before going to their working places, should be compelled to report to the official whose duty it is to make the early morning examination. This rule should be unbreakable and if ignored should be followed by prompt dismissal.

According to George S. Rice, engineer in charge U. S. Bureau of Mines, Pittsburgh, Penn., there is an opportunity for concrete ties, if they can be adapted to the conditions in the main haulage-ways. If made light and durable, they could be used for temporary room ties and taken up and relaid like rails in another part of the mine when the room is worked out.

A great deal of unnecessary wear in the working parts of machinery could be avoided if the nature and application of the lubricants were properly studied. Too much oil should never be used, and it should be the special care of the workman to see that it is uniformly distributed and regularly applied. One dry spot on a hearing causes heat, and cutting is sure to follow.

Some time ago a fatal accident occurred, due to a miner heating his explosive in an oven. This is perhaps a much more common method of "getting the explosive into condition" than is usually suspected, and among others is that of carrying the explosive next to the body. The miner who is guilty of this habit is a walking danger, not merely to himself, but also to his companions.

The advantages and disadvantages of fixed screens used in the preparation of anthracite coal are: Advantages—(1) Low first cost. (2) Run with very little attention. (3) No power is needed to run them. (4) Large capacity. Disadvantages—(1) Do not screen the coal as perfectly as might be desired. (2) Need of additional breaker height to accommodate the pitch. (3) Breakage and loss of coal due to the drop at the lower end.

As the pressure increases with the depth of mining, so will the proportion of large coal decrease. This is clearly recognized, and it may be moderated by laying out the workings so as to take advantage of the cleavages. Also by the method of holing and packing, and by avoiding downhill falls in seams with much dip. It is further held to be especially desirable to work at a uniform rate with just sufficient pressure to help in bringing down the coal. Stopping the workings for a time is generally detrimental.

Comparing methods of working, Joseph Dickinson, a British mining expert, informed a coal-supplies commission that he favored the longwall system, but stated that there are considerations which have to be taken into account with regard to all mines. If there is no material in the seam for stowing and packing, it may be necessary to use the room-and-pillar system. As regards cost, there may not be much difference between the two systems, but on the question of the quality, the longwall method will probably produce the best coal.

The importance of accurate work in the surveying department of a coal company is obvious when it is remembered that mistakes are liable to cause great loss of mineral by bringing down the overlying strata in the vicinity of faults and loose ground, also through flooding in piercing old workings in front or overhead. Such mistakes also lead to trespass actions, the loss of coal through leaving extra-thick pillars and an increased length of haulage. Care, accuracy and attention to details should be the characteristics of a good mine surveyor.

Regarding the limit of depth in mining, Joseph Dickinson said: "Some people are talking now of 5000 ft.; I think the possibility is that it may be obtained hereafter by means of deeper shafts, and taking the men out and allowing them a little respite and time to cool; also the use of some of these cooling adjuncts. I do not know what effect an ice arrangement or liquid air will have, but compressed air, when liberated, will freeze the small valves of an air machine. We have by no means exhausted the cooling powers within reach of the collier."

Crush and upheaval naturally increase with the depth. To certain depths, varying with the degree of hardness, the increase may be moderated by increasing the proportion of pillars, and in all kinds of work by varying the direction of the working. Soft seams with slippery faces, begin to crush in narrow openings at a depth of about 500 yd.; in some instances, both in narrow and wide work, large outbursts of crushed coal occur suddenly from the unworked portions of the seam beyond. Such outbursts are often accompanied by firedamp, and may occasionally be avoided by boring in advance, or in the roof or floor.

Explosives should be handled with great care, and it is well to keep in mind the eight causes of accidents when shotfiring, quoted by Prof. Courtenay de Kalb: (1) A hole missing fire; driving a wedge near the hole two days later has been known to explode the charge. (2) Using a short fuse to hasten explosion has exploded the charge before the workmen could retreat. (3) Smoking a pipe while charging a hole. (4) Loading a hole with the aid of an iron needle. (5) Firing a charge in a hole to clear it of water, and immediately reloading. (6) Ramming a charge in a hole with an iron crowbar; also tamping a charge with an iron bar. (7) Drilling out a misfire shot with a blunt drill. (8) Forcing a cartridge in too small a hole.

The British Mine Inspector, R. A. S. Redmayne, is of the opinion that it would be advisable to eliminate safety catches, and to substitute chains in place of the rigid rods at present used for suspending the cage from the rope. He also advocates having the former systematically annealed at stated periods. Such safety catches as are now in use constitute a doubtful safeguard and may actually be a source of danger. This was shown by Inspector Walker in connection with the inquiry into the Barrow colliery shaft accident. He said: "The engineer did not run the cage at the same speed all the way down, and the safety catches partially acted with the result that the rope accumulated on the top of the cage until the weight became such as to cause the cage to drop."

The Yorkshire mine inspectors have long held the view that miners should not be allowed to keep gunpowder in their homes. Explosives should be supplied by the owners themselves, and the following case is to the point: The manager of a South Yorkshire colliery, who was bound to use a "permitted" explosive, thought the men were buying their explosives outside. He had them searched and found that they were taking in gunpowder wrapped up with their meals and in their pockets. Even the British miner is partial to this class of powder, but as is known, under certain conditions it is dangerous to use it in mines; in this particular mine it was prohibited by law. There had already been one explosion, and the result of the foolish conduct of the men might very easily have caused another.

DISCUSSION BY READERS

Carbon Monoxide Produced by Explosion of Methane

I was interested in reading the answer to the examination question, COAL AGE, Nov. 23, p. 732, which reads:

> What would be the probable composition of the explosive mixture, if the afterdamp of the explosion shows the presence of whitedamp, instead of blackdamp, and why?

The answer to this question states as follows:

> . . . . The complete combustion of the carbon requires a volume of air practically nine and one-half times the volume of the marsh gas. This proportion denotes the maximum explosive point of the firedamp. When the firedamp mixture contains a less proportion of air, the combustion is incomplete and whitedamp is formed.

Now, the complete combustion of methane in air is expressed by the formula,

$$CH_4 + 2\ O_2 + 8\ N_2 = CO_2 + 2\ H_2O + 8\ N_2$$

From this equation it is apparent that two volumes of oxygen (O_2) are required to burn one volume of methane (CH_4); or, what is the same thing, for the complete combustion of the methane, the firedamp mixture must contain 9.46 per cent. of gas and 90.54 per cent. of air.

My own experience confirms that of Dr. Broockmann's, namely, if more than 9.46 per cent. of methane is present and less than 90.54 per cent. of air, there will be no carbon monoxide (CO) formed by the explosion of the firedamp mixture, but the afterdamp of the explosion will contain some unburned methane (CH_4). Again, if more air is present and less gas than the proportions stated above, oxygen will be found in the afterdamp.

In most gas explosions in mines, dust is also present; and, as a result, carbon monoxide (CO) is found in the afterdamp of mine explosions. In one case, in my own experience, where only gas was present, a sample of the afterdamp taken for analysis did not show any carbon monoxide.

HENRY BOCK.

Denver, Colo.

[In answer to the remarks of our correspondent, we would draw attention to the discussion of the same question, in the excellent paper, "Notes on Explosive Mine Gases and Dust," by R. T. Chamberlin, being the original Bulletin No. 383, of the U. S. Geological Survey and reprinted as Bulletin No. 26 of the Federal Bureau of Mines. This bulletin, pp. 11-14, gives a full discussion of the possible composition of afterdamp. The bulletin, p. 12, refers to the apparently as yet unsettled question in regard to the combustion of methane in an atmosphere containing an insufficient amount of oxygen for the complete combustion of the gas.

As indicated in Mr. Chamberlin's bulletin, the conclusion of Dr. Broockmann that carbon monoxide *cannot* be formed by the combustion of pure methane in air, even though the quantity of air present is insufficient for the complete combustion of the gas, does not seem to have received sufficient corroboration for its general acceptance. The early experiments of Dr. J. W. Thomas, corroborated by the later experiments of the French Firedamp Commission, led by the eminent mining experts, MM. Mallard and Le Chatelier (1882), have since been further proved and endorsed by the able experiments of G. A. Burrell, chemist of the U. S. Bureau of Mines.

The experiments of Mr. Burrell are fully explained in a paper read by its author, before the Coal Mining Institute of America, Pittsburgh, Penn., Dec. 20, 1911. (COAL AGE, Dec. 23, 1911, p. 348.) We quote from this paper as follows:

> In these experiments pure methane was prepared and mixed with air in such proportion that not enough of the latter was present for the complete combustion of the methane. The mixtures were then exploded and the products of combustion examined. The most explosive proportion of methane and air contains 9.46 per cent. of methane. When the latter is increased above this figure, certain products are formed, about which there has been some disagreement. Some investigators have gone on record as saying that no carbon monoxide is formed.
>
> According to these experiments the carbon monoxide and hydrogen increase, and the carbon dioxide decreases as the methane content of the original mixture is raised.

The following is quoted from "Mine Gases and Explosions," Beard; p. 130:

> . . . . The increase of carbon dioxide and decrease of carbon monoxide, as the proportion of air to gas is increased, is shown by the following results (Thomas):
>
> Gas to air:
> 1:4.5; 10% carbon forms CO_2; 90% forms CO;
> 1:5.0; 13% carbon forms CO_2; 87% forms CO;
> 1:6.0; 20% carbon forms CO_2; 80% forms CO;
> 1:9.57; all the carbon is converted into CO_2.
>
> The point of complete combustion is reached when the proportion of gas to air is 1:9.57 (9.46%), when all of the carbon of the marsh gas is burned to carbon dioxide; and all the hydrogen is converted into water vapor, ...

In an article entitled "Methane in Coal Dust Explosions," COAL AGE, Feb. 17, 1912, p. 609, F. I. Wilbur, another reference will be found to the claim of Dr. Broockmann. It is the opinion of COAL AGE that until further proof is presented to the contrary, it is better to place confidence in the earlier experiments of Thomas, as corroborated by the French Firedamp Commission and the U. S. Bureau of Mines.—EDITOR.]

Reducing Ventilation at Firing Time

Continued from Dec. 14, p. 838.

When the Western Coal & Mining Co. requested me to go to mine No. 15, Dec. 1, as mine foreman, the mine was a complete wreck and the miners were moving away from the place, there being less than fifty per cent. of the men left now to operate the mine. I agreed to take charge of the mine, provided I was allowed to manage the mine without any interference in using my method of preventing explosions. Myself and Inspector Gilday made an examination of the mine Dec. 1, 1912. The fan was out of commission; all the stoppings, doors and overcasts, were destroyed. We found a heavy air current circulating in the mine, 78,000 cu.ft. per min.

I employed some sixty men to build stoppings and made the repairs necessary to put the mine in working condition. When this was done I found that with the fan stopped I

had a natural circulation of 32,000 cu.ft. of air per minute, which I considered a dangerous condition. I therefore had carpenters seal up the air shaft with heavy folding doors, hung to fold down and close the upcast shaft during firing time. For this I was criticized by the mining men of that section, who claimed it would be murder to allow any person to enter the mine under those conditions. I stated through the press, at that time, that I would be responsible for any explosions at the mine and would guarantee to fire all shots.

The steam and water pipes were destroyed by the last explosion and I did not replace them. Every part of the mine contained a heavy coating of highly inflammable coal dust. The first night, I found nineteen shots in the danger zone. These shots were charged with an average of 5 lb. of black blasting powder and tamped with coal dust and fuse. I invited the critics to come to the mine and see the results. Over one hundred of them came. I closed the doors over the upcast shaft, shut down the fan, and, going down, lit those nineteen shots, at one lighting. There were no windy shots or any explosions. The mine was only 220 ft. deep, and the people on the surface claimed the nineteen shots went off in less than one minute. I fired all the shots each night and, in some cases, had twenty-five ignited at one time.

I succeeded later in hiring two men to do the shotfiring, by paying them each $8.00 per day, and agreeing to accompany them while they were performing their work. I had safety holes cut in the solid coal, in the danger zone, for the shotfirers' protection. When they had become convinced that there was no danger of an explosion, I told them that I considered the mine a fine testing station, and got them to agree for me to make some tests. This was in the month of December. The first test I made was with the doors closed and twenty-seven shots prepared as before, in the danger zone.

We next established stations at intervals of 25 ft., from the face of the entry toward the shaft bottom. At each station, we placed a timber, and nailed some fine paper to the timbers. My object was to find out how far the flame would extend under those conditions. I then placed one 25-lb. keg of Du Pont blasting powder, at the face, with a fuse attached, and covered the powder up with fine coal dust. I wished to find out if it was possible to ignite this dust and cause an explosion under these conditions. I went on top, closed the doors and spread newspapers over them and set several empty cans on top of the doors. My object was to discover if a vacuum or a pressure was caused by this method. I stationed two persons close to the fan to watch the result. The shotfirers and myself then went into the mine and ignited those twenty-seven shots and the fuse attached to the keg of powder. We retreated into the safety hole to watch the results. An explosion started as the fourth shot went off, but it stopped and the rest of the shots went off. On going to the surface we found that the cans were not moved, but the newspapers were drawn into the crevices in the doors, which showed a vacuum was created by the explosion. I opened the doors, started up the fan, and went into the mine to ascertain what had occurred there. We found the track covered with dust, 500 ft. from the face of the entry. We found the flame had extended for 275 ft. The timbers and everything showed there had been much flame.

Two days later, the superintendent instructed me to remove the doors from the top of the upcast shaft, and place doors on the main-return airway to give the same results. I refused to do this and immediately tendered my resignation. He refused to accept my resignation, but agreed to assume all responsibility if I would make this change. As I still refused, he ordered the blacksmith and carpenter to remove the doors, which was done. He then ordered the men to put a door on the main-return airway and that was done. I sent for the shotfirers and the mine committee and informed them of the change the superintendent was making. When the day's work was over and the men were hoisted the mine committee, the shotfirers and myself went into the mine to note the conditions as changed. We found a strong air current on the south side of the mine, the second south being in the danger zone. I explained the danger in that entry, and added that I would not fire a shot in this entry for $5000, under those conditions. Returning to the bottom, I asked the shotfirers to refuse to fire shots under those conditions, and told them an explosion would occur if they did. The mine committee and myself then went to the surface and I had sworn statements made by them as to the instructions I had given of this danger.

The shotfirers meanwhile held a consultation between themselves and decided to fire that entry first, to prove that I was right in my prediction. They went to the second south and lit two shots and a terrific explosion occurred. At the time of this explosion, one of the cages was resting on the bottom, the other being up at the upper landing. This cage was forced through the headframe, breaking one of the sheave wheels. The other cage was buried in wreckage, the shaft buntings and guides were blown out. At the fan shaft the fan drift and buildings were destroyed; the stairway was blown out the top of the shaft, and all means of rescue were destroyed, except the steel rope, that was attached to the cage on the bottom.

I at once procured a lamp and a wet cloth and slid into the mine by the steel cable and made direct for the second south. All stoppings, doors and overcasts were destroyed in the mine. Natural ventilation had set in, however, and I found in the center of the main south entry a small tunnel, formed by the rush of air through the gas-filled mine. When I at last succeeded in reaching the safety cellar in the second south the men were not there. I made an attempt to get further in to locate them, and heard one of them struggling. I rescued him, brought him into this air tunnel and, returning, found the other and brought him to the same place. I left them there and went to call assistance. By this time, willing hands had procured a block and tackle and lowered men with restoratives. In two hours our efforts were rewarded by the men being in a condition to be brought to the surface.

The following day, I agreed to take charge of the mine again, if allowed to seal up the upcast shaft. This was done and there were no more explosions. I held this position until the following March, 1908, when I resigned. These are but a few of the tests that were made by me on the question of reducing the ventilation at firing time.

ALEXANDER MCALLISTER,
Croweburg, Kan.

INQUIRIES OF GENERAL INTEREST

Danger Signals in Mines

The revised bituminous mine law of Pennsylvania (Art. 3, Sec. 3) requires that danger signals, in all mines, shall be uniform and of a design approved by the chief of the Department of Mines. Will you kindly inform me what kind of danger signals are required and where these can be obtained. We have been using a board laid across the track marked with chalk "Danger. Keep Out." It would seem from the reading of the mine law that this is not sufficient, at the present time.

MINE FOREMAN.

Punxsutawney, Penn.

One of the important provisions of the revised bituminous mine law is the requirement that all danger signals shall be uniform. The old bituminous law required that all dangerous places be "fenced off and proper danger signal boards so hung on such fencing that they may be plainly seen."

The difficulty is present, however, that the large class of foreign labor employed (many of whom cannot speak or write the English language) fail to understand the old signal board, or comprehend the danger it points. As a consequence, there have been many avoidable accidents due to this class of labor not being properly warned.

Another difficulty is presented in the fact that men going from one mine to another are unacquainted with the danger signals used in different places and fail to familiarize themselves with the change in methods and conditions. They are, on this account, exposed to many dangers that a uniform system of signals would avoid.

FIG. 1. DANGER SIGNAL APPROVED BY THE PENNSYLVANIA DEPARTMENT OF MINES

This matter has received the careful consideration of many mining departments. The chief of the Department of Mines in Pennsylvania draws special attention to the matter of uniform danger signals as required by the bituminous mine law, in the bituminous Report (1911), recently issued. In this report Mr. Roderick states as follows:

In compliance with this provision and after a general consultation with operators and inspectors as to the kind of danger signals that would be most suitable for all persons concerned, I approved the signal designated in the following letter, which was sent to every superintendent in the bituminous region:

Dear Sir—In accordance with Sec. 3 of Art. 3, of the Act of June 9, 1911, which demands that danger signals in all mines shall be uniform and of a design approved by the chief of the Department of Mines, I have approved a signal of which a sample is inclosed herewith. The size recommended for the signal is 10x30 in., with an oval circle in the center, 10x14 in. The word DANGER appears in the middle of the circle, in white letters. The color inside the circle is red, and the color outside is black. . . . .

The last paragraph of Sec. 1, Art. 5, reads: "The meaning of all danger signals shall be explained to the non-English speaking employees of the mine, in their several languages, by the mine foreman, assistant mine foreman, or fireboss, through an interpreter."

A sample signal should be placed at a convenient point on the surface so that the non-English speaking employees can see it and be taught what it means when placed in any entry or at the entrance to a room or the entrance to any place in the mine where such signals are likely to be found.

JAMES E. RODERICK,
Chief of Department of Mines.

Harrisburg, Penn.,
Oct. 31, 1911.

The form of signal board approved by Mr. Roderick is shown in Fig. 1, with the exception that the red background within the circle is here shown in black, and the black outside the circle is hatched in the figure.

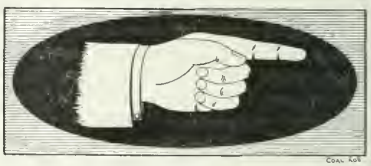


FIG. 2. UNIVERSAL SIGNAL POINTING WAY OUT OF MINE

All practical mining men will heartily approve of the suggestion of "uniform danger signals." The form approved by the Pennsylvania Department of Mines appears eminently appropriate for the purpose. In this connection, we would suggest another uniform signal board, similar to the danger board just mentioned and shown in Fig. 2, consisting of the black board with the same red circle and a white hand pointing always in the direction men should take to escape from the mine. Many of the recent mine disasters have demonstrated the necessity of pointing the way of escape, at numerous points on all travelingways throughout the mine. For this purpose, a board with a hand, the index finger pointing the way out, would be readily understood by every man. As stated in Mr. Roderick's letter, a sample of the board should be placed in a conspicuous place on the surface, and its meaning fully explained to every employee and particularly to the foreigner who does not understand English. As far as possible, all signs should indicate their meaning by their form rather than by words.

The only firm we know who makes a specialty of danger and other signs for mines is the Stonehouse Enameled-Steel Mine-Signal Co., Denver, Colo. This company has made a specialty of producing indestructible signs of charcoal-rolled steel, the enameled lettering being fused on the sign at a high temperature, which renders the sign impervious to all underground conditions and enduring.

EXAMINATION QUESTIONS

State Civil Service Commission

EXAMINATION FOR MANAGER OF MINE RESCUE STATION
Springfield, Ill., Oct. 3-4, 1912.

(Selected Questions Answered by a Successful Candidate, by Request of COAL AGE*)*

Ques.—Explain the general principles upon which mine-rescue breathing appliances operate.

Ans.—The general principle of all mine-rescue appliances is to supply the wearer with oxygen and absorb the carbon dioxide and moisture contained in the air exhaled from the lungs.

Ques.—There are three different types of rescue apparatus used at the Illinois stations. Describe the construction and operation of each of these types, giving their essential points of difference. Tell which you consider the best, and why.

Ans.—The three types of apparatus in use at the rescue stations, in Illinois, are: the Draeger, Westphalia and Fluess. The principles on which the Draeger and Westphalia operate are much the same. They use the same chemicals, soda and potash, in the regenerator. Both of these types now use the helmet or the mouth-breathing attachment and deliver the same amount of oxygen per minute. The Fluess has no helmet and is confined wholly to the use of mouth-breathing attachment. The chemical used in this regenerator is caustic soda. The regenerator is equipped with a by-pass valve, which is a decided advantage over the other types, for the reason that if the reducing valve should get out of order this valve can be used to fill the breathing bag. In the latest make of the Draeger type they have added a by-pass valve.

Each type has its special advantages. Some men cannot use the mouth piece as it makes them gag. The advantages of the mouth-breathing type of apparatus are the following: They are more convenient for use when the atmosphere contains no irritating gases, as the condition of roadways can be more easily examined, and the wearer keeps cooler than when wearing a helmet.

The disadvantage of the mouth-breathing types is the absence of the protection afforded by the helmet. Helmets are better when the air contains fumes given off from fires. Men can talk to each other, which cannot be done when using mouth-breathing apparatus. The dangerous feature connected with helmets is that if the atmosphere contains no irritating gas, but will not support life, leakage is not easily detected and the wearer may be overcome. Leakage usually occurs around the face band, and is more apt to be present than in the smaller mouth-piece of the other types.

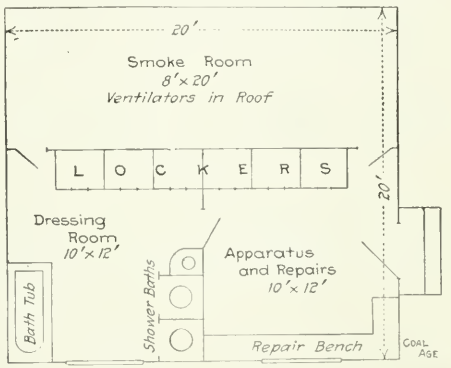
Ques.—(a) How much oxygen per minute does the average normal man require? (b) How do you determine the amount of oxygen the apparatus is furnishing?

Ans.—(a) It is estimated* that a man requires under normal conditions, when at rest, 263 c.cm. of oxygen per minute, which is increased by violent exercise about 8 or 9 times, making $8 \times 263 = 2104$ c.cm.; or, say the required amount of oxygen in mine work would be $2104 \times 0.06102 = 128$ cu.in. per min. The quantity generally stated by the manufacturers of the apparatus is 122 cu.in. per minute.

(b) Attach a measuring bag to the inhalation tube leading to the helmet or mouth-piece; then open the exhalation tube, turn on the oxygen, and note the time required to fill the bag. The volume should not be less than 2 liters (122 cu.in.) per min.

Ques.—If asked by a mine superintendent to advise him how to plan and equip a training station, at his mine; what plan of station would you suggest, and what different appliances would you advise him to get?

Ans.—I would advise him to erect a building 20x20 ft., having no less than three rooms; a room for apparatus



PLAN OF PROPOSED RESCUE STATION OR TRAINING BUILDING AT A MINE

and for making the necessary repairs; another for shower baths and lockers; and a larger room to be used as a smoke chamber. The following are the dimensions I would recommend; as shown in the accompanying diagram: Smoke Room 8x20 ft. and each of the other rooms 10x12 ft. This makes a very compact arrangement all under one roof.

The approximate cost for building and equipment, including six sets of breathing apparatus, oxygen storage tanks and pumps, electric and safety lamps, pulmotor and other necessary equipment, would be about $3000.

Ques.—What effect is produced on a man by breathing air that contains as much as 5% of carbon dioxide (carbonic acid gas)?

Ans.—The effect produced by breathing air containing 5% of carbon dioxide (CO_2) would be to cause the head to ache, and the man would soon begin to get dizzy and have pains in the back, chest and limbs, and breathe with difficulty.

*Mine Gases and Explosions—Beard, p. 184.

SOCIOLOGICAL DEPARTMENT

Novel First Aid Splint for Fractured Limb

By James G. Jones*

As a member of a first-aid corps in the anthracite region, I have recognized for some time the want of a combination splint which could be used for a dislocated hip. This as all first-aid men know is a difficult part to secure properly. After considerable thought, I planned and constructed a splint for use in such cases.

When first-aid squads, without this appliance, were called upon to dress a dislocated hip it was necessary to secure three splints, one about 4 ft. 6 in. long and two measuring about 3 ft. and the necessary padding. It was then necessary to turn the patient over on his side

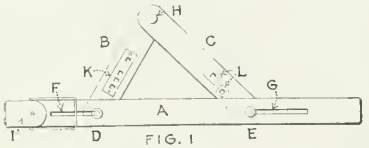


FIG. 1

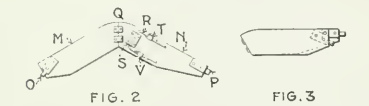


FIG. 2

FIG. 3

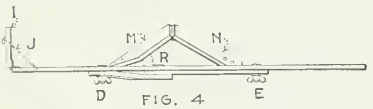


FIG. 4

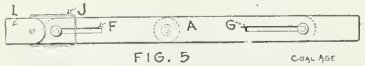


FIG. 5

COAL AGE

The Jones Splint for Compound Fracture

to get the proper measurements, after which the splints were bound together and applied with the padding to keep the leg in position.

In many instances the men were compelled to waste time in hunting for old clothing and other suitable material for padding purposes. With this combination splint, less padding is needed. It is unnecessary to take the measurement of the patient's leg and hence he is not kept in suffering while splints and padding are being prepared.

The device is constructed so that the side support can be extended or shortened to any desired length and raised or lowered to the level at which the limb of the patient may be comfortable. Its most important feature is its wide range of use. While constructed principally for a dislocated hip, it can be taken apart and used for any fractured limb or fore limb. In addition it enables the first-aid men to prepare the patient promptly for transportation, thus reducing suffering to a minimum.

It can be used for either the right or left leg by reversing the rise splint as can easily be done. Where it is found that the patient must be carried any great distance without a stretcher it can be locked by tightening the bolts thus rendering it unnecessary to depend on bandages to hold the splint in place.

[Fig. 1 shows a plan of the splint as seen from above. *A* is the long or main splint and *B* and *C* are the extension splints which are made adjustable by thumb screws *D* and *E* (see Fig. 4) which pass through the slots *F* and *G*. *B* and *C* are pivoted at *H*. The main splint *A* is 4 ft. 6 in. long and at one end is a foot rest *I* which can be turned up as shown in the side view Fig. 4 and secured by the bridle wire *J* as also shown in that figure.

In limb *B* of the extension splint is a countersunk plate with four slots *K*, and in the limb *C* are two small plates carrying slots *L*. Fig. 2 shows the rise splint also consisting of two parts *M* and *N* having lugs *O* and *P* engaging in slots *K* and *L*. The two parts are hinged at *Q* and are supported by a V-shaped wire *R*, hinged at *S* and provided with extension clamps *T* and *V*. This enables the rise splint to be supported at any angle. Fig. 3 shows this splint as it appears when folded. Fig. 5 shows the whole apparatus collapsed so that it can be put away.—Editor.]

Note—Paper read before the Panther Valley Mining Institute, held at Lansford, Penn., Nov. 2, 1912.

*Mine foreman, Lehigh Coal & Navigation Co., 22 Patterson St., Lansford, Penn.

English Miners Object to Fuses

Practical miners in northern England are taking exception to some of the clauses in the recent order in regard to explosives which attended the advent of the Coal Mines Act, 1911. They argue that the use of fuses in nongaseous mines is totally unnecessary from the point of view of safety, but they admit that in wet places it is often convenient.

It is recalled that in the old days thousands of shots were fired by the home-made straws, and with practically no risk. Squibs have supplanted these and are much more effective, being the acme of safety where there is no gas present.

The present complaint is, that, to compel miners in pits free from gas to use fuses to prevent an explosion of gas, and at the same time allow them to rush about the working place with a flaring candle in their hands, is a trifle ridiculous. A deputation from the workmen presented their case to the Home Secretary, and he agreed to appoint a small expert committee to inquire into the facts.

Meanwhile the order has been modified somewhat; a fuse may be ignited in naked-light mines by a naked light, subject to certain conditions. Special provision is made in regard to shotfiring on roads where mechanical haulage is in operation up to the face and where conditions make "back-ripping" necessary.

COAL AND COKE NEWS

WASHINGTON, D. C.

It is understood that the House Democrats are being very strongly urged to place coal of all kinds upon the free list in the new revision of the tariff which is about to be taken up. The subject has been agitated for a good while and this action was urged at the time when the reciprocity bill was under consideration, but it was not possible to get from the State Department any provision for free trade in coal with Canada.

Now the suggestion is to take off the duties entirely on the ground that conditions have so radically changed as to destroy all alleged danger from foreign competition. One particular phase of the situation that is being pressed upon the politicans is the circumstance that under the proposed arrangements for selling coal in the Canal Zone, the government depots there will afford a tremnedous new demand for the American product, which will be shipped from Newport News and the terminus of the Virginian Ry. direct to the Canal Zone.

At the same time the coal shortage of the current winter and the difficulty experienced in getting an adequate supply in several parts of the country, coupled with the attempt to advance prices at a good many points which has taken an actual, although frequently veiled, form have had their effect just as they did during the coal famine in the year 1902 when Congress came very near definitely shifting coal from the dutiable to the free list.

A list of commodities is being made up by the Democrats for free-trade treatment and it is understood that this is a good deal more extensive than was the farmers' free list bill passed in the summer of 1911. Coal is one of the new items.

Petty Strikes Again

A loss to the market of 11,000 tons of coal has been caused recently by the strike of 1300 men at two Lehigh Valley Coal Co. collieries in the Pennsylvania anthracite region. In both cases the men quit work without negotiating for a settlement as provided in the agreement signed last May.

The members of the Conciliation Board, including the three labor representatives, not long ago voted in favor of a resolution condemning these strikes that are called in violation of the agreement, but interruptions are still occurring with frequency enough to reduce materially the output of coal.

At the Centralia colliery 700 men quit because of the company's requirement that three plane tenders work an hour overtime two or three days a week. The men were paid at the regular overtime rate to clean the plane after the mine closed in the afternoon, the only time when this work could be done.

The three men themselves did not object to the work, but some of their fellows protested, called a meeting of the local union Thursday, and stopped all work at the mine on Friday. The company officials learned of this decision only when the men did not start to work Friday morning.

The agreement between the mine workers and operators provides that any grievance may be taken up first with the company officials before recourse to the Conciliation Board, but in this case no notice was given even to the foreman.

The daily production at the Centralia colliery is 2000 tons, so that the strike has caused a loss of over 8000 tons.

At the Dorrance colliery, in Wilkes-Barre, where the production is 1600 tons a day, a strike of 600 men caused a loss of 3200 tons of coal. Here also the strike occurred without the attempts at peaceful settlement provided in the agreement.

PENNSYLVANIA

Anthracite

Pottsville—Snow, which fell Dec. 23 and 24, materially retarded shipments of anthracite coal. The collieries, many of them located at the bottom of steep mountains, were covered to a depth of some 12 to 15 in., greatly delaying the delivery of empty cars and the shipment of loaded ones. It is expected, however, that the situation will soon be normal again.

Wilkes-Barre—A mine fire was discovered by one of the fire bosses of the Buttonwood colliery of the Parrish Coal Co. The fire is in No. 2 East Kidney vein. Operations were suspended at noon, Dec. 16.

Hazleton—The rockmen of the Panther Creek Valley have been on strike for three weeks for a 10 per cent. wage advance. They are in the employ of contractors who are doing tunnel and other work for the Lehigh Coal & Navigation Co. This class of work does not come under the agreement signed in the spring between the coal operators and the miners.

Bituminous

Connellsville—Reports from the various trade centers are to the effect that cars are still short. In those sections where the shortage is less pronounced, the scarcity of labor is preventing operators from profiting to any great extent.

An adjustment of the wage scale of the U. S. Steel Corporation, which will result in increased earnings for its employees, has been announced. Definite statements as to the revised scale and when it will become effective, will be made later, but it is certain that an advance will be made in the near future.

Holidaysburg—James M. Dysart, formerly located in the Connellsville coke region, near Mt. Pleasant, and former general manager of the Essen Coal Co., of Pittsburgh, has presented a new Y. M. C. A. building to Holidaysburg, where he now resides.

WEST VIRGINIA

Charleston—The Kanawha Coal Operators Association has addressed a letter to the Interstate Commerce Commission, complaining about the statement accorded the Kanawha operators through the machinations of the New York Central, the Chesapeake & Ohio, and the Hocking Valley railroads, and the Sunday Creek Coal Co. interests.

Downs—Deeds for the Pittsburgh vein of coal and mining rights for about 1300 acres, located near Downs, were filed with the county clerk, Dec. 27. These deeds are made to Marcellus A. Jolliss and the total consideration is over $100,000. Although details of the deal are not to be had, it is understood that Mr. Jolliss expects later to transfer the coal to the little Kanawha Syndicate, and that the field is not to be opened until some time in the future.

Turner—The Morris Fork Coal Co. has complained to the Interstate Commerce Commission that the Coal & Coke R.R. Co., operating between Charleston and Elkins, is discriminating against it. The company charges the railroad with supplying more cars to the Davis Colliery Co., of Elkins, than to the Morris company.

Charleston—More than 4000 guns and revolvers, taken from the miners and operators in the Cabin Creek coal district, were returned to their owners, Dec. 26. Governor Glasscock has declared that he is convinced that all trouble is passed. In fact, he has granted pardons to seven of the 20 men sent to the penitentiary by the Military Commission.

Gary—Invitations have been issued for the third annual banquet of the United States Coal & Coke Co. to be held Jan. 4, for the purpose of discussing the prevention of accidents to employees.

OHIO

Columbus—A strike has been ordered by union officials at Mine No. 23 of the Hlisylvania Coal Co., at Glouster, Ohio. The cause of the strike was the discharge of three men whom the superintendent claimed were careless in their work in the mine and who endangered the lives of themselves and fellow employees.

J. W. Blower, manager of the concern, upon investigation found the men working in a room with more than 750 sq.ft. of floor space without a pillar or support. The question involved is one of considerable interest to operators and miners generally as it concerns the right of the employer to discharge for carelessness. According to Mr. Blower, the company will make more money without operating at all than by being compelled to employ careless miners.

KENTUCKY

Central City—The tipple and power house of the Nelson Creek Coal Co., near Central City, Ky., burned to the ground recently, the fire being caused by a spark from the firebox. Work will begin at once on the installation of new equipment, in order that operations may be delayed as little as possible.

Henderson—Robert M. Roll has filed suit here against the People's Mining Co. for $1750, alleging breach of contract. The plaintiff claims that he resigned his position as president of the United Mine Workers of District No. 23 in order to become the manager of the defendant's mines, and that he was subsequently discharged by the president of the company without cause.

INDIANA

Washington—C. C. Martin, president of the Davies County Coal Co., has offered a reward for information that will convict the persons who attempted to blow up the boiler of the company's mine at Black Oak. The condition of the boiler was discovered just in time to prevent the entire plant from being blown up.

Fairmount—Hundreds of cords of wood will be consumed in this vicinity during the winter in the place of coal. The clearing of the Newby woods has paved the way for many to secure their winter supply of fuel at a small cost.

Richmond—In the annual report of Frank I. Pearce, state mine inspector, he states that the production of bituminous coal is increasing steadily, while the production of block coal is decreasing.

Clinton—The Indiana Railroad Commission has declined to order the Elgin, Joliet & Eastern R.R. to operate a miners' train between Clinton and the mines of the Bunsen Coal Co., six miles distant. Other trains of this character are operated in this vicinity, the miners paying $1 per month for transportation, but in this case even if this amount was doubled, the train could only be operated at a loss.

Terre Haute—The Vandalia Coal Co., the Coal Bluff Mining Co. and the Western Indiana Mining Co. have contracted with the Terre Haute, Indianapolis & Eastern Traction Co. for electric current to be used in mining operations. The furnishing of current to these and other developments, it is believed, will not only greatly increase the output, but render the mines less hazardous in every way.

Lafayette—The Railroad Commission of Indiana issued an order, Dec. 23, fixing the freight rate for coal from Linton, Brazil and Clinton District, Indiana to Lafayette, at 65c. This order will become effective Jan. 25, 1913.

IOWA

Boone—The returns from the Mine Workers' election, District No. 13, although incomplete, show that W. H. Rodgers, of Albia, has been reëlected president for the coming year. Sam Ballantyne, of Boone, has been elected vice-president. Mr. Rodgers is quite popular with the miners of this community and has proved an efficient official in the service of the union. It is said that he ran far ahead of the other two contestants for the office.

ILLINOIS

Georgetown—There seems to be little doubt that the Bunson Coal Co. has contracted for the John F. Ashby farm, northwest of this city, and also for a portion of the farm adjoining. The purchase of this farm gives rise to the belief that it is to be used for the sinking of a new shaft at an early date.

Taylorville—The Taylor interests, of St. Louis, are preparing to take 1500 acres of coal rights in May Township, in addition to the 11,000 acres recently taken in Taylorville, Buckhart and Stonington Townships.

Springfield—A New York syndicate has purchased 30,000 acres of coal rights in Macoupin County, for $600,000, and taken an option on 280,000 acres additional, paying, therefor, $24 an acre in Montgomery, Saline, Perry, Madison and Jefferson Counties. The syndicate will sink four mines in the 30,000-acre tract.

Pekin—The Tazewell coal mine has been destroyed by fire, which is thought to have been started by particular enemies of the company.

Belleville—On Dec. 19 the Supreme Court of Illinois affirmed a ruling of Judge Bernreuter and awarded damages against a railroad company for failure to supply sufficient cars for the transportation of coal. The suit was brought by the Mulberry Hill Coal Co. against the Illinois Central R.R. Other suits of a similar character are pending.

FOREIGN NEWS

Tokyo, Japan—Over 200 Japanese coal miners are entombed and probably dead as a result of an explosion which occurred in the Ubari colliery, at Sappero, on the Island of Hokkaido, Dec. 23.

Quebec, Canada—Fire completely destroyed the coal sheds of the Nova Scotia Steel & Coal Co., on the Louise Embankment, Dec. 12. The loss is in the neighborhood of $20,000.

Cardiff, Wales—The report that 100,000 tons of American coal is being purchased by the Egyptian railroads in place of the customary Welsh supply has caused quite a sensation here.

PERSONALS

Coal men and traffic officials generally are urging the appointment of Howard Manington, formerly secretary of the Ohio Coal Operators' Association, as a member of the Ohio Public Utilities Commission.

President J. M. Fitzgerald, of the Davis Coal & Coke Co., has announced the appointment of Newell W. Roberts as assistant to the chief executive of the company. Mr. Roberts was formerly connected with the Durham Coal & Iron Co.

Joe Smith has resigned as general superintendent of the Stag Cañon Fuel Co. and leaves for Trinidad on Jan. 1 to devote his attention to his coal property there. The position will be filled by William McDermott, who has been connected with the Victor-American Fuel Co. for a number of years.

F. J. Durdan, of Pittsburgh, has been appointed Kentucky sales agent of the Monongahela River Consolidated Coal & Coke Co., succeeding Charles H. Bohmer, whose resignation takes effect Jan. 1. Mr. Durdan has been associated with the company for about a year, and was formerly sales agent of the Buffalo & Cleveland Coal Co.

OBITUARY

Martin McLaughlin, state mine inspector, at Shamokin, Penn., died in that city after a brief illness. He was prominent in Democratic politics in Northumberland County.

The funeral of A. W. Carlson a prominent coal dealer, of East Des Moines, was held at his home, Dec. 15. Mr. Carlson organized the Maple Grove Coal Co., the Maple Block Coal Co., and another enterprise known as the Delaware Coal Co. At the time of his death he was president of the High Bridge Coal Co., at High Bridge, and also of the Zimbelman Coal Co., at Boone.

CONSTRUCTION NEWS

Sartell, Minn.—The projected erection of a coal tower and water tank at Sartell has at last become a reality. Material is now being hauled to the location and work will be started soon.

Pottsville, Penn.—Work on the new Girard mammoth colliery, Raven Run, which is being rebuilt on the site of the old breaker destroyed by fire several months ago, is being pushed rapidly.

Heaverdale, Penn.—It was announced here, Dec. 20, that the large tipple owned by the Pennsylvania Coal & Coke Corporation, which was damaged by fire several evenings ago, would be rebuilt.

Osceola, Mo.—C. R. Hunt and associates plan to construct a hydro-electric plant on the Osage River, including a 14-ft. dam of reinforced concrete, to develop 4000 hp., at an estimated cost of $600,000.

Connellsville, Penn.—The National Consolidated Coal Co. will develop a large tract of coal in Barbour County, W. Va. It is proposed to erect coke ovens and enter that trade as well as the selling of coal.

Hendersonville, N. C.—Manufacturers Power Co., of Hen-

dersonville, N. C., is reported as planning to construct a dam, power house and transmission system, etc., on Green River, between Hendersonville and Saluda.

Cedar Rapids, Iowa—Among the notable improvements of the year are those of the Hawkeye Lumber & Coal Co. now nearing completion. The plant of this company has been thoroughly modernized at a cost of several thousand dollars. The yards and general surroundings have been greatly improved.

Reynoldsville, Penn.—The McConnell Coal Co., which is composed chiefly of Reynoldsville, Brockwayville and Beechwoods people, is making rapid headway at its operations above Brockwayville. Two hundred acres of land have been leased for a long term of years. Work on the tipples and the drifts has been going on for several days.

Mount Sterling, Ky.—The Kentucky Utility Co. plans extensive improvements to its electric light, power, railway, water and gas system, at Mt. Sterling, Winchester, Shelbyville, Versailles, Somerset and Elizabethtown, Ky., and is reported as expecting to build a $100,000 electric plant at Winchester, and a $75,000 plant at Somerset.

Luzerne, Penn.—Last week the new East Boston breaker, which replaces the one recently burned down, was put in operation. It is of steel and concrete construction, and unlike the old breaker, which was built directly over the shaft, this is erected several hundred feet distant from the shaft opening or mouth, to conform with the mine laws now in force.

Smith's Ferry, Penn.—The East Liverpool Traction & Light Co., and the Ohio Valley Scenic Route Ry. Co. expect to spend $2,000,000 in the construction of a big power plant, one mile north of here on Beaver Creek, at the Island Run Mines. The traction interests have leased or bought over 2000 acres of coal land in Beaver County, near the site of the coal plant.

Muscatine, Iowa—The Graving Coal Bin Co., of Chicago, has just completed its automatic coal-handling plant at a cost of $30,000. The plant is 450 ft. long, 40 ft. wide and 55 ft. high. More than ½ million feet of lumber were used, together with 1000 bbl. of concrete. Barely 3 min. are required now to load a 4-ton wagon; while, before, it required fully fifteen.

Toledo, Ohio—Final details of a contract whereby the C. W. Mooney coal lease of 25,000 acres, in Belmont and Monroe Counties, Ohio, involving nearly $5,000,000 are said to have been closed. The Captina Development Co., composed largely of Toledo capital, is the purchaser. It is said that a railroad switch to the old Correll mine, at Big Run, and a new steel tipple will be built there.

Jenkins, Ky.—Authentic information indicates that the Baltimore & Ohio Ry. Co. is planning to build a bridge across the Ohio River, at Huntington, as a part of a new line which will be built from Jenkins, Ky., to Jackson, Ohio, to connect with the main line.

If present plans are carried out eight operations will be conducted on the Jenkins side of the mountain and six on the McArthur side. It is thought that the traffic over the new road will be heavy and the Baltimore officials are pleased with the prospects.

Cowansburg, Penn.—The development of the coal lands between Yukon and Cowansburg after many years is a realty. The Pennsylvania R.R. Co. has begun work on the extension of the Yukon branch from its western terminus at Bell's Mills to Cowansburg, on the Yough branch. The railroad will follow the big Sewickley Creek and about seven miles of new roadway will be built. McMann & Simms, of Philadelphia, Penn., are the contractors. This coal is nearly all the property of the Manor Realty Co., of Philadelphia It will be developed in due time.

NEW INCORPORATIONS

Winston-Salem, N. C.—The Carolina Coal & Ice Co. has been incorporated with a capital stock of $125,000.

Cincinnati, Ohio—Cliff Coal Co., Portsmouth, Ohio, has increased its capitalization from $30,000 to $40,000.

Detroit, Mich.—The Durmond Coal & Cartage Co.; $2500. Ernest I. and Ethel M Durmond and Levi Anderson, incorporators.

Reading, Penn.—American Fuel Co.; capital, $100,000. Incorporators: T. F. Magarity, B. P. Ocheltree, M. B. F. Hawkja, Wilmington, Del.

Kansas City, Mo.—The V. McDaniel Fuel Co. has been incorporated with a capital of $4000. The incorporators are Virgil McDaniel, G. L. Stauffer and Charles Hayward.

Brooklyn, N. Y.—Greason, Son & Dalzell, Inc., deal in and transport coal of all kinds; capital, $100,000. Incorporators, J. Greason, J. L. Greason, E. T. Dalzell, Brooklyn, N. Y.

St. Louis, Mo.—The Ratican Coal & Contracting Co. has been incorporated here with a capital of $10,000, the incorporators being I. C. Muckermann, Wm. Ratican, and Peter J. Ratican.

Hillboro, Ill.—The Fayette County Coal Co. has been organized. A. J. Williford, of Nokomis, is treasurer of the company; $300,000 will be paid out immediately for 32,000 acres of coal land.

Ottawa, Ont.—Letters patent have been granted incorporating the London Land & Coal Co., of London, Ont.; capital, $2,000,000, to operate mineral and other lands and to search for coal and petroleum.

Clearfield, Penn.—Application will be made Jan. 14, by J. Boynton Nevling, Reuben F. Nevling, and Samuel E. McLarren, for the charter of an intended corporation to be called the Nevling Coal Mining Co.

Waukegan, Ill.—The Waukegan Coal Co. has been incorporated with a capital of $35,000 to deal in lumber, coal and building materials. The incorporators are Thomas McGay, W. O. McKinney, Alexander Whan, David U. Hart and J. D. Pope.

Lexington, Ky.—The Kypadel Coal & Lumber Co. recently organized with a capital of $500,000, for the purpose of acquiring coal and timber lands, has secured some 35,000 acres of land in Eastern Kentucky. No immediate development is contemplated, however.

Dover, Del.—Articles of incorporation have been filed for the Buffalo Creek, Coal & Brick Co., of Pittsburgh, Penn., to purchase, lease, hold, own, control and deal in coal and other mineral land. The capital stock is $250,000. Incorporators, Childs A. Smith, of Pittsburgh; R. D. Duranter, of McDonald, Penn.; C. E. Meyer, of Ingham, Penn.

Wheeling, W. Va.—The West Virginia Gascoloil Co., of Huntington, W. Va., has been incorporated to drill for oil or gas, mine coal, acquire mineral or timber lands, and develop them. Capital, $200,000. Incorporators, A. B. Brode, H. G. Bowles, and Frank W. Irvin, of Huntington; May B. Hess and H. H. Baker, of Hamlin, W. Va.

INDUSTRIAL NEWS

Lisbon, Ohio—Work at the new mine of the Card & Prosser Coal Co. on the old Hanna farm, near Teegarden, is now fairly under way.

Whitesburg, Ky.—The Consolidation Coal Co. is shipping from 30 to 40 cars a day out from McRoberts, consigned to the Northwest.

Scranton, Penn.—The Bittenbender Co. announces that it has just issued a complete catalog covering mine, mill, railroad and contractors' supplies.

Missoula, Mont.—O. O. Dutcher has discovered a vein of coal in Boise County which is reported to be exceptionally good and he is making arrangements to place the coal on the market.

Connellsville, Penn.—L. S. Mellinger and J. S. Bryner are busy having options on Indian Creek valley coal lands assigned to them, preparatory to turning them over to new purchasers.

Uniontown, Penn.—The big purchase of Mrs. Sarah B. Cochran, of Freeport coal in lower Tyrone township, will be developed at once. Her nephew, Frank A. Farr, is superintending the work.

Marion, Penn.—The Hillsdale Coal & Coke Co., one of Clark Brothers' interests, has opened up new mines on Horton Run, not far from Horton. The plant will be operated by electric power from the plant at Glen Campbell.

Wilkes-Barre, Penn.—Madeira, Hill & Co. have commenced transporting coal over the Lehigh Valley R.R., from their Pond Creek openings to their Harleigh breaker, a distance of about 11 miles, for preparation and shipment.

St. Louis, Mo.—The Merchants Ice & Fuel Co. has obtained a permit to build a branch office and coal and ice depot at the northeast corner of Hodiamont and Bartmer Aves. The estimated cost of the improvement is $28,000.

Manitou, Ky.—Bernheim Bros., of Louisville, who own what is known as the Talley coal field, near Manitou, are reported to have made a deal in which they purchased adjacent properties to the amount of about 200 acres. The price is not announced.

Madisonville, Ky.—It is reported here that the large block of coal properties in what is known as the Beulah coal field is to be transferred under an existing option or an extension thereof, as titles have been examined and the deal practically agreed upon.

Johnstown, Penn.—Louis J. Bradley, of Williamsport, has been in Johnstown for the past ten days conducting negotiations for coal land, and it is rumored he has secured control of a large acreage in Westmoreland County, and will start operating in the near future.

Coshocton, Ohio—Workmen, excavating for a barn on the Edward and R. R. Hanlon farm, have uncovered what is believed to be the richest vein of coal in this county. The owners of the land plan to lease it to coal operators, thus opening up an entirely new Ohio field.

Sunbury, Penn.—The season recently closed has not been a record one, owing to the fact that the water conditions were not at the best during much of the time. Thousands of tons of coal were secured, however, and there was a ready sale for all that could be mined.

Greensburg, Penn.—Over 1000 acres of Freeport coal located in Ligonier Township, near the Four Mile Run, has been sold by the farmers of that section to Franklin Byers, of Mt. Pleasant. This purchase, which is the first of the Freeport vein sold in this section, may develop this coal field.

Wilkes-Barre, Penn.—The Lehigh Valley Coal Co. is erecting a large new breaker at its Franklin Colliery in Wilkes-Barre East, which is one of the first, if not the first, colliery owned by it. It will be modern in every respect, and is estimated to cost about $200,000, or more, when completed.

Monongahela, Penn.—It has been learned that the Mongah mine of the River Coal Co., which has been shut down for the past 18 months, is to be opened up shortly after the first of the year. This mine employs over 400 men. It will be fitted out with new equipment which will cost in the neighborhood of $50,000.

Philadelphia, Penn.—The Penn. R.R. Co. is buying or condemning by right of eminent domain, a strip of land along its tracks for a considerable distance on the Sunbury Division, mainly in Conyngham Township (including some leased by the West End Coal Co.) for additional trackage and improvements. It has long needed these for its increasing trade.

Clarksburg, W. Va.—An important coal deal which has been pending for some time has just been closed, whereby Vincent E. Gocke, president of the Daniel Coal Co., has acquired from the Calvert Coal & Coke Co., of Chicago, their Byron and Robey plants. No possession will be taken of the plants until Jan. 1. The consideration is private.

Hazard, Ky.—The Buffalo Creek Coal Co. has secured the C. G Bowman tract of 2000 acres in Perry County, near Hazard, the consideration being about $75,000. The company has made arrangements for the immediate installation of equipment for mining operations, and also plans to put in saw and planing mills for the utilization of the timber on its properties.

Whitesburg, Ky.—Philadelphia and Baltimore interests recently acquired fifty acres of coal land in the Shelby Creek section, above Whitesburg, Ky., adjoining other properties owned by the same parties, at a price of a little over $7500 cash, which is said to be the highest price ever paid for land in that section. The purchasers are said to be preparing to develop their properties.

Baltimore, Md.—The Alabama Consolidated Coal & Iron Co.'s stockholders' committee has announced details of the plan it has drafted for rehabilitation of the property. It provides for an assessment of $30 a share against the preferred stockholders and $15 a share against the holders of the common stock. This would furnish a total of $750,000, divided equally between the two classes of stock.

Scotidale, Penn.—Hon. John R. Byrne and his brothers became the owners of the Mathias tract of coal, which lies in Sewickley Township, and is a part of the Yukon coal and coke development. The Byrne interests will at once begin the building of a 60-oven coke plant, it is said, and will also commence on tipple, tracks, and other improvements, it being their intention to ship coal as well as manufacture coke.

Lincoln, Ill.—The options given the Peabody interests on the coal mines in Sangamon County have expired and Mr. Peabody has been in Springfield to listen to reports of experts he has had investigating local conditions for him. Should these reports be satisfactory, Mr. Peabody was expected to have taken up the options. He has assured the Springfield people that a merger will not mean a closing down of the mines.

Ashland, Ky.—The Sara Furnace, the Martiny Iron & Steel Co., and the Ironton Iron Co., at Ashland, Ky., have been compelled to shut down owing to a lack of coke, which in turn was a direct result of the car shortage. The expected operation of the big new plant of the Kentucky Solvay Coke Co., will relieve the situation, as it will turn out enough coke to supply the local demand, as well as considerable tonnage for the outside market.

Freeland, Penn.—Dump cars and a steam shovel are on the ground and operations have been begun on the new stripping at the east end spur of the Buck Mountain vein, Drifton No. 2 colliery, of Coxe Bros. & Co., Inc., in the Lehigh region. The vein of coal is said to be about 15 ft. in thickness, lies near the surface, and is believed to crop out near the southern boundary line of the borough. It will be transported by locomotive to and prepared at No. 2 breaker of this firm.

Chicago, Ill.—The Roberts & Schaefer Co. has just been awarded a contract by the Queen & Crescent Route for two 500-ton capacity, fireproof, main-line, reinforced-concrete, Holmen coaling stations, electrically driven, for installation at Danville, Ky., and Oakdale, Tenn. Price, $37,000. These plants are to be exact duplicates of two former plants of this character of construction that this firm erected for the Queen & Crescent at Montlake, Tenn., and Ludlow, Ky.

Kingston, Penn.—Near Sugar Notch, the Pittston Coal Co. is demolishing the old breaker and building a new one of increased capacity, to cost about $30,000. The old breaker was dynamited at some parts to facilitate its removal. The concrete walls for the new are already in place, heavy lumber is on the ground and being framed, and the work is being pushed with all possible dispatch by the contractors, Messrs. Reilly & Co., of Kingston. It will scarcely be completed, however, before late next spring.

North Bend, Ore.—A new coal mine is being opened by C. A. Smith, of North Bend, and his business associates, and when in operation will be the largest coal mine in the county. Only 25 tons per day are taken out at present, but when the shaft is sunk deeper and the mine is in full operation, the output will be upward of 200 tons per day. A private railroad is used to transport the coal to deep water, where it is dumped into bunkers and stored till sold. There are about 1,000,000 tons of coal above water level at this mine.

Birmingham, Ala.—Walter Moore announces that the Panama Coal Co. will spend approximately one million dollars in the development of 35,000 acres of Black Creek coal land. Included in this development is the building of several miles of railroad for the purpose of connecting the property with the Frisco R.R., also modern equipment suited for working the Black Creek seam. It is expected that the company will be able to mine a minimum of 2000 tons of coal daily shortly after completion of the railroad spur to the mines. An average of 18 analyses of this Black Creek coal showed less than 2 per cent. ash and 15,629 B.t.u. per lb. It is equal in quality to the very best coals.

Barbourville, Ky.—Besides the Wallsend plant of the Continental Coal Corporation, near Barbourville, several other coke ovens have recently begun operations in eastern Kentucky, and turn out a product which is said to be the equal of any on the market. The Wisconsin Steel Co. is operating the largest battery of coke ovens in that region at Benham, and with a million-dollar installation turns out coke for the use of the company's northern plants, which are owned by the International Harvester Co. Ovens are also in operation in Pike County, Elkhorn district, and elsewhere in the field, and the industry bids fair to attain large proportions during the coming year.

Portland, Ore.—Much improvement is being made at the Libby mine, which is leased by George Doll. A new vein is being opened, which will greatly increase the production. The town of Libby, where the mine is situated, and which for several years was deserted, when the mine was closed down, is now quite lively.

The Beaver Hill mine, owned by the Southern Pacific interests, is undergoing some extensive development work. A new shaft is being sunk that will cost $300,000. Coal from this mine has become widely known in Portland, and is good coal for general use. The Southern Pacific owns its own coal ships and makes considerable money from the operation of this mine.

Marshfield, Ore.—The Millicoma mine on Coos Bay has been leased from the chief owner, J. A. Ward, by Portland capitalists and will be operated at once. E. H. Morgan, who examined the mine for the Portland men several months ago, will be the superintendent, and will take charge of the property at once. Mr. Ward expects to be connected with the operating company. The mine property takes in about 400 acres of land, and it is in such shape that coal in marketable quantities can be taken out at once.

COAL TRADE REVIEWS

GENERAL REVIEW

Additional stress has appeared in the anthracite market, due to the holiday suspension in the mining regions. Retailers continue short and the public is disregarding preferences in sizes and taking what can be obtained. Renewed interest is being shown in the premium coal out of New York and, while prices remain unchanged, a great deal depends on the weather. The trade has to depend on current production, which is far from sufficient to supply the demand. In some respects, however, the situation is easing off. There does not seem to be the pressure there was for egg, but pea, stove and chestnut are still quite short, and dealers can make no promises about deliveries.

In the Middle West the larger sizes appear to be getting more plentiful, and there are some cancellations, due to the milder weather, but premiums are still being well maintained. Consumers were well stocked in anticipation of a hard winter, and the trade is only about normal. In the South, the situation appears more acute; the demand continues active, and supplies are quite short.

In the coastwise bituminous trade, the last of the year developed more buying and in a larger volume. There are only small arrivals, all-rail, quantities available are scattering, and few operators can guarantee prompt shipment. Prices have reached the highest point since the depressed condition in effect during the summer and show every evidence of advancing still further. The receipts at the piers are small, and supplies generally, far short of the demand.

The appearance of real winter weather, together with a shortage, has developed an unusually strong market generally in the East. The situation could, however, hardly be otherwise in the face of these conditions; if the producers had an adequate supply of both labor and cars, they would doubtless flood the market with coal. The situation will, of course, ease off when the production does increase, but the trade generally is of the opinion that there will be no material decrease in consumption and that the high prices will hold. In the Pittsburgh district, the market has been quiet, and production relatively light due to the holiday suspension. The domestic demand has been fair, but the manufacturing quite light. In spite of the suspension over the holidays, there has still been considerable activity in Ohio. The steam business continues strong, consumers stocking against an emergency and the colder weather has brought an increased domestic demand. Prices on slack are particularly firm and some contracting is being done at a slight advance over last year's business.

Considerable surprise was occasioned at Hampton Roads, when the new circular for 1913 was announced, showing an advance of 30c. a ton over the old figures. West Virginia coals are gaining rapidly in favor for bunkering purposes, and the operators felt justified in making this increase. Railroads in the Kentucky field have apparently about satisfied their requirements, and are now taking little coal; domestic has been declining for some time, and appears to be on the verge of a break. In the Southern markets the usual holiday dullness prevails and not much buying is expected for the present; operators in this district made a special effort to lose as little time as possible over the holiday period, because of the prevailing high prices.

There has been a temporary set-back in the Middle-western market because of the holidays, but prices, as a rule, remain steady. The expected cold wave about Christmas did not materialize, and domestic is rather dull, but dealers believe that this will only be of short duration. Considerable buying has been put off until after the first of the year, and, when this appears, it will materially strengthen the market.

BOSTON, MASS.

Another small spurt has come in bituminous. The last of 1912 developed more buying, and in a larger volume. On the other hand, receipts at the loading piers are materially reduced by the holiday suspension, and prices are up at least 20 to 25c. from a week ago. This is especially true at New York, and Philadelphia shares it to a limited extent. At Hampton Roads and Baltimore there are as yet few sales of spot coal. The larger agencies are committed to loading vessels on contracts that are still effective, and the detention is only slightly improved. Of late years a large tonnage for New England has been loaded from Baltimore, and the excessive delays there, due to car shortage on the B. & O., make a serious upset in the calculations of those depending on supplies from that quarter. The quantity of coal available at other points is scattering, and values are almost sure to be higher in the next fortnight.

All-rail there is only a small movement of bituminous; $2@2.15 at the mine is the current price for fair grades from the Clearfield region. It is only the exceptional operator who can guarantee prompt service, and there is less heard about coal offering at the junction points for New England routing. The Christmas snowstorm was confined to the seaboard for the most part and apparently did not affect rail shipments, except to increase the anxiety of consumers who are running on small reserve stocks.

Hard weather on the coast has seriously interfered with arrivals. The retail dealers continue on the ragged edge for the popular sizes, and there is nothing new to report. A great deal depends on January weather; if it turns cold for a fortnight or so at a time, there will be real distress for fuel. As things have been, the public has shown a willingness to disregard preferences and get along on what sizes of anthracite could be had. There is renewed interest in premium coal at wholesale out of New York, although prices are not materially changed.

Present wholesale quotations are about as follows:

Clearfields, f.o.b. mine	$2 00 @ 2 15
Clearfields, f.o.b. Philadelphia	3.25 @ 3.40
Clearfields, f.o.b. New York	3 55 @ 3 70
Cambrias, etc., f.o.b. mine	2 15 @ 2 25
Cambrias, etc., f.o.b. Philadelphia	3 40 @ 3 60
Pocahontas New River, f.o.b. Hampton Roads	3.50 @ 3 60
Pocahontas New River, on cars Providence	4 50
Pocahontas New River, on cars Boston	4.75

NEW YORK

Anthracite—The effects of the heavy snow storm, on Tuesday of last week, have been discounted and the hard-coal trade is again back on about the same basis it was immediately preceding this. This abrupt change in weather conditions, threatened for a time, to effect a radical change in the hard-coal market and conditions during the remainder of that week were quite uncertain and rather tense. It was believed by many that the trade would prove very susceptible to this first, and rather alarming appearance, of real winter and the result was that shippers were inclined to hold all consignments available and free tonnages became quite scarce all along the line.

The tense feeling, however, has been gradually easing off since that time and is now back to approximately the same conditions in effect before. The demand has been slowing up and the situation getting easier all along the line, particularly on egg coal, the premiums on which are quite materially off; there is also little demand for chestnut. The consumption appears to be about normal and it is improbable that large premiums will again be paid in this market during the remainder of the season.

Production is quite good and it is doubtful if any large losses will be sustained as a result of the holiday suspension. These stoppages at the mines has enabled the railroads to keep the operators supplied with all the equipment they could load, which was not the case previous to this. It is probable, therefore, that the loss of time, due to the holidays, was only about the equal that which would have been sustained in any event, because of the insufficiency of cars at the mines.

We quote the New York anthracite market on the following basis, with prices generally firm in all departments:

	Upper Ports	Lower Ports
Broken	$5 00	$5 00
Egg	5 25@6 00	5 20@5 60
Stove	5 25@6 50	5 20@6 30
Chestnut	5 50@6 50	5 45@6 30
Pea	3 50	3 45@4 25
Buckwheat	1 75	2 35@2 70
Rice	2 25	1 70@1 95
Barley	1 75	1.25@1 70

Bituminous—The soft-coal situation is badly mixed up at the present time, there not being much coal available while the demand is spotty and intermittent, and confined mostly to small tonnages. There are fairly good supplies coming

in, but on the whole shipments are light. The line trade is the best feature of the business, the situation at tide being rather weak. The requirements of the trade are naturally reduced as a result of the holiday suspension in general manufacturing, but the production at the mine has likewise decreased for the same reson, and thus conditions in this respect are practically unchanged.

At the present moment it is practically a weather market. A general decline in the temperature will doubtless bring with it a jump in prices, while on the other hand, if the weather remains mild, the market will continue soft and unsteady; the car and labor supply are also important considerations that may assume serious proportions at any time.

Production in the mining regions has been quite poor. The car supply in West Virginia has been entirely inadequate, even with the curtailed work at the mines over the holidays. In Pennsylvania, however, the roads seem to have been able to keep the mines well supplied with cars. The shortage of labor in this latter district, however, is assuming serious proportions and promises to become quite acute should there be a heavy production.

New York bituminous prices are as follows:

West Virginia, steam	$3.15@3 25
Ordinary grades, Pennsylvania	3.15@3 25
Fair grades, Pennsylvania	3 15@3 25
Good grades, Pennsylvania	3.20@3 30
Best Miller, Pennsylvania	3.30@3 40
Georges Creek	3.50

PHILADELPHIA, PENN.

The inclement weather of early in the week caused additional calls on the dealers, and they are more than insistent in their desire to secure supplies of anthracite coal. Conditions are not in any way improved as to the output, for after a week of holidays, with curtailed production, certain sizes are in as short, if not shorter supply, than has been the case so far this winter. Stove and pea coal are simply impossible to obtain in sufficient quantities, and all the dealers are complaining bitterly, but it is a fact nevertheless, that the trade in this vicinity is being taken care of to the best of the ability of the companies forwarding coal to this market.

The large operators and some of the small ones, have been handicapped by lack of men, petty strikes and inadequate car supply. Large quantities of coal are coming to this market, but the demand is so heavy, and everyone so insistent, that when spread around, no one is satisfied. Egg coal seems to be in easier supply than any of the other domestic sizes, but chestnut still maintains its place as a scarce article. With two months of what is likely to be severe winter weather, the situation looks anything but promising, and a heavy snowstorm or blizzard would be likely to cause considerable discomfort, if not actual famine, if the operations of the railroads were held up for any considerable length of time.

Bituminous prices have reached what is considered the high-water mark in quotations since conditions became better the middle or latter part of the summer. Prices are anywhere from 10 to 15c. per ton over quotations of the previous week, and the supply is far short of the demand at the present time, due in a large measure to the holidays, added to insufficient car supply. As a matter of fact, the advance in prices is doubtless due to the scarcity of coal, rather than any extraordinary demand.

BUFFALO, N. Y.

The bituminous market is strong and could hardly be otherwise, so long as the car supply is so short. No doubt if the operators could have their way they would soon flood the market, no matter how great the demand might be, but as it is they are handicapped and it looks as if they would remain so for some time. The car shortage is quite as great as it has been at any time.

That there is no letting up of the stringency is shown by the report of one of the large city jobbers, that he was notified by the railroad that if he would load with fuel for the road a supply of cars would be given him next day. Of course, there was nothing to do but comply, regardless of the fact that there were plenty of customers waiting for coal.

The holiday time is not a very good one for sizing up the market, for the miners are idle a great part of the time, so that even if the factories are shut down also, it is likely that the decreased output is more than the decreased consumption. What the operator is trying to do is to evade the drawbacks and put a full capacity supply on the market in spite of everything. There is comparatively a big margin of profit in the business now and to do that would mean a large measure of success. For all the bad places in the bituminous trade, however, the general tone is very much better than it was a year ago. It is the policy of business not to be satisfied, but there are many grades of dissatisfaction for all that.

The quotations are as strong as ever. Some markets seem to find a weakness in the trade, but anything of the sort here is denied. One active jobber of bituminous and independent anthracite reports, that, for the first time in many months, he has not a single car in this vicinity subject to reconsignment. The Pittsburgh figures remain at $3 for select lump, $2.85 for three-quarters, $2.75 for mine-run and $2.50 for slack. Coke is hardly as strong as formerly, the prices appearing to have reached the top. It is still proper, however, to quote best Connellsville foundry at $6.50.

There have been a few cancelations of anthracite orders on account of the weather, but a jobber is still able to report sales of independent hard coal at $1.50 premium; the average excess is about $1.25, as last week. There is just now, very little anthracite coming this way from the mines, and prices are expected to remain pretty strong till mining is more active. Large sizes of anthracite are more plenty, and small grades shorter.

PITTSBURGH, PENN.

Bituminous—The coal market has been quiet the past week, and production has been relatively light, due to the interruption of the holiday. There has been a fair demand for domestic coal, but very little from manufacturing consumers, either for prompt or contract. Circular prices continue to be quoted as follows: Slack, 90c.; nut and slack, $1.05; nut, $1.25; mine-run, $1.30; ¾-in., $1.40; 1¼-in., $1.55, per ton at mine, Pittsburgh district.

Connellsville Coke—Consumers of furnace coke were so well provided with stocks that last week's light shipments, on account of the holidays, had only a moderate effect upon the market. Prompt furnace coke sold up to $4.25, when $4 had been about the highest previously obtained. Contract business has been light, consumers objecting to paying the high prices asked, and believing the present to be an inopportune time to contract, when prompt coke is particularly scarce. It is reported that one contract has been made within the past few days for 12,000 tons a month over the first half at $3.50. We quote: Prompt furnace, $4.15@4.25; contract furnace, first half, $3.25@3.50; contract furnace, year, $3@3.25; prompt foundry, $4.25@4.75; contract foundry, $3.24 @3.75, per ton at ovens.

BALTIMORE, MD.

Real winter weather conditions and a limited supply of coal were the dominating factors in the exceptionally strong market which prevailed here during the past week. The day before Christmas, this section experienced the first touch of cold weather for weeks, which was accompanied by a 3-in. snow, and such conditions have figured largely in the movement of fuel from the mines to tide water. Added to this was the expected shortage, resulting from the holiday period, in the West Virginia and other regions. One of the large local operators stated that the output from the mines of his company was considerably reduced on Tuesday. Wednesday, the mines were closed down altogether, and not more than half the miners normally employed, put in an appearance on Thursday, thus reducing the week's output of fuel to three whole days. This was the experience of practically all of the local companies.

Under such conditions, the market was naturally strong, and prices of all grades advanced from 10c. to 20c. over those of the previous week. There were rumors that one operator received $2 for low-grade coal the latter part of the week from consumers, whose stocks had run low, and who were eager for coal at any price. This was the highest price recorded during the week, but the last three days spot coal brought $1.75 and $1.80, and there were at least a half dozen customers for every ton offered.

The coal tonnage of the Consolidation Coal Co. for the year to Dec. 24 was 10,200,000 tons as compared with 9,075,000 tons for the corresponding period of last year, an increase of 1,125,000.

COLUMBUS, OHIO

While the past week has been broken by the Christmas holiday, still it has been one of considerable activity in the coal trade. Colder temperature has caused a better domestic demand and accordingly orders from retailers in Ohio, Indiana and Michigan have been more urgent. On the whole, the trade is satisfactory, when the condition of the car supply is taken into consideration and operators look for more activity in the near future.

Prices are remaining firm at the figures which have been prevailing since Dec. 1. Reports show a little softness in the Chicago market, but this condition has not affected the Hocking trade to any appreciable extent. Dealers in all sections

are fairly well stocked with domestic sizes, although in some localities stocks have run down rather low.

Steam business is still one of the strong points of the trade and there is a good demand from all lines of manufacturing. Some of the larger plants have been attempting to stock up to guard against an emergency, but they have not succeeded to any great extent because of the car supply. Concerns engaged in the iron and steel industries have been especially large purchasers of steam sizes. Some contracts expire about this time and renewals are being made, in some cases at slightly higher figures than prevailed during the previous year. There is still a good demand for railroad fuel and this branch of the trade is gaining in importance.

Production in all fields has naturally been curtailed by the shortage in cars, although it has also been affected by the Christmas holidays. In the Hocking Valley proper, the production is probably larger than in other sections in the state.

Retail trade has been rather inactive under the influence of the mild weather. Most of the larger householders have purchased their winter's supply, although there was a rush of small orders recently. Retail prices are practically unchanged.

Quotations in the Ohio fields are as follows:

	Hocking	Pittsburg	Pomeroy	Kanawha
Domestic lump	$2 00		$2 25	$2 00
3-inch	1 80	$1 50	2 00	1 65
Nut	1 50		2.00	
Mine-run	1 50	1 40	1 50	1 50
Nut, pea and slack	1 15		1 25	0 90
Coarse slack	1.00	1 15	1 10	0 75

CLEVELAND, OHIO

Prices fell off considerably on coarse coal in the vicinity of Cleveland during the past week. This break, no doubt, is due to the fact that the companies in the Pittsburgh No. 8 field have been forced to operate their mines exclusively on rail shipments during December; approximately 40% of this product was shipped via the Lakes during the summer months. The sudden placing of this tonnage in the rail market after the Lake season had a tendency to reduce coarse-coal prices.

During the early part of December operators were quoting $1.20 on Pittsburgh No. 8 run-of-mine for spot shipment and $1.10 for contract. This price has reduced considerably and consumers are now purchasing run-of-mine as low as $1.10 for spot shipment.

Slack is still the ruling factor. One 50- and one 100-car order was closed during the past week on Pittsburgh No. 8 slack at $1.20, the mines. On account of the high price of this grade, practically all of the mines are screening ¾-in. lump coal on run-of-mine orders. Slack is averaging 10c. per ton higher than run-of-mine.

The following prices per net ton f.o.b. the mines are quoted on the various coals for immediate shipment.

District	¾-in.	Mine-run	Slack
Youghiogheny	$1 40	$1 30	$1 10
Pittsburgh No. 8	1 20	1 10	1.20
Goshen No. 6	1 45	1 35	1 25
Coshocton	1 75	1 50	1 25

The production of coal between Christmas and New Years was reduced 50% on account of holiday celebrations. Mines continue to report a scarcity of railroad equipment. These conditions are bound to increase prices after the first of the year.

LOUISVILLE, KY.

The car situation has been affected by the holiday lay-off, which the eastern Kentucky miners, in particular, are taking this year as usual, despite short work during the fall. This enforced idleness at the mines is permitting cars to accumulate. It is reported that the Southeastern railroads, however, are in serious straits for coal, as initial lines have been absorbing all the fuel available. When the Louisville & Nashville and the Atlantic Coast Line, for example, have been facing a lack of fuel which made a curtailment of operations imminent, it is obvious that roads less favorably situated, with reference to the mines, must be rather badly off.

As a natural result of this condition, run-of-mine has sold, during the present week, as high as $1.75, and nut and slack has run up to $1.25, although all sorts of prices, down to 65c. have been heard. While lump is quoted at from $2.25@2.40, this is still a good deal under the high figures of November, when the car shortage was at its worst.

HAMPTON ROADS, VA.

Although interrupted by the Christmas holiday, the dumping at Hampton Roads during the past week was heavier than at any time in the past month and a half. All shippers appear anxious to clean up what old obligations are remaining, during the last few days of the old year. While the month's dumping figures are not yet available, indications point to a larger tonnage put over the local piers than during November.

During the past week, prices on bunker coal at Hampton Roads for the year 1913, were announced. Considerable surprise was expressed when it was learned that it would be advanced 30c. per ton. On the other hand, it has developed recently that good steamship coal could be purchased here for much less than at other points, and steamers were going out of their way in order to take advantage of the cheap supplies here. It is probable for this reason that the export shipments from here will soon show a rapid increase.

MEMPHIS, TENN.

Notwithstanding this territory is having one of the most open winters in its history, there is quite a scarcity of coal because the car situation has been bad for the past 60 to 90 days. The miners are having a prolonged vacation during the holidays, and it is making coal just a bit more scarce than it has been this winter.

The car situation on all the roads leading into Memphis would be very disastrous to all concerned should we have any weather demanding an unusual amount of coal. While there has been no scarcity of any particular grade, other than screenings, it has made these higher this season, than ever before.

BIRMINGHAM, ALA.

The usual holiday quietude prevails in the market for coal and coke and not much buying is anticipated until well after the new year.

Owing to the high prices now being obtained for all grades, a special effort was made by the operators to cut the loss of time, incident to the holidays, to a minimum. Many of the mines were, therefore, put into operation on Dec. 26 with a good quota of men ready for work.

Both domestic and foundry cokes are in urgent demand, and by adopting strenuous measures the coke plants were kept running full all through the holidays.

INDIANAPOLIS, IND.

The Indiana coal industry has progressed fairly well during the past week. With the exception of two holidays, the miners in nearly all the districts have worked full time. Operators say the demand is good, orders are being filled regularly and that little trouble is now experienced in securing cars for shipments. Retail and wholesale dealers report an even trade in all except anthracite coal; this has become a luxury in some markets. The Railroad Commission of Indiana has issued an order correcting and modifying rates to Lafayette and other points in the state and otherwise materially rendering assistance to the mining industry.

CHICAGO

As a result of the holiday season, there has been a temporary setback in the Chicago market, although prices, as a rule, remain steady. There is dullness throughout the domestic trade, but dealers believe there will be a resumption of brisk buying within a short time.

Hocking coal is being received in comparatively small consignments. Smokeless is stronger by from 15 to 20c. a ton than it was a week ago. Mine-run commands $1.50 and the price on lump and egg is about $2 a ton. Splint coal shipments are very light. Domestic lump is being sold for $2 at the mines. Orders for coke have lessened, although the producers have sufficient on hands to keep a full force at work for some time.

Prevailing prices at Chicago are:

	Sullivan Co.	Springfield	Clinton	W. Va.
4-in. lump	$2 87			
Domestic lump		$2 32 @ 2 57	$2 52	
Egg	2 62			$4 30 @ 4 55
Steam lump		2 12 @	2 17 @ 2 27	
Mine-run	2 07 @ 2 17	1 97	1 97 @ 2 02	3 45 @ 3 55
Screenings	1 62 @ 1 67	1 47 @ 1 57	1 57 @ 1 62	

Coke.—Prices asked for coke are: Connellsville, $6.75@7; Wise County, $6.75@7; byproduct, egg and stove, $6@6.25; byproduct, nut, $6@6.25; gas house, $6.

DETROIT, MICH.

Conditions during the past week have not varied a great deal, even considering the usual holiday dullness. Anthracite is coming in plentifully, and the fact that we have had a mild season, and that nearly everyone stocked full of the softer coals in preparation for a hard winter and a prolonged strike, the price of same is only normal.

Coke, however, is a scarce article, even in all sizes and is commanding $5 at the ovens with scant possibility of getting any large amounts.

Local market conditions are as follows:

	W.Va. Splint	Gas	Hocking	Pitts. No. 8	Jackson Hill	Pocohontas
Domestic lump..	$1 70				$2 50	$2 75
Egg..	1 70				2 50	2 75
Nut	1 60		$1 60			
3-lump..	1 40	$1 40	1 50	$1 40		
Mine-run.	1 25	1 25	1 35	1 30		1 50
Slack..	1.25	1 25	1 10	1 15		1 25

The cold wave, expected about Christmas time, failed to show up, and the market consequently continued to break. The first of the year, however, saw a slight improvement, occasioned by the demand more than anything else, inasmuch as buying has been held off until the first. It is doubtful, however, as to whether coal will again see the prices this season that it did in the fall.

The car shortage and the slow movement of coal has been the only support the market has had, and as a matter of fact, it is the only thing that is keeping the price of coal above the cost of production right now. The anthracite situation is still tense as far as chestnut is concerned, but there is plenty of the larger sizes. Coke is extremely scarce, and the price continues to advance.

The prevailing prices are as follows:

	Carterville and Franklin Co.	Trenton and Big Muddy	Mt. Olive	Standard
2-in. lump..	.....	.....	.....	$1 00 @ 1 10
3-in. lump..	.....	.....	$1 40	.....
6-in. lump..	.....	.....	1 60	1 25 @ 1.30
Lump and egg..	$1 45 @ 1.60	$2 25	.....	.....
No. 1 nut..	1 30 @ 1.50	.....	.....	.....
Screenings..	0.75 @ 0.85	.....	.....	0 55 @ 0 65
Mine-run..	1.10 @ 1.20	.....	.....	0 90 @ 1 00
No. 1 washed nut	1 50 @ 1.60	.....	.....	.....
No. 2 washed nut	1 35 @ 1 40	.....	.....	.....
No. 3 washed nut	1.15 @ 1 20	.....	.....	.....
No. 4 washed nut	1.05 @ 1 10	.....	.....	.....
No. 5 washed nut	0.85 @ 0 90	.....	.....	.....

Gas house and byproduct coke are quoted at $5.50, f.o.b. St. Louis.

OGDEN, UTAH

For the past two weeks the mines in Utah have been troubled with a car shortage, which from present indications promises to become quite severe. The Rio Grande R.R. has been putting forth an extra effort to handle the coal business tributary to its line and consequently a large percentage of its cars have gone to foreign roads and have not been returned.

Shortage of closed equipment on the Union Pacific is still acute and a very small portion of the domestic coal is being loaded in box cars. Operators are sending urgent requests to the trade to accept lump and nut in open cars. There is no relief in the labor situation and the mines are unable to reach maximum tonnage. No doubt this condition will continue throughout the remainder of the winter.

The cold weather has not affected the quotations f.o.b. mines, which are as follows:

	Wyoming	Utah
Lump.	$2.75	$2.75
Nut.	2.25	2.25
Mine-run.	1.85	1.85
Slack.	1.00	1.25

PORTLAND, ORE.

Portland is planning the installation of a system of coal bunkers for the accommodation of off-shore shipping and is now looking over the field for a satisfactory source of supply. In the past, large craft have found it advantageous to proceed to Puget Sound or British Columbia to fill their bunkers, at considerable additional expense, but the establishment of bunkering stations here will obviate this necessity. It is expected to bring the coal to the river in barges.

FOREIGN MARKETS

GREAT BRITAIN

Dec. 20—Colliery owners are still heavily booked; and they are holding firmly to quotations for all descriptions of large and small, for forward as well as prompt positions. Quotations are approximately as follows:

Best Welsh steam.	$4 50	Best Monmouthshires	$4 20
Best seconds	4 26	Seconds	3 72
Seconds	4 20	Best Cardiff smalls	3 72
Best dry coals	4 38	Seconds	3.48

The prices for Cardiff coals are f.o.b. Cardiff, Penarth, or Barry, while those for Monmouthshire descriptions are f.o.b. Newport; both exclusive of wharfage, and for cash in 30 days—less 2½%.

PRODUCTION AND TRANSPORTATION STATISTICS

Pennsylvania Railroad

Statement of coal and coke carried on the P. R.R. Co.'s lines east of Pittsburgh and Erie during November and the first 11 months, with the increase or decrease over the same period last year, in short tons:

	November	Difference	11 Months	Difference
Anthracite	916,914	— 244,373	9,275,631	—1,466,713
Bituminous	3,934,876	+ 48,512	42,162,485	+3,724,526
Coke	1,245,500	+ 332,013	12,128,463	+2,400,327
Total	6,097,290	+ 136,152	63,566,579	+4,658,140

Connellsville Coke

The "Courier" reports production in the Connellsville region as follows:

Production	Week Ending Nov 30	Dec 7	Dec 14	Dec. 21
Connellsville	218,546	214,990	212,890	228,563
Lower Connellsville	181,564	178,016	176,174	183,555
Totals	400,111	393,006	389,064	412,118
Shipments To	Cars	Cars	Cars	Cars
Pittsburgh	2,863	3,410	3,985	4,548
West of Pittsburgh	8,003	7,197	6,552	7,316
East of Region	998	1,019	1,015	964
Total	11,864	11,626	11,552	12,828

Norfolk & Western Ry.

The following is a comparative statement of the coal and coke shipments over the lines of the N. & W. Ry. for the month of November and the first 11 months of the years 1911-12, in short tons:

	November		11 Months	
Destination	1911	1912	1911	1912
Coal				
Tidewater, foreign	87,389	83,887	894,282	1,259,228
Tidewater, coastwise	303,873	239,476	2,790,824	3,325,067
Domestic	1,444,053	1,573,454	13,950,269	16,361,386
Coke				
Tidewater, foreign	8,489	.....	70,154	52,762
Domestic	118,351	136,912	1,317,997	1,282,093
Total	1,962,155	2,033,729	19,023,526	22,280,536

COAL SECURITIES

The following table gives the range of various active coal securities and dividends paid during the week ending Dec. 28:

Stocks

Company	High	Low	Last
American Coal Products	90	90	90
American Coal Products Pref	111	111	111
Colorado Fuel & Iron	34	33½	33½
Consolidation Coal of Maryland	103½	103½	103½
Island Creek Coal Pref	87½	87½	87½
Lehigh Valley Coal Sales	240	240	240
Pittsburg Coal	24¼	23¾	23⅝
Pittsburg Coal Pref	92½	89½	92
Pond Creek	26⅝	26	26
Reading	168⅝	165¾	166¾
Reading 1st. Pref	90	90	90
Reading 2nd. Pref	93¾	92½	92½
Virginia Iron, Coal & Coke	58	55	55

Bonds Company	Closing Bid	Asked	Week's Range or Last Sale		Year's Range	
Colo. F. & I. gen. s f g 5s	98	102	98	Dec. '12	97	100¾
Colo. F. & I. gen. 6s	....		107¼	June '12	107¼	107¾
Col. Ind. 1st & coll. 5s, gu.	82¼	Sale	82¾	84	72½	85¾
Cons. Ind. Coal Mc. 1st 5s	80	84½	85	June '11	....	....
Cons. Coal 1st and ref. 5s	....	94	93	Oct '12	93	94
Gr Riv. Coal & C. 1st g 6s	....	....	102⅝	Apr. '06	....	....
K & H. C. & C. 1st s f g 5s	....	....	98	Dec. '12	97½	98⅜
Pocah. Con. Coll. 1st. s f 5s	87	88	88	Dec '12	81½	89½
St. L. Rky. Mt. & Pac. 1st 5s	76	79½	79½	Dec. '21	79⅝	84½
Tenn. Coal gen. 5s	102½	103	103	103	101	103½
Birm. Div. 1st consol. 6s	102	103½	102¼	Dec. '12	102	104½
Tenn. Div. 1st g 6s	101½	103½	101¼	Dec. '12	101¼	104
Cah. C. M. Co. 1st g 6s	103½	110	110	Jan. '09	....	....
Utah Fuel 1st g 5s	....	....	....	....	....	....
Victor Fuel 1st s f 5s	....	83	85½	Oct. '12	85¾	86
Va. I. Coal & Coke 1st g 5s	96	97	97	Dec. '12	94½	98½

Youngstown Coal R.R.—Dividend of $5 on the common, payable Feb. 1, to holders of record Jan. 16. On the preferred, 2½%, payable Jan. 2, to holders of record Dec. 24.

Del., Lack. & West. Coal Co.—Regular quarterly of 2½%, payable Jan. 15, to holders of record Dec. 31.

Pittsburgh Coal—Regular quarterly on the preferred of 1¾%, payable Jan. 25, to holders of record Jan. 15.

PRICES OF MINING SUPPLIES

THE MARKET IN GENERAL

The year 1913 opens far more auspiciously than did 1912. Manufacturers everywhere have orders on their books to keep them busily engaged for three or four months at least, while the prospect for new business is far better than at the same time in any year since 1907.

Iron and steel industries continue to furnish the greatest volume of orders, and the phenomenal increase in business taken by the U. S. Steel Corporation is marvelous. Every blast furnace, rolling mill, and finishing plant in the country is not only working full blast, but endeavoring to find additional men to turn out a larger product. Moreover, many of these mills are building extensive additions to care for future business.

Railroads of the country have purchased more liberally during the last month than at any time this year, and indications point to a continuation of this large amount of business for several months to come. Railway net earnings are increasing, and in good ratio. Of course, no man or corporation makes as much money as desired, but the profits of the railways are now fairly satisfactory.

Ship-building work is active, and promises to be more so. Freight rates have advanced rapidly in the last year, and even now ocean berth space is so scarce that few, if any, of the transatlantic carriers can offer cargo space for the next ten to twelve weeks. The railroads' conditions appear much the same. The shortage of cars, while not as apparent as a month ago, still exists, and in December, more cars were purchased than in any other month last year, while the railways on Jan. 1 were preparing to buy about 60,000 additional freight cars.

New terminals must be built by the railways, and additional facilities provided to take care of the enormous freight traffic.

Financial conditions have materially improved, and there is a healthy demand for money for mercantile purposes, entirely distinct from stock-market speculation.

LABOR

The differences between laborers and employers have, as a general rule, been readily adjusted, and, in fact, there have been only a few disturbances which required any outside interference. It rather prolonged strikes, the settlement of which was unnecessarily delayed by blundering on the part of the authorities.

Voluntary action on the part of the U. S. Steel Corporation in raising the wages of all of its employees after Jan. 1 seems to indicate that the officials of this corporation believe the present era of industrial prosperity will continue. It is estimated that the increased wages paid out by this company alone will amount to $5,000,000 annually.

In New York, on Dec. 30, about 75,000 garment workers went on strike. They are better organized than heretofore, and seem to have plenty of funds to carry on their campaign, backed by able leaders.

The Public Service Co., which controls a large part of the public utilities of the State of New Jersey, announced shortly before Christmas that hereafter no woman in its employ would receive less than $9 per week. On making this announcement, it stated that two-thirds of the company's female employees were affected by it.

In Boston the clerks of the New Haven railroad are striking for $2.25 per day.

IRON AND STEEL PRODUCTS

A better supply of coke in and around the Pittsburgh district, a more even distribution of cars, and the settlement of a small strike in Homestead mills all combine to make a larger production of steel products. While for the month of December, we usually present no records on account of the Christmas holidays, it is probable that in January several new high records of tonnage will be made, and it is furthermore probable that the record-breaking production which was established on several occasions in 1912 will be augmented from time to time.

Prices of steel products have changed slightly. Pig iron is practically the same as a month ago; semi-finished steel is likewise unchanged, but finished forms, such as plates and structural shapes, have been advanced $1 per ton.

Railway buying has continued in large volume. The principal transportation companies of this country bought more new equipment in December than in any month this year.

Inability to obtain shipments of bars, sheets and other finished material has caused more uneasiness than any other one thing this year.

The price of old material is considered an excellent index to the course of the market by experienced iron and steel men. The highest prices recorded in 1912 were reached around the first of November, but a month after that, prices declined with little show of resistance. During December sales was larger, but there was practically no improvement in prices. The outlook now is not especially bright.

Orders for rails placed for 1913 by railroads in 1912 will probably exceed 2,500,000 tons. The total requirements of the railroads for the present year will undoubtedly total 4,000,000, and to roll this vast quantity will tax the capacities of the mills. It is true that the rolls of the country had a capacity in the neighborhood of 5,000,000, and perhaps somewhat in excess of this, but that was several years ago, and since that time these mills have been equipped with different rolls; to change them over again would require a great expenditure.

Rails—Several good export orders came up during December, one for 100,000 tons for Brazil, which, however, was not closed. Another order of 19,000 tons for South America was accepted. Quotations are unchanged, with a continued scarcity in the lighter-weight rails, and, f.o.b. Pittsburgh, are as follows: Standard sections, 6 to 100 lb. per yd., 1.25c. per lb.; 40 to 50 lb., 1.21c.; 12 lb., 1.25c. Relaying rails in Chicago, 45 lb. subject to inspection, are held at $22 to $24 per ton. Standard sections of relaying rails in the same market are held at $24 per ton. Some of these rails can be had at points other than Chicago.

Track Supplies—A scarcity seems to exist in track bolts and prices have been moved upward. In Pittsburgh, 2.05c. per lb. is quoted. Angle bars are in plentiful supply and 1.50c. per lb. is named in Pittsburgh. In Chicago, angle bars are 1.50c.; spikes, 1.75 to 1.95c.; track bolts with square nuts, 2.30 to 2.40c.

Structural Material—Mills rolling structural shapes and track material have all the orders on their books that they can take care of for the next six months, and in spite of an advance of $1 per ton, made in the latter part of December, there seems to be no diminution in the amount of business offered. While the mills making plain material are crowded, the fabricating shops are working to the limit of capacity, and now have orders on their books which will carry them well through the summer. Of course, some rush jobs can be taken care of in the meantime, but for ordinary roof trusses and the like, there seems to be no possibility of getting material for six months, unless fancy prices are paid for it. Prices, as stated, are $1 per ton higher, ordinary angles, beams, channels and tees being quoted at 1.55 to 1.60c., f.o.b. Pittsburgh, for deferred shipments and 1.75 to 1.80c. for fairly prompt delivery. In Chicago, quotation for future shipment is 1.68 to 1.78c., and for fairly prompt delivery, 1.88 to 1.93c. The enormous buying of cars by the railroads as well as the orders by shipbuilding firms resulted in stiffening the prices of plates which are now quoted at 1.55 to 1.60c., Pittsburgh, for future delivery, and 1.75 to 1.80c. for fairly prompt. In Chciago, the price for future shipment is 1.68 to 1.73c., and for delivery in the near future, 1.88 to 1.93c.

Mine Timbers—The demand for mine timber has not been up to the expectation of the mills rolling these special shapes and the tonnage disposed of was disappointing. Makers of mine timbers, however, have sufficient stock on hand to supply the limited need, and prices are steady and unchanged at 1.50 to 1.55c., Pittsburgh.

Pipe—A revision in the list of pipe announced by manufacturers on Jan. 1, resulted in slight changes being made in the price of practically all different sizes. Most of the makers of pipe have discontinued the manufacture of merchant sizes, and all pipe will now be standard. Discounts are as follows: Steel pipe, ½-in. large lots from the mill, black, 77½ from list; galvanized, 66⅔%; ¾- to 3-in., black, 80%; galvanized, 71½%; 2-in., black, 77%; galvanized, 68½%; 2½- to 6-in., black, 79%; galvanized, 70½. Based on these discounts, the net prices of pipe per foot are as follows, in cuts:

Size, inches	Black	Galvanized
¾	2.30	3.10
1	3.40	4.85
1¼	4.60	6.55
1½	5.50	7.70
2	7.40	10.30
2½	11.50	16.70
3	15.40	21.75

Sheets—Sheet makers are beset with many difficulties in pleasing their customers. For blue annealed sheets, 14 to 16 weeks' delay is experienced, while on the better known sizes of black and galvanized sheets, from 10 to 14 weeks, and on sheets generally used for automobile purposes, there is a delay of 12 to 16 weeks. Specifications continue larger than the mills can turn out, and the total purchase of sheets increases rather than diminishes. On Dec. 31, many long-time contracts expired, and these were taken at much lower prices. Sheet mills expect considerably better prices after the first of the year, with a volume of business fully equal to that of the last three months. In general, prices are steady without change, but small mills, which make prompt shipments, are able to command fancy prices for this accommodation.

The following table gives the price of sheets in carload lots, f.o.b. the Pittsburgh district, and also the price of small lots from store in Chicago:

	Cents per pound			
	Pittsburgh		Chicago	
	Black	Galv.	Black	Galv.
Nos. 22 to 24	2.10	2.90	2.50	3.20
Nos. 25 and 26	2.15	3.10	2.60	3.45
No. 27	2.20	3.25	2.65	3.65
No. 28	2.25	3.40	2.70	3.90

WIRE PRODUCTS

Wire—Continued efforts have been made to advance the quotations of wire, as were noted last month, but the largest manufacturers have strenuously opposed such a course, and they have been successful in their attitude. This does not mean that there is no expectation of an advance in the near future, for it is the unanimous opinion among manufacturers that an upward revision of quotations must be made before spring. Plain barbed wire is $1.75@1.80, f.o.b. Pittsburgh, and galvanized is $2.10@2.15. Annealed fence wire is $1.55@1.65, and galvanized is $1.95@2.05. All of these quotations are per 100 pounds.

Wire Rope—Some large orders have recently been placed for wire rope, and a notable export order was for 6000 ft., to be shipped to Cuba to haul 100,000-lb. cars. Samples of this rope were tested by machines, and broke under a strain of 600,000 lb. There does not seem to be the same scarcity that existed a month ago. Net prices of the sizes in most general use are quoted, f.o.b. Pittsburgh: 2-in., 57@76c. per ft.; 1¼-in., 23@32c. per ft.; ¾-in., 10@13c. per ft. All of these prices are for large lots.

Telegraph Wire—The demand for telegraph wire has been large. For lots in fair size, the wire measured in Birmingham wire gage, prices are as follows: "Extra Best Best," Nos. 6 to 9, 4½c.; Nos. 10 and 11, 4½c.; No. 12, 4⅝c.; No. 14, 5¼c.; "Best Best," Nos. 6 to 9, 3½c.; Nos. 10 and 11, 3⅝c.; No. 12, 3½c.; No. 14, 4c. Actual freight is allowed from basic points where it does not exceed 25c. per 100 pounds.

Copper Wire—Manufacturers of copper wire had a very satisfactory business all last year, and while they are somewhat behind on shipments, as a general rule these are made promptly. Prices are firm, at 18¾@19c. base, depending on the size of the order.

MINE SUPPLIES

Nails—The price of nails did not advance, but it is felt that an advance will be made within the next month or so. The following quotations are per keg of 100 lb., f.o.b. the points named: Wire nails, Pittsburgh, $1.85 base. In Chicago, the base price is $2.08 for wire nails, and in Pittsburgh, less than carload lots are quoted at $1.85. Cut nails are held at $1.80 in Pittsburgh for jobbing lots.

Bar Iron and Steel Shapes—Consumers ordering direct from the mill find it difficult, if not impossible, to secure shipments with any degree of regularity, and in consequence, much of this material is ordered from Jobbers' stocks. The prices from jobbers' store in cents per pound, f.o.b. Chicago, are as follows:

	Cents per lb.
Refined Iron:	
1 to 1¾ in., round and square	2.05
1½ to 4 in. x ⅜ to 1 in.	2.05
1½ to 4 in. x ¼ to ⅜ in.	2.25
Norway bars	3.60
Soft Steel;	
¾ to 3 in., round and square	2.05
1 to 6 in. x ⅜ to 1 in.	2.05
1 to 6 in. x ¼ and ⅜ in.	2.20
Rods—⅜ and ½ in.	2.15
Bands—1½ to 6x¼ to No. 8	2.35
Beams and channels—3 to 15 in.	2.25
Angles;	
3 in. x 1 in. and larger	2.25
3 in. x ⅜ in. and ¼ in.	2.60
1½ to 2½ in. x ¼ in.	2.35
1½ to 2½ in. x ⅜ in. and thicker	2.25
1 to 1½ in. x ⅜ in.	2.35
1 to 1¼ in.	2.40

Belting—Manufacturers of belting have all the business they can take care of for the time being, and the prospects are excellent. There has been a slight falling off in the demand for leather for other purposes, and in consequence, discounts are unchanged from last month. These discounts may be found on page 482 of the issue of Oct. 5. Net prices per foot for various widths of leather belting are as follows:

LEATHER BELTING, NET PRICE PER FOOT

Width inches	Extra heavy	Heavy	Light
1	$0.11	$0.10	$0.08
1½	0.17	0.14	0.11
2	0.23	0.19	0.15
2½	0.28	0.24	0.19
3	0.34	0.29	0.23
3½	0.40	0.34	0.27
4	0.46	0.38	0.31

Brattice Cloth—Quotations continue at a high level. In fact, prices today are on a higher basis than ever before. This is caused by a phenomenal demand for all kinds of jute products, in addition to an enormous inquiry for brattice cloth itself. Shipments are somewhat better, and deliveries can be made in shorter time than a month ago, while stocks in the United States have increased slightly. This is a relief in point of view of shipment only, for lower prices are not looked for by conservative dealers in the trade for six months to come, at least.

Packing—Prices vary within wide limit, according to the brands of various dealers, but in general, packing can be purchased at the following quotations: Asbestos wick and rope, 13c. per lb.; sheet rubber, 11 to 13c.; pure gum rubber, 40 to 45c.; red sheet packing, 40 to 50c.; cotton packing, 16 to 25c.; jute, 5 to 6c.; Russian packing, 9 to 10c.

Chain—Mills seem to have caught up with their orders, but the revision of prices announced two months ago has had no effect on the volume of inquiries and many of these will subsequently be turned into orders. Prevailing quotations per 100 lb., f.o.b. Pittsburgh, are as follows:

⅛ in.	$7.50
¼ in.	4.95
⅜ in.	3.95
½ in.	3.40
⅝ in.	3.20
½ and ¾ in.	3.00
⅝ and ⅞ in.	2.90
¾ and 1⅛ in.	2.80
⅞ and 1¼ in.	2.70
1 to 1¼ in.	2.60
Extras for BB	
⅜ in.	1.50
½ in.	1.50
⅝ in. and larger	1.25
Extras for BBB	
⅜ and ½ in.	2c.
⅝ and larger	1.75c.

CONCRETE AGGREGATES

Portland Cement—While prices are unchanged from last month, the market is undeniably stronger. Makers of portland cement are looking forward to this year's being the most satisfactory of any in the cement industry. Eastern markets, which have been lagging behind for the last five years, are the most hopeful. There, a large amount of business is already in sight, and indications are not wanting that much more will develop, if conditions are at all favorable. All things considered, it would not be at all surprising if the price of cement should be advanced in the latter part of February, or slightly later, and revised on a basis of 10 to 20c. per bbl. higher. At present, quotations are unchanged, as stated, at $1.58 per bbl., f.o.b. Pittsburgh, subject to the regular allowance of 10c. for all bags returned. In wood, cement is quoted at $1.58 per bbl., at the same place.

Bars, Concrete Reinforcing—The inability to secure direct shipments of bars from the mills has caused many consumers to buy warehouse stocks, and in consequence, there is a premium of $4 to $6 per ton for such stock. Shipments cannot be made within three to four months on any kind of material from mill, and in some cases it is even longer.

The following quotations are named, f.o.b. Pittsburgh, for large lots from mill, also for small lots from warehouse stock:

Pittsburgh prices in cents per pound.

	Mill shipments	Warehouse stocks
¾-in. and larger	1.45@1.50	1.95@2.05
⅝-in.	1.50@1.60	2.00@2.10
½-in.	1.55@1.65	2.05@2.15
⅜-in.	1.65@1.75	2.20@2.30
¼-in.	1.95@2.05	2.45@2.55

Triangular Mesh—This form of concrete reinforcement is selling at unchanged prices, and the makers state that they are able to make delivery in a day or so after the receipt of order.

From mill in De Kalb, Ill., quotations are 18c. per 100 lb. higher. Prices are as follows, per 100 sq.ft., f.o.b. Pittsburgh district, for less than carload lots and lots of more than 10,000 sq.ft.:

No. 4	$1.23	No. 32	$2.62
" 23	2.05	" 36	1.05
" 26	1.42	" 40	3.25
" 28	1.97	" 41	2.48

Petroleum Products—Much higher prices prevail for crude oil from well. In fact, the advance in December was as rapid as any month this year. For example, Pennsylvania is now quoted at $2.07 per bbl., compared with $1.30 at the beginning of the year; Second Sand and Tiona, $1.90; Mercer black and New Castle, Corning, $1.53; Illinois, above 30 gravity, $1.08; Kansas and Oklahoma, 83c. All these prices are for the crude oil at the wells per barrel. A revision has been made in the price of kerosene, and it is now being quoted at 9c. per gal. Auto naphtha is 19¾ cents.

Paints—A further revision in the price of linseed oil brought the quotation down to 46c. per gal. in the principal market. Paints have not followed the decline, but in a general way paint is cheaper, and there are few adulterants used in the mixing of it. The amount of low-grade oils which has been used in the cheaper grades of ready mixed paints during the last few years is amazing, and the great trouble is that their imperfections do not appear for six months or so after a structure has been painted. In consequence, all bills have been paid, and there is no redress.

Spirits of turpentine is also slightly easier at 35c. to 36c. per gal. White lead in oil in 100-, 250- and 500-lb. kegs is 6½@7c. per pound. Red lead and litharge in lots of 500 lb. and over may be obtained at 7 cents.

Insulators—Prices continue with out change. Glass insulators in lots of 1000, and less than 10,000, are sold at the following price per 1000: Double petticoats, 20-oz., $33; Western Union, $30.25; No. 2 cable, $53.90; No. 4 cable, $2.10; Muncie type, 7-in., $236.50; No. 3 triple petticoat, 4½-in., $90.75.

Sheet Steel Roofing—The same scarcity which is noted in the market for ordinary sheets is felt in the corrugated-sheet market. Prices are irregular, but from store, Chicago, are as follows per 100 sq.ft. for 2½-in. corrugation, painted: No. 22, $4.75; 24, $3.75; 26, $2.85; 28, $2.50. Galvanized roofing is held at an advance of 10c. per 100 lb. over the flat sheets from which they are made. For example, 24-in. galvanized roofing in Chicago would be $3.75 per 100 lb.; 28-in. galvanized, $4.20 per 100 lb.

COAL AGE

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Facts and Figures.

The history of the development of America is a record of unparalleled interest, but the story of the growth of coal mining is a romance which reads like fiction.

The pinnacle of progress in the coal industry was reached in 1912, when the total production amounted to 511,964,403 short tons, having a spot value at the mines of approximately 680 million dollars. This was the largest output and highest total value ever recorded in any single year.

Nearly one-half the coal produced in the world is mined in the United States. The following figures clearly show the miraculous growth of the industry:

In 1850—11	states	produced	7,018,181	short	tons
" 1860—15	"	"	14,610,042	"	"
" 1870—21	"	"	33,035,580	"	"
" 1880—25	"	"	71,481,570	"	"
" 1890—28	"	"	157,770,963	"	"
" 1900—28	"	"	269,684,027	"	"
" 1910—27	"	"	492,647,863	"	"
" 1912—28	"	"	511,964,403	"	"

It is evident from the foregoing table that the output of coal has practically doubled every 10 years. It is likely therefore, if business continues normal, we will see either a material increase in production, or much higher prices for the tonnage mined.

The production of coke in 1912 also made a new record, bettering the figures shown in 1910 by a small margin. This important branch of the industry has shown a growth equally as remarkable as coal mining. The following summary is convincing:

In 1880 the	U.S.	produced	3,338,300	short	tons	coke
" 1890	"	"	11,508,021	"	"	"
" 1900	"	"	20,533,348	"	"	"
" 1910	"	"	40,807,204	"	"	"
" 1912	"	"	41,803,199	"	"	"

The total output of coke in 1912 had a spot value of approximately 110 million dollars, and was produced by 591 plants operating 107,000 ovens. The feature of the coke-making business was the advance in retort-oven practice. A plant of the byproduct type, comprising say 75 ovens, would cost approximately $1,000,000, while a 75-oven beehive plant costs only $65,000. The latter installation, however, will produce only about 52,500 tons annually, while the 75 byproduct ovens will show a yearly output of 400,000 tons.

Practically the only difficulty in the way of the general adoption of the byproduct oven is its first cost. Here is an important instance, then, where industrial waste of a criminal order can be eliminated only by consolidation along lines so generally condemned. Those who will look back a century hence, when "Connellsville coke" is but a name in history, will marvel at the stupidity of a nation dissipating its natural wealth into fifty miles of atmosphere. Wise men no longer predict what may be in years to come, so there is some consolation in the belief that a people of greater intelligence than ourselves will recover from the atmosphere a high percentage of what we have thrown away.

A few years ago the press and public in the United States were calling attention to the high death rate in our coal mines, as compared with European practice. A revision of opinion is now in order. Counting only those fatalities in 1912 where three or more were killed, a careful compilation shows the following: United States, 254; Great Britain, 117; Germany, 183; France, 85; Japan, 284. Considering these figures in the light of tons mined, this country does not compare so unfavorably with Great Britain, and is far ahead of Germany, France and Japan.

In fact, working in the coal mines is now about as safe an occupation as following a vocation in New York City. In our metropolis last year, 532 persons were killed on the streets. Of this number 221 were struck by automobiles, and fatalities due to this one cause are increasing at the rate of 38 per cent. annually. If we continue to improve safety conditions in our mines, these underground workings will soon be a haven of refuge for New York citizens who are not quick on their feet.

In conclusion, there is much that we of the coal industry can be proud of. Our product is the most needed of all the necessities Providence hasn't seen fit to make free, like air and water. It is the life-blood of all industry. More than two million men gain their livelihood directly or indirectly through the production and use of this mineral. Two billion dollars are expended for it, although the producer gets less than one-third of this sum, which is equal to nearly one-tenth the total income of the nation. Freighting brings in over two-thirds the gross revenue of the 350,000 miles of American railways, and coal forms nearly one-third the entire freight business of the country. It does appear, therefore, that we should feel quite pleased with our progress although it seldom pays to be entirely satisfied.

Reviews of Coal Mining for 1912

SYNOPSIS—Reports from state mine inspectors and special correspondents, giving estimates of the year's production and the outlook for 1913.

Alabama

By G. B. Allen

The general conditions in the coal industry of Alabama during 1912 have been most satisfactory and the indications are that this year's production will exceed that of any previous year, probably running to between 18,000,000 and 19,000,000 tons. In support of this prediction the advance statistics recently gathered from twelve of the largest operators in the district show material increases in tonnage during the greater portion of this year over that of 1910, which was the "banner" year.

There have been no strikes or other labor disturbances in any quarter, although here and there at certain seasons there have occasionally been slight temporary shortages of labor. A considerably larger number of men have been employed in all directions. No serious accidents have occurred, excepting one in Tuscaloosa County, where 18 men perished in a gas explosion.

There has been an increased use of permissible explosives. Mechanical haulage by electricity and gasoline motors has been made more extensive, and operators have incurred large expense for additional spraying facilities. Several large Jeffrey fans have been installed in the district.

The general trade in this state is divided into three classes, namely: steam, domestic and coke. New openings have been made in Walker, Jefferson, Tuscaloosa, St. Clair and Jackson Counties (twelve in all) and these give promise of even greater production in 1913. The Pierce Coal & Lumber Co. has already opened up some mines on the Belmont seam (in Jackson County) and will make other openings at once. This company will concentrate all its coal at one tipple, and the total output will reach approximately 1000 tons per day.

During 1912 McCormack & Ramsey, of the Pratt Consolidated Co., purchased the Newcastle properties from the Anniston Iron Corporation. Eight hundred tons are being mined daily and it is expected to greatly increase the output in the early part of 1913.

The Woodward Iron Co. absorbed the Birmingham Coal & Iron Co.; the Bonnyman-Norman Coal & Iron Co. took over the Coalmont Mine of the Helena-Cahaba Mining Co., and a small property near Brookside. These were the only consolidations of consequence.

Unfortunately there was a shortage of cars in September, October and November, and at times this was the cause of some embarrassment; the situation in this respect began to improve in December, however, and no particular complaint on this score is heard at present.

The Tuscaloosa Mineral R.R., (property of the Louisville & Nashville R.R.), operating between Birmingham and Tuscaloosa (56 miles), was opened for traffic in the spring of 1912. This line will develop a large tract of valuable mineral lands, which will naturally inure greatly to the general prosperity of the Birmingham District.

In the direction of safety, the important operators have placed several classes of well-trained helmet men in readiness for immediate service when emergencies arise. These classes have received instruction under Government supervision at the Mine Rescue Station in Birmingham, and have been awarded Government certificates of competency.

The coke production in Alabama will show an increase in 1912 over 1911 (when 2,756,697 tons were manufactured), although it is doubtful whether it will be in excess of the production in 1910, which was 3,231,399 tons. The Government work on the Warrior River is nearing completion, a number of locks having been finished. Immense deposits of undeveloped high-grade coal are accessible to this stream only, while others are accessible to both the river and the steam roads.

Practically all of this enormous tonnage for markets farther south will be transported by barges down the Warrior River, and thence by the Tombigbee and Alabama Rivers to the Gulf.

It is estimated that no other agency will contribute more vastly to the welfare of general trade conditions in Alabama than the achievement of water transportation from the rich Warrior coal fields to the Gulf of Mexico.

Colorado

By James Dalrymple*

The condition of the coal industry in the state of Colorado for 1912, has been wholesome and normal and there has been a steady increase in the production over that of 1911. The demand for coal in 1912 has greatly exceeded the production. This was due, in a measure, to the better financial conditions prevailing in the country. The operators have been seriously handicapped, however, both by a shortage of miners and a shortage of cars.

The shortage of miners may be said to be due largely to the Turkish war, which has caused an egress from the United States of many Turks, Greeks, Bulgarians and other foreigners, who follow mining as a livelihood. The shortage of cars has been greater than was ever known before and may be attributed, in part, at least, to the bumper crops. The coal industry is but one of the many great industries of Colorado, which has been hampered.

Colorado comes under a new administration early in January, 1913, at which time the legislature will convene, when it is confidently expected that our present very inadequate mining laws will undergo some much-needed changes.

The price of domestic coal was practically the same as the preceding year, with the exception of lignite coal, which suffered a slight decrease. In the matter of wages, in the southern coal field there has been an increase of about 5 per cent. In the northern field, the American Fuel Co. and the Louisville Coal & Land Co. have signed up with the United Mine Workers and, as a result, conditions have been greatly improved and the advance in wages given, which was demanded in 1910, amounts to little more than 5 per cent. The strike is still on, however in the mines of the National Fuel Co., the Rocky Mountain Fuel Co. and the Brooks-Harrison Fuel Co.

*State Inspector of Coal Mines, State Capitol, Denver, Colo.

Coal is now mined in 18 counties in this state and 90 per cent. of the mining is done by hand, while machinery is used for the remaining 10 per cent. For the latter, electrical machinery and compressed air are used.

The number of new mines started and old mines reopened is fifteen. The total number of mines in operation this year is 158. The average number of men employed during the year was 13,713.1, and the number of days worked was 186.4.

The number of fatal accidents recorded to Dec. 1, 1912, has been 92, while the non-fatal for the same period has been 291. Falls of roof still leads as the cause of fatal accidents, although there have been several gas explosions this year. The most disastrous explosion occurred in the Hastings mine, Las Animas Co., June 18, 1912, when twelve men met their death. In the Piedmont mine, also in Las Animas Co., on Aug. 29, 1912, the superintendent and the mine boss were killed by a gas explosion. A gas and dust explosion in the South Canon mine, in Garfield Co., on Oct. 1, 1912, killed two men, and the night foreman of the Simpson mine, in Boulder Co., was killed on Nov. 9, 1912, by an explosion of gas.

Black powder is used in practically all of the mines of the state, except in the coking coal mines, where permissible powder is used. It is but a natural consequence that the mining dangers are increased by the changing, shifting forces of men, although as a whole the operators and miners show a disposition to respect the law.

SUMMARY OF THE COAL PRODUCTION OF COLORADO IN 1912

Number of mines in operation	158
Tons of lignite coal produced	2,213,606
Tons of semi-bituminous coal produced	701,913
Tons of bituminous coal produced	8,327,070
Tons of anthracite coal produced	64,379
Total number of tons produced (Dec. estimated)	11,306,968

There have been but seven coke plants operating in the state during 1912 and the production has amounted to 928,917 tons, some of which has been shipped from Colorado, although the bulk has probably been used at the smelters throughout the state. A very superior grade of coke is produced here. The Sopris coke, which possesses a quality particularly adapted to the production of steel, is used exclusively at the Minnequa Steel Works, which contracts for the entire Sopris output of coke.

COLORADO COAL PRODUCTOIN FROM 1873 TO 1911 INCLUSIVE

1873	69,977	1892	3,771,234
1874	87,372	1893	3,947,056
1875	98,838	1894	3,021,028
1876	117,666	1895	3,339,495
1877	160,000	1896	3,571,633
1878	200,630	1897	3,565,660
1879	322,732	1898	4,174,057
1880	375,000	1899	4,826,939
1881	706,744	1900	5,495,734
1882	1,161,479	1901	6,210,405
1883	1,220,593	1902	7,322,923
1884	1,130,024	1903	7,775,302
1885	1,398,796	1904	6,776,551
1886	1,436,211	1905	8,989,631
1887	1,791,735	1906	10,308,421
1888	2,185,477	1907	10,965,640
1889	2,400,629	1908	9,773,907
1890	3,075,781	1909	10,772,490
1891	3,512,632	1910	12,104,887
		1911	10,197,595

Colorado

By F. W. Whiteside*

In the year 1906, the coal production of the state broke all previous records, reaching a total of 10,308,421 tons. Since that year it has fluctuated about this amount until 1910, when the highest point yet reached was attained, the total being 12,104,887 tons. In 1911, the figures dropped to 10,197,595 tons and in the past year again ascended to 10,943,153 tons, a gain of 7.3 per cent. over that of the preceding year. Of this amount only the tonnage figures of the first 11 months of 1912 have been received; a conservative estimate for the production of December was therefore added to reach the total given.

The coke production of Colorado during the past four years is shown as follows:

COKE TONNAGE IN COLORADO

Year	No. of coke ovens	No. of tons produced
1909	3240	1,076,593
1910	3164	1,190,901
1911	2764	937,952
1912	2857	969,688

Total number of coke-oven plants operating, seven; gain in 1912 over 1911, 3.3 per cent.

The total number of fatal accidents in and about the coal mines for the entire state during the past four years was as follows:

FATAL ACCIDENTS IN COLORADO

Year	In the mine	On the surface	Total
1909	89	8	97
1910	319*	4	323
1911	86	5	91
1912			92**

* 220 men were killed in the four big explosions which occurred during the year.

** Reports up to Nov 30. December reports not yet received.

The coal tonnage for 1912 is distributed as follows:

TONNAGE BY COUNTIES, COLORADO

Counties	Number of Mines Working	Tons of Coal Mined
Boulder	20	1,052,938
Delta	5	66,844
El Paso	7	340,527
Fremont	12	734,037
Garfield	3	177,205
Gunnison	8	549,608
Huerfano	29	1,897,548
Jackson	1	41,951
Jefferson	3	81,419
Las Animas	38	4,821,782
La Plata	4	121,056
Mesa	8	98,870
Pitkin	1	74,820
Routt	6	430,000
Weld	11	451,548
Total	156	10,943,153

Average tonnage per mine 70,148.4 tons.

The largest producers in 1912 were: Delagua mine, of the Victor-American Fuel Co., 625,736 tons; Frederick, Berwind and Primero, all properties of the Colorado Fuel & Iron Co., with productions of 387,312, 361,162 and 325,220 tons respectively, all situated in Las Animas County.

Place of Coal in Colorado's Mineral Industry

Assuming two dollars per ton as a fair average price, the value of the coal production for the past year amounts to $21,886,306.

The production of the most important minerals mined in Colorado is as follows: Coal, $21,886,306; gold, $18,786,000; zinc, $8,361,000; silver, $5,099,000; lead, $3,331,000, and copper, $1,165,000, which gives coal a lead of $3,100,306 over the gold production and a value of 37.3 per cent. of the entire mineral output of the state.

A number of influences affected the output of the year just concluded. While general business was better than in 1911 and the demand for coal therefore greater, there was still room for much improvement. All operators were seriously affected by the Balkan war, which took many of their most reliable men. During the busiest period of the fall season, the shortage of cars seriously impeded deliveries and made systematic mine operation impossible.

*Chief engineer, Victor-American Fuel Co., Denver, Colo.

The increase in output, though but 7.3 per cent. above that of the year preceding, is indicative of improved and more healthful business conditions, and when considered in connection with the prosperous state of business in the East, bodes well for a year of much greater activity in 1913.

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Illinois

MARTIN BOLT*

The coal production of Illinois reached the highest point in the history of the industry during the year ending June 30th, 1912. The total tonnage amounted to 57,685,700 tons, an increase over 1911 of 7,349,141 tons. This increase is the more remarkable when it is considered that the shipping mines, which produce 97½ per cent. of the total product, have decreased in number.

While the number of men employed and the number of days worked have increased for the year, the rate is not in proportion to the increased product. The average daily output for each man employed is 4.27 tons, while 3.87 tons was the daily average for 1911.

There has been a considerable increase in the number of mines using machines, in the number of machines in use and in tons undercut. The increase in machine mines is 13; while increase in machines themselves is 151 and in tons undercut is 5,551,760. This method of mining has steadily increased from year to year until more than 44 per cent. of the total output is mined in this way.

ACCIDENTS

The number of men killed while in the discharge of duty was 180, and 800 men were injured so as to lose 30 or more days from their employment. The increase in number of fatal casualties is in exact proportion to the increase in tonnage which is 14.6 per cent. Most of the accidents in the mines in Illinois are caused by falling coal and rock and by mine cars and motors.

There are no reports on the mines for the last half of the year 1912, except in a general way and these indicate a healthy activity in all sections where coal is produced in large quantities. The tonnage produced in the last half of 1911 was nearly 31½ million tons and there is no reason for estimating the output at less than that figure for the same period this year. It will probably reach a higher point, if the same rate of increase is maintained.

The activity is due largely to the fact that an early agreement between the operators and miners in regard to the wage scale was reached, thereby giving the operator a better opportunity to secure contracts for the year.

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Idaho

BY ROBERT N. BELL†

There are several scattered deposits of tertiary lignite in the state that have in no place proven of commercial value so far, and are confined to small ancient lake-bed areas and margins.

In the Teton Basin in Fremont County, a limited area of the rich coal bearing cretaceous formations of Western Wyoming extends across the Idaho state line and embraces a few townships. In one of these, at Horse Shoe Creek, some interesting coal deposits are under slow process of development and have been tested to sufficient extent to warrant the anticipation of an important local supply of desirable coal in the near future. The most extensive point of development has been on the Brown Bear claim, and all that has been done has been by the original discoverers without any outside capital.

This property has been developed by two crosscut tunnels at a total depth of 200 ft. From the bottom tunnel, entries have been run out on the seam 1000 ft. in each direction. The total extent of the development exceeds 5000 ft. on this property, during the progress of which several thousand tons of coal have been produced, and sold to the local agricultural settlers of the vicinity.

The average analysis of this coal is as follows:

Moisture	3.60%
Volatile Carbon	36.63%
Fixed Carbon	55.42%
Sulphur	0.15%
Ash	4.20%

This seam and in fact the whole series has been somewhat disturbed by vertical cross faults that cut the bed clean and displaced them in steps varying from the thickness of the seam up to 30 ft. The only serious effect of these displacements is the softening of the coal in their immediate vicinity where they carry water. The faults, however, are usually clean-cut, filled with a narrow clay gouge and when these are passed the bed continues in its usual clean and uniform condition.

The series of veins to which this 5-ft. seam belongs is traceable for over two miles along the foothill slopes by shallow surface work, and in this distance much more serious displacements along the east-west lines are in evidence.

On the adjoining Horse Shoe claim, a vein 11 ft. thick, containing 10 ft. of the same clean high-grade sub-bituminous coal and a foot of white clay in the center of it has been drifted upon by an adit entry for 500 ft.

The Horse Shoe claim has several thousand feet of similar shallow entry work on three other smaller veins, 3 ft. and over, all of which carry similar high analysis to that of the Brown Bear claim.

This coal is a blocky, lustrous black fuel, very similar to the product of the Western Wyoming mines. It works well by blasting off the solid to a loose end. It carries well and has good storing qualities, and makes a splendid steam coal, giving a long oily flame.

The property has been examined by some practical coal men, including some excellent authorities, and the minimum estimate of the resources of two 640-acre claims which have been filed upon above a drainage-tunnel site that would cut the main series at a depth of 500 ft. is 5,000,000 tons.

During the progress of its development, this property has been situated 35 miles from the nearest railroad transportation. Recently, however, a branch of the Oregon Short Line R.R. has been completed to within 10 miles of these deposits for the accommodation of the extensive agricultural interests that border the field in all directions. A survey line has been extended up to the coal

*Chief Clerk, State Mining Board, Springfield, Ill.
†Mine Inspector, Boisé, Idaho.

mines and a spur railway could be constructed on a very easy grade.

Indiana

By Frank I. Pearce*

The mining situation in Indiana during the fiscal year ending Sept. 30, 1912 was peculiar in some respects. The first half of October, the demand for coal began to improve somewhat, and from this period to Dec. 30, 1911, the mines averaged a little better than half time. A number that were closed down earlier in the year resumed operations.

From Jan. 1 to the latter part of March, demands for coal were fairly good, and the mines generally were operated better than three-fourths time. The market conditions during the latter period were strengthened somewhat, due to the wage agreement between the miners and operators, expiring on Mar. 31, and with its expiration the likelihood of a lengthy suspension of work at the mines.

All of the mines in Indiana, except one or two very small producing mines, stopped work Apr. 1, 1912, pending a settlement of the wage agreement. Work in the bituminous field was not resumed until June 1, and in the block coal field June 10, 1912.

Both wage agreements were bitterly contested, and before a settlement was finally reached it was necessary to submit them to the miners for a referendum vote. The agreements submitted to the miners were carried by overwhelming majorities, giving to the Indiana miners the highest price ever paid for mining coal.

Immediately on the signing of the wage agreements a few of the mines resumed operations, but at most of them considerable repairs and cleaning up had to be done, and as a result it took several days to restore them to their normal condition.

Production

Notwithstanding the two months' suspension pending the adjustment of the wage agreement and a number of days lost at some of the mines on account of car shortages and a number of local strikes, the total production for the year was 14,204,578 short tons. The total production of bituminous coal was 13,690,878 tons, while the tonnage of block coal reached 513,700.

A fraction over 51.8 per cent. of this was mined by machines, the electric chain cutters predominating. In only one year (1910) in the history of the state was this production excelled, when the miners of Illinois were on strike for seven months, giving Indiana the opportunity of additional markets north and northwest. These could not have been reached if the mines in Illinois had been working.

Distribution of Product

In Indiana, 8,023,701 tons of the bituminous coal were consumed during the year; 5,667,177 tons were shipped to other states. A fraction over 57.88 per cent. was consumed in Indiana. This shows an increase of about 1 per cent. in the home consumption of the yearly production over any previous year. The aggregate wages reported for the year was $13,089,001.32.

*Deputy Inspector of Mines and Mining, Indianapolis, Ind.

Cost of Production

The aggregate wages reported from the bituminous field was $12,302,947.71, making a fraction over 0.898c. per ton for the labor cost for the total production of bituminous coal. The total wages reported from the block coal field was $786,053.61, or a fraction over $1.53 per ton for the labor cost for the total production of block coal. There was a considerable increase in the labor cost per ton for total production of both the bituminous and block coal over any previous year.

There are many things which are contributing to increase the cost of producing a ton of coal and necessarily adding cost to the selling price of a ton of coal. Increased wages is an important factor. Deeper mining and increased cost of keeping the mines in proper condition, more efficient safety appliances to protect life and health, increased cost of timber and all kinds of material used in a mine all contribute to the cost of production.

Market Prices

The market prices for bituminous coal during the period from Oct. 1 to Dec. 30, 1911 (except yearly contracts) ranged from $1.00 to $1.35 per ton for mine-run bituminous coal (f.o.b. mine) and for screened block coal from $1.90 to $2.25 per ton (f.o.b. mines).

From Jan. 1 to March 30, 1912, selling prices for mine-run bituminous coal (except yearly contracts) ranged from $1.35 to $1.90 per ton (f.o.b. mine) and the the price of screened block coal ranged from $2.25 to $2.75 per ton (f.o.b. mine). The higher prices paid during this latter period, were due to the 2-year wage agreement between the miners and operators, which expired on the last day of March and with its expiration came the likelihood of a lengthy suspension of work at the mines.

From June 1 to Sept. 30, 1912, the selling price of mine-run bituminous coal (except yearly contracts) ranged from $1.15 to $1.20 (f.o.b. mines), and for screen block coal the prices ranged from $2.05 to $2.20 (f.o.b mine).

Average Wages of Employees

The total number of employees reported for the year was 21,230, an increase of 452 over the first nine months of the year 1911. Of this number 19,703 were bituminous and 1527 block-coal employees.

The total wages reported from the bituminous field being $12,302,947.71, show an average earning of $624.42 for each bituminous employee, and the total wages paid to block-mine employees being $786,053.61, show an average earning of $514.77; the aggregate wages for the state being $13,089,001.32, and the total number of employees in the state 21,230, show an average earning of $616.53 for each mine employee in the state.

Nine new mines, and other seams in seven mines already in operation, were opened up. Eighteen mines, and the seams worked by three others, were abandoned during the year ending Sept. 30, 1912.

Fatalities

During the year there were thirty-seven fatal accidents. This large loss of life we deeply deplore. We feel somewhat gratified however, with the fact that only in one year, 1899, to our knowledge, has the number of tons of

coal per fatality been excelled, and that our yearly report also shows that in 1912 fewer persons were killed per thousand employed than in any other year with the exception of 1903 and 1906.

Iowa

By L. E. Stamm*

In reviewing the coal mining industry of Iowa for 1912, it will not be possible for me to give the exact figures as to coal production, number of employees, etc., for the calendar year ending Dec. 31, 1912. This condition is due to the fact that since the establishment of the department of state mine inspection, it has been the custom as well as the law to collect all statistical data relating to the coal mining industry of the state for the fiscal year ending June 30. The law requires a report to be made to the governor biennially, just prior to the assembling of the state legislature.

Coal has been mined in Iowa since 1840, the first coal being mined several years prior to Iowa becoming a state. During the first several years that coal was produced, the output was small and was mined only for domestic use. Later, with the growth in population and the advent of the railroads in the state, the production increased each year, and considerable coal was shipped to the North and West.

For a number of years Iowa was the second largest coal-producing state west of the Mississippi river. From the time that coal was first mined until the year 1900, the output increased each year steadily until in the year 1900 the output of the state had increased to more than five million tons.

From 1900 to 1906 the production each year was more than six million tons. Since then the tonnage produced by the state has reached more than 7,000,000 tons each year until the fiscal year ending June 30, 1912, when the output was slightly under the seven million mark.

The State Geological Department is authority for the statement that the Iowa coal field contains about 19,000 square miles, possibly two-thirds of which in time may become productive. These figures do not take into consideration that portion of the most productive formation, the lower Pennsylvania (Des Moines) which is covered by the Cretaceous, and the upper Pennsylvania (Missouri) which will certainly become in part productive.

Mr. Campbell, of the United States Geological Survey, estimates the original coal supply of Iowa at 29,160,000,000 tons. Subtracting the 177,884,461 tons mined from 1840 to June 30, 1912, from the original supply, we still have left more than 4000 times the production of 1912. If the present ratio of a half a ton lost for every ton marketed continues, the supply will last nearly 2750 years at the present rate of production of about 7,000,000 tons per year.

I believe that it will be safe to say that the production for the calendar year 1912 will approximate that for the fiscal year.

The coal industry of Iowa has added much to the material wealth of the state. The mining of coal has brought manufacturing industries into Iowa because of the cheap fuel furnished. It has added to the population of the state, as the industry now gives employment to more than 17,000 people. Aside from this it provides cheap fuel which is an important item in the state's welfare.

Development work is progressing in the new mines in Marion county along the new extension of the Rock Island Railroad from Des Moines to Allerton. These new mines will add much to the output of the Second District this coming year. New mines are also being developed in Monroe and Polk counties. Owing to the warm weather which has prevailed this fall the work in mining has been but fair, but from now until March the mines of Iowa will run at their full capacity.

During the last year there have been but few labor troubles affecting the production of coal. Local strikes or difficulties were usually settled within a day or two, and none of these at any time seriously affected the output of coal. Such troubles as arose at the mines were usually caused by a difference of opinion as to the construction to be placed on the agreement between the miners and operators.

An agreement between the miners and operators of Iowa as to wages and working conditions in and around the mines of this state and extending until Apr. 1, 1914, was entered into the latter part of last May, thus giving assurance that the coal industry of Iowa will be free from serious disagreements or disturbances between the contracting parties during the life of the agreement. We therefore look forward to an increased tonnage in this state for the year 1913.

*Secretary, Iowa Mine Inspectors, Des Moines, Iowa.

Kansas

By Leon Besson*

The year ending Dec. 31, 1912, was one of the most prosperous recorded in the mining industry of the state. The coal production will exceed the output of 1911 by almost 700,000 tons, and will reach near the 7,000,000-ton mark.

The increase in production in Kansas for the year just ended can be attributed to two causes: First, the negotiating of a wage contract without any resort to strikes or shutdowns. Second, to the decrease in output of natural gas and an increase in the price of fuel oil.

There were 27 fatal accidents during the year, most of which were caused by falls of rock. This is a considerable decrease from last year.

Crawford County ranks first in point of coal production, producing more than half the output of the state. Cherokee County ranks second in the matter of coal output.

Kansas (By Special Correspondent)—The past year has been fairly prosperous in the State of Kansas. The trade was brisk during the early months of the year, due to anticipated labor troubles after the expiration of the wage agreement on Apr. 1. However, such troubles did not develop and aside from a few local strikes, the situation is quiet. The trade was materially stimulated during the last half of the year by a marked increase in the price of fuel oil and a decrease in natural-gas supply, which two fuels have been the cause of quiet business in this state for the past two years. Both steam and domestic business have been benefited by this change

*State mine inspector, Pittsburg, Kan.

in conditions, but more particularly has the demand for steam coal been stimulated. During the latter weeks of the year some fancy prices were realized for slack coal which is unusual at this period.

Steam Shovels Introduced

The year has been noted for the introduction in this state of steam shovels, which are used for "stripping" coal near the outcrop. There are now sixteen of these giant dirt movers in the Pittsburgh, Kan., field. They each have an average capacity of about 250 tons of coal per day when the coal is 3 ft. in thickness, with an average of 20 ft. of cover.

There has not been much progress made in the way of introducing mining machines in the deep shaft mines, but it is predicted that more will be done in this respect in the near future, as the growing practice of the miners of shooting the coal with dynamite will likely force the operators to the use of machines in order to get some lump coal from their product.

Fatal accidents have been few, although slight personal injuries seem to have been quite numerous.

Development of several new properties in Crawford County has commenced, and 1913 should show a good increase in tonnage unless the mild winter which marked the close of 1912 continues on into the early months of the new year.

There has been little change in ownership of properties, the largest transaction being the purchase of The Fidelity Coal & Mining Co.'s properties by The Mayer Coal Co.

The state produced considerably more than 6,000,000 short tons during the year and furnished employment to 12,000 men, with an average working time of about 220 days.

Kentucky

By C. J. Norwood*

Based on the returns for 11 months ending Dec. 1, the output of coal for the state of Kentucky will be approximately 15,500,000 tons. Estimating the production by districts, we have as follows: Western district, 7,435,500 short tons; southeastern, 4,880,900 short tons; northeastern, 3,163,100 short tons, making a total of 15,479,500 short tons.

This indicates an increase of more than 1,550,000 tons over the commercial output for 1911, and an increase of about 760,000 tons over that for 1910. The latter year held the highest record up to the year 1912.

A complete record of the mine fatalities has not yet been received. Indications, however, show that during 1912 there was a material reduction in the number of deaths from falls of roof. Five deaths from electric shock have been reported, and five persons were killed by a dust explosion in the Central mine. A gas explosion in the Coil mine also resulted in the death of five miners.

This record is as complete as it can be at the present day. The figures are made up from the monthly reports.

Maryland

By William Walters†

It is gratifying to find Maryland still in the 4,000,000 column. Business during the year 1912 has been quite favorable. There was a period of dullness in May and June, but despite the fact, there will be an increase in tonnage over 1911. The production in that year was 4,166,236 tons. The mining companies report an increase for 1912, and I estimate the total will be 4,500,000 gross tons.

The Consolidation Coal Co. will produce about 2,166,000 tons. This corporation is the largest coal company in Maryland. The Georges Creek Coal Co., Inc., reports 244,000, an increase of 66,000 tons. The Piedmont & Georges Creek Coal Co. reports 287,558, an increase over last year of 73,289 tons. The New York Mining Co. reports 265,000, a 66,000 increase. The New Central Coal Co. reports 90,731, an increase of 10,000. Likewise the Maryland Coal Co. has increased its tonnage.

The following list comprises the new coal-mining companies organized during the year: Maryland-Georges Creek Coal Co., Mertins Bros., managers; Allegheny Coal Co., Edwin Roberts, manager; Moscow Iron Co., of Barton, Oscar Batdorff, manager; and the Ajex Coal Co., with James G. Pugh, president. The latter mines are situated in Garrett County, Maryland.

Eleven fatal accidents occurred during the first eight months of the fiscal year, commencing May 1, 1912.

Montana

By J. B. McDermott*

The total tonnage produced in Montana for the year ending Oct. 31, 1912, was 3,143,799 tons, valued at $5,600,097. The number of men employed inside was 3057, and outside, 541; while the average number of working days was 195.

The number of fatal accidents was less this year than last, a total of ten against thirteen last year; but the production was the largest reported for a like period in the history of the state.

Many improvements have taken place during the past year for the betterment of the producing end of the business and there is an incentive for still greater activity along these lines. With nearly one million tons entering the state, competing for local trade, together with the fact that Montana is favorably situated to enter other fields, it looks as if there was considerable business that could be gotten with the proper endeavor.

TABLE 1. NUMBER OF COAL MINES; NUMBER OF DAYS OPERATED; COAL HAND MINED AND SHOT OFF SOLID; MACHINE MINED; VALUE OF PRODUCT AT MINES DURING 1912

County	Number of mines	Number of days operated	Hand mined and shot off solid	Machine mined	Value, selling price at mine
Valley	1	130	820		$1,927.00
Gallatin	1	138	3,687		5,588.00
Custer	1	190	4,527		13,031.00
Blaine	2	103.7	5,720.9		16,745.00
Fergus	4	213.7	4,947		11,867.50
Chouteau	2	276	10,086		24,223.50
Hill	5	194.4	16,687		38,864.22
Park	2	218.5	45,396		105,906.00
Cascade	16	191	226,054	624,803.6	1,338,975.89
Musselshell	5	200.4	732,144	201,341	1,680,273.00
Carbon	8	197.5	1,019,472	248,114	2,362,695.89
Total	47	Av. 195	2,069,540	1,074,258.6	$5,600,097.00
Total coal				3,143,798.6	

In the last published biennial report mention was made of some new properties opening up in what is known as the Roundup field. The mines were then, according to county lines, divided between Fergus and Yellowstone Counties, but are now in the baby county, Musselshell.

*Chief Inspector, Lexington, Ky.
†Chief mine inspector, Midland, Md.

*Chief coal mine inspector, Helena, Mont.

TABLE III. OCCUPATIONS OF THOSE EMPLOYED IN AND AROUND COAL MINES IN MONTANA DURING 1912.

	Rope riders	Cagers	Drivers	Laborers	Machine-men	Loaders	Boys under ground	Boys above ground	Motormen and nippers	Miners	Shot firers	Timbermen	Trackmen	Trappers	Others under ground	All above ground	Total employees
Valley										4							4
Gallatin	1			1						9					3	5	19
Custer										6					1	1	8
Blaine			2							6							8
Fergus	1									10						1	12
Chouteau	1					7				11						8	27
Hill			4			1				22			1		1	3	32
Park	2		2	5			1	2		63		1	1	1	3	16	97
Cascade	10		72	27	137	185	5	15		255	15	21	22	14	46	173	997
Musselshell	2	2	72	16	10	150	4		8	449		10	18	1	44	101	886
Carbon	11		43	58	34	220	1	12	41	703	1	51	37	3	60	233	1538
Total	28	2	195	106	181	563	11	29	49	1538	16	83	79	19	158	541	3598

The latter, instead of being a helpless infant this year, stands the second largest producing county in the state; Cascade, which for many years led in the production of coal, gave up first place to Carbon in 1909, and second place to Musselshell this year.

The labor unions throughout the state of Montana are agitating the subject of workmen's compensation and have practically agreed to adopt the Washington law as a model. This will probably be welcomed by the majority of coal-producing operators of the state.

The Madison and Missouri Rivers are being harnessed up and power lines at many points, especially along the Missouri River, are branching out and entering many towns that were prairies five years ago. Not only are the power companies supplying the rural districts with light and power, but several coal properties in Cascade County have been connected and are utilizing the power for light, haulage and pumping. In one instance electricity is being used for running undercutting pneumelectric punching machines to prepare the coal.

The following is a list of equipment used for undercutting the coal mines in Montana:

12 Ingersoll Puncher machines (Compressed air power)
26 Harrison Puncher machines (Compressed air power)
1 Sullivan Puncher machine (Compressed air power)
3 Sullivan Post Puncher machines (Compressed air power)
7 Sullivan Electric shortwall machines
11 Jeffrey Electric shortwall machines
11 Goodman Electric shortwall machines

There were less mining machines used in 1912 than in 1911, in spite of the fact that some mines are equipping with them this period and did not have them last. The decrease is accounted for by the decline of one of the larger coal mines in Cascade County, which reported 14 machines in use in 1911 and only 7 in 1912.

The number of motors in use in our coal mines in 1912 is reported as follows:

1 Whitcomb Gasoline motor
4 Goodman Electric motors
2 Jeffrey Electric motors
1 Link-Belt Electric motor
17 General Electric motors

Total 24 Electric and 1 Gasoline motors.

Rope haulage is being used in several mines in Cascade County, at 2 mines in San Coulee, and 2 mines in Stockett.

New Mexico

By Rees H. Beddow*

The law creating the office of state mine inspector became operative Sept. 13, 1912, and I was appointed inspector Sept. 25, so there has not been sufficient time since my appointment for me to become thoroughly familiar with the conditions existing at the mines throughout the state, nor to give an elaborate review of the industry for the year 1912.

*State mine inspector, Gallup, N. M.

We have 47 mines producing coal, ranging from the small country bank to large modern collieries employing hundreds of men, and equipped with the best machinery for extracting the coal, and preparing it for market, and where the latest and most improved methods of mining are adopted. On account of the favorable natural conditions, the industry has been conducted with few catastrophes or fatal accidents.

The production of the mines consists of anthracite, bituminous coal and sub-bituminous, which latter may be termed a high grade of lignite coal. Part of the bituminous coal is well suited for coking and blacksmithing. The production of each kind of coal for the year 1912, is as follows:

OUTPUT ETC. OF NEW MEXICO, 1912

Anthracite	47,892 tons
Bituminous	2,657,169 tons
Sub-bituminous	712,032 tons
Total	3,417,093 tons
Coke	400,180 tons
Number of employees in and about the mines	3,650
Number of fatal accidents	14
Number of tons of coal mined for each life lost	244,078
Number of employees for each life lost	261
Number killed for each thousand employed	3.83

There have been no explosions or catastrophes of any kind; all the fatal accidents were caused by falls of coal or slate or by mine cars and motors. Owing to the large amount of territory in the Southwest which is supplied from the mines of New Mexico, the demand for coal is good, and the greater part of the year the output is limited only by the number of miners who can be secured and by the number of coal cars supplied by the railroad companies.

Fuel oil has been a strong competitor with coal in this field, and lessened the demand by fully 50 per cent., but it seems certain that fuel oil will soon become so scarce that it will not pay to use it as a fuel. Then the output of the mines will be doubled. As we have all the different kinds of coal, of superior quality, we should be able to compete with all neighboring coal regions.

North Dakota

By J. W. Bliss

The production of lignite in North Dakota during 1912, was 545,000 tons, or 14 per cent. more than was produced in 1911 and a greater amount than has ever been mined in any one year during the history of the state.

It is to be remembered that as a coal-producing state, North Dakota is very young. Lignite cannot be shipped great distances or held in storage for other than short periods on account of its moisture content, which is comparatively high.

Furthermore, until recently, only three main lines

*Assistant State Engineer, Bismarck, N. D.

passed through the western part of the state, giving shipping facilities to but four coal-producing localities. Practically the entire lignite-bearing area was inaccessible to shipping points. Further, that portion of the state west and south of the Missouri was given over to grazing purposes, and settlers were few and far between. Now this section of the state is becoming ramified with railroads and homesteaders have taken all of the available land, and as a result lignite mining has received a considerable stimulus.

During the past year, 105 mines were operated. Some of these shipped but a portion of the fall and winter, others operate the year around, part of the time working double shifts. All of the mines are developed either on a single or double entry method of room-and-pillar work. The beds of coal vary from 3 to 19 ft. in thickness, occurring at depths of from 5 ft. to 200 ft. Where the over-burden is light the coal is mined by stripping.

As a general rule, beds of coal which are not thick enough to permit of coal to be left for the roof, are not worked by underground methods, on account of the cost of timbering. Practically all of the timber used underground consists of posts of cedar and tamarack shipped from Minnesota and Wisconsin. Local timber, such as cottonwood, elm and ash is available only in a few instances.

No Fatalities Occurred

An average of 1300 miners were employed during the winter months, while 400 was the average for the summer. The state was especially fortunate in that no fatalities occurred during the year, and very few serious or minor accidents have been reported. In none of the mines is there any explosive gas, although black damp is occasionally found, and lignite dust does not create a dangerous condition. Lignite being slightly resilient, the coal ordinarily left to support the roof usually gives ample warning of fall. Thus lignite mining is a comparatively safe occupation.

Briquetting is a subject of much interest to mine owners, and the experimental station maintained at Hebron is performing work along this line that must be of ultimate economic value to the industry.

Lignite has thus far only been used on the grate. However, it is now established beyond question that it possesses great possibilities for the manufacture of gas, while in the gas-producer engine it is especially efficient as a fuel.

Ohio

By J. C. Davies*

Reports received from all the coal-mining districts of the state point to an increase in tonnage over the year 1911. In some districts the increase will amount to 10 per cent., in some 8, while in others it may only be 5 per cent.

While the tonnage for the year may not reach that of the year 1910, which was approximately 34,500,000 tons, it will, in all probability, increase from two to three million tons over that of the year 1911, when it amounted to 30,342,039 tons.

*Chief inspector of mines, Columbus, Ohio.

Car Shortage

The tonnage for the year 1912 would undoubtedly have been much greater had the mines not been handicapped by an insufficient number of cars to move the product. The car shortage for the winter months of the year 1912, was the worst experienced in years, in fact a coal famine was threatened, which only seems to have been averted by the unusual climatic conditions, which rendered the situation less acute.

The situation became so serious that an investigation was made at the instigation of the Public Utilities Commission of the state, and while their report has not been completed, the investigation has so far developed the fact that while there was no doubt as to the existence of a car shortage, it was due largely to the inability of railroads to move them, from some cause, from one point to another after they were loaded and discharged. The output of eastern Ohio would have been much greater had it not been for this drawback. The Hocking Valley operators did not suffer to so great an extent from this cause as did those in other parts of the state.

Statistics

The number of employees in the mines of the state will not be materially changed from that in the year 1911, when it comprised some 48,000 persons.

The average time worked in the mines of the state will vary in different districts. In some it will average one-half, in others two-thirds, while in some it will amount to three-fourths of full time.

The highest price ever paid for producing the coal ready for the market was made possible by a wage agreement entered into between the miners and operators of the state for a period of two years, commencing Apr. 1, 1912, and ending Mar. 31, 1914. An increase of 5c. was granted on pick-mined, screened lump coal, and 4c. on machine-mined, screened lump coal per ton, 3½c. of which was an increase on the wages of the loaders, while the ½c. was added to the wages of the machine runner.

No important strikes occurred during the year. The wage-scale agreement which will last for a period of two years makes strikes of state-wide importance almost an impossibility.

Increase in Accidents, Many Mine Fires

Up to Dec. 27, 133 fatal accidents have been reported, which is an increase of twenty-four over the year 1911. Ninety-nine were due to falls of roof and coal, and accidents due to mine cars increased from 8 to 13.

While no explosions or mine catastrophes of any importance occurred in the mines of the state during the year, the greatest care and precaution have been necessary in order to prevent such unfortunate events on account of mine fires breaking out in many of the large mines; good judgment, however, was exercised in handling them, and one mine which is considered unusually dangerous, is now sealed up and will not be reopened until every vestige of fire has been extinguished and there is no possible danger to life or property.

Twenty violations of the mining laws were reported during the year, and fines amounting to $170 were assessed. One mine official was arrested for not supplying the required amount of ventilation; the other offenders were mine employees. Eight machine runners were prose-

cuted for not having the necessary shield on the machines, as required by law. Other offences were: Riding on mine-car trips, 3; using impure oil, 3; using steel tamping tools, 2; crossing a danger signal, 1; and conveying powder while the electric current was on the wires, 1.

The outlook for the year 1913 is exceedingly promising, especially if present conditions prevail; and if industrial and manufacturing concerns maintain their present activities, this year should be even more prosperous than 1912, and in consequence, coal, which is our prime commodity, will also increase in tonnage. The year 1912 from many standpoints was a most unusual one, and notwithstanding the fact that it was a presidential year, the coal trade did not suffer.

Oklahoma

By L. C. Snider*

All the coal in Oklahoma lies in the eastern portion of the State and the greater part of the deposit is in an area comprising parts of five or six counties in the east-central section. This main area is underlaid by seven workable seams of coal. A belt runs from this area north to the Kansas line. It has three or four beds of coal, which are mined by underground workings in the south end of the belt and stripped by steam shovels at the end near the Kansas line. The area is thus continuous with the Kansas field to the north and the Arkansas field to the east. The coal from the different seams does not vary to any great extent. All supply a good quality of bituminous coal.

The production of coal began to be recorded in 1880 when 120,947 tons were produced. The production gradually increased until 1903 when the output rose to over 3½ million tons. Since 1903 the production has remained nearly stationary at very near 3 million tons except in 1907 when it reached 3,642,658 tons, with a value of $6,253,567 the greatest output for any year up to the present. Since 1907 the yearly output has been as follows:

OUTPUT OF COAL IN OKLAHOMA

Year	Quantity	Value
1908	2,948,116	$5,976,504
1909	3,119,377	6,253,367
1910	2,646,226	5,867,947
1911	3,074,242	6,291,494

The principal causes for the lack of development during this period have been the strong competition of gas and fuel oil in adjacent territory and the mining and labor conditions which make the production cost higher than it is in other states so that coal from other fields can compete with the Oklahoma coal inside the state in spite of the difference in freight rates.

During 1912 the trade conditions have been somewhat better than in 1911 and a substantial though not a phenomenal increase is promised. From preliminary reports the indications are that the production will be in the neighborhood of 400,000 tons greater than that of 1911, which will make it between 3,400,000 and 3,500,000 tons. The value at the mine ruled a few cents less per ton than in the previous year, but the value for 1912 should be about $6,750,000 thus establishing a new high record for values.

*Geological Survey of Oklahoma, Norman, Okla.

Pennsylvania

By Frank Hall*

Pennsylvania will attain to still greater distinction this year as a coal-producing territory by reason of the fact that the bituminous output will reach the unprecedented volume of 150,000,000 net tons, the largest annual production in the history of the industry. The anthracite output may reach 85,000,000 net tons, making a total of 235,000,000 net tons.

In both regions a shortage in the car supply lessened the shipments to some extent. In the bituminous region the complaint has been loud and persistent regarding this check to trade. The inability of many of the mines to obtain sufficient labor has also tended to restrict the output.

In the anthracite region, many of the mines have reached their maximum capacity and some of them have passed beyond that point, and it may therefore be predicted that the future annual production will never greatly exceed the output of the present year. The culm banks, which have been furnishing a great deal of marketable coal of the smaller sizes, are about exhausted, and thus less coal of this grade will be marketed in the future.

Important Reduction of Accidents in Bituminous Field

In the bituminous region, the number of employees was approximately 185,000, and the number of fatal accidents in that region will total to about 450, a decrease from last year, when the number was 515. The number of days worked was about 235. In the anthracite region, the number of employees was approximately 174,000, and the number of fatal accidents will total about 600, a slight decrease from last year. The number of days worked was about 220.

The number of accidents which occur in mining operations are unfortunately increased by the rushing methods of operation which naturally result after the mines have been idle for a period of several weeks and the supply of coal approaches exhaustion. The strenuous effort made to extract enough coal to meet the demand at such times adds greatly to the hazard of an occupation that is fraught with danger even if the operations are carried on with the greatest care.

There were, however, no accidents of unusual magnitude. Several mine fires occurred, but they were only moderately destructive. Two floods of the character of cloud-bursts caused the destruction of much property in the Fifth, Seventeenth and Twenty-sixth Bituminous Districts. In addition to the property loss in the Fifth District, 18 mine employees were drowned.

The production of coke will probably reach 22,000,000 tons, the year closing with business extremely brisk and prices satisfactory. The same may be said of the coal industry, and the prospects for the coming year for both lines of trade seem to be extremely bright.

The anthracite production would no doubt have been greater had not a suspension of about seven weeks occurred during the months of April and May, pending the settlement of the differences between the miners and the operators and the signing of an agreement for the coming year. The bituminous trade was not much disturbed by strikes, although some local suspensions of activity occurred for short periods.

*Deputy to the chief mine inspector, Pennsylvania Department of Mines, Harrisburg, Penn.

Industrial Developments of the Past Year

The operators generally have been making more improvements than usual about the mines, and in accordance with the act of June 15, 1911, all inside buildings have been made incombustible. Many mines also are now equipped with the most modern and complete electrical haulage apparatus and lighting system.

One notable feature in the bituminous industry has been the recent acquisition by the Pittsburgh Coal Co. of the mines of the Monongahela River Consolidated Coal & Coke Co. and the New York & Cleveland Gas Coal Co. This addition to the present operations of the Pittsburgh Coal Co. will give it a daily capacity of 100,000 tons.

In the anthracite region two new mines were opened during the year, both in the Sixth District. In the bituminous region 46 were opened, 2 in the 2d District, 6 in the 3d, 6 in the 4th, 1 in the 5th, 1 in the 6th, 4 in the 8th, 3 in the 12th, 1 in the 17th, 6 in the 18th, 4 in the 20th, 1 in the 21st, 3 in the 23d, 3 in the 24th and 5 in the 25th.

Tennessee

By Geo. E. Sylvester*

The 1912 output is probably not materially different than for several years past. This year has been free from any general disaster, and the death rate has been materially lowered, being only eighteen from inside accidents. There was but little labor trouble during the past 12 months, although many of the mines ran on short time at various periods on account of dull season or car shortage. Business with the mines at present is good, and practically all companies are running full time.

Utah

By J. E. Pettit†

We close the fiscal year Nov. 30, 1912, with the largest increase in output of coal and coke for any one year in the history of the state. The output of coal increased 586,885 tons, or 23.46 per cent., and the coke production was augmented by 134,988 tons, or 63.56 per cent., but the extraction of hydrocarbon minerals other than coal decreased 3393.69 tons, or 9.1 per cent.

The most important reason given for the large increase in coal has been the demand for our coke. During the past year, 603,446 tons of coal were used in the manufacture of coke against 365,822 tons for 1911. The increase in the use of coal in the state for the past year is also noticeable. The amount used in 1911 was 2,124,500 tons, and in 1912, 2,466,745 tons, while our exports to neighboring states increased from 418,671 tons to 463,349 tons in the same period of time.

Increased Demand from Smelters

The distribution of coke provides some interesting figures. The Nevada smelters received 31,563 tons, against 335 tons in 1911. The Montana smelters increased their order from 86,714 tons to 135,865 tons. Idaho used 894 tons for that purpose, while Utah increased her smelter demand from 133,752 tons in 1911 to 176,426 tons in 1912.

The decrease in the output of the hydrocarbon product is due to peculiar Eastern conditions, by which its market is governed. The sale of this mineral seems to be intermittent, one month the mines are working to full capacity, the next month the forces are reduced.

We have had no labor troubles during the past year. The wages of those employed in and around the mines and coke plants remained practically the same as in the previous 12 months, and, from close observation, we are convinced that a good feeling exists between employer and employed.

The selling price of coal remained the same as in 1911; however, the market price for the hydrocarbon mineral is somewhat lower. No serious shortage of cars has been reported during the year, except in latter part of September and October.

New Developments in Utah

Three new coal properties, viz., the Willow Creek mine, operated by the Utah Fuel Co.; the Panther Cañon or Cameron mine, operated by the Castle Gate Coal Co., and the Neslen mine, operated by the American Fuel Co., have been added to the list of shippers during the past year.

The Storrs mine, being developed and equipped by the Spring Cañon Coal Co., will be shipping coal by Feb. 1. A railroad four and one-half miles in length has been built to the mine connecting with the main line of the Denver & Rio Grande R.R. Co., one-half mile west of Helper.

A new contrivance (for the Western states) in handling coal from the mine to the tipple is being installed at this mine. The coal outcrops on a bluff several hundred feet above the bed of the cañon. Because the grade is so steep that the railroad cannot approach within 3600 ft. of the mine opening, it was decided to transport the coal this distance by an aërial tramway, which is in course of erection.

It has been impossible for the state mine inspector to visit all the coal and hydrocarbon mines of the state as required by law, owing to the increase of new mines and the development of the old producers, separated as they are from one another by long distances. All the large operating mines have been visited. Those which were not inspected were mines in Iron and Uinta counties, and these are only in operation for a few months of the winter season. During the past 60 days, G. B. Smith has been employed as deputy state mine inspector.

Statistics

The coal production for 1912 was 3,088,356 tons, making an increase of 586,885 tons over that of the preceding year. The coke production was 347,356 tons, an increase of 134,988 tons. The hydrocarbon production was 33,656.31 tons, or a decrease of 3393.69 tons.

The miners used 351,505 lb. of black powder and 395,218 lb. of giant and permissible powders, a total of 746,723 lb., or about one pound of powder for every 4.13 tons of coal mined.

The men employed in and around the collieries, hydrocarbon mines and coke plants, aggregated 4063 during the year, or an increase of 265 men over those employed in 1911. The average number of days worked by the regular producing mines was 280 days.

*Chief mine inspector, Nashville, Tenn.

†State mine inspector, 501 Dooly Block, Salt Lake City, Utah.

The average amount of coal produced per man (including miners, daymen and outside men, but not including coke workers) was 770 tons. Six mine foremen's certificates were issued and three certificates were awarded to firebosses.

There were 160 accidents in and around the coal and hydrocarbon mines during the past year. Eighteen resulted fatally, 31 were serious, and 111 non-serious. Two of the fatal accidents occurred outside of the mines, one in an open rock cut, and one in an engine house.

West Virginia

By John Laing*

On account of the unsettled labor conditions in this state during the past few months and also because of the inadequacy of the car supply which has been extremely short, the production of West Virginia has been much constricted. However, as will be seen, we produced a little over five and one-half million more tons gross in 1912 than we did in the preceding twelve months. I believe that had it not been for the labor troubles and the short car supply that the production in the calendar year would have been at least 63,000,000 gross tons, but, as it is, I think we produced approximately 60,000,000.

Including superintendents, mine foremen, fire bosses, store and office clerks, there are 79,781 persons employed directly in and around the mines of this state. The mines have operated 218 days during the calendar year 1912.

Many improvements have been made at the various mines throughout the state and about 25 new mines have been opened; 38 power plants installed; 30 to 35 uptodate fans erected; 35 tipples built and 38 additional openings made at old mines.

West Virginia Only Beginning to Produce Coal

In my opinion, the development of the coal in this state is in its infancy. The next ten years will show such a marked improvement in the coal industry that the years prior to this will be almost entirely forgotten as periods of mining development in West Virginia. Furthermore, unless all signs fail, we will have the largest output of bituminous coal of any state in the Union.

The operators throughout the state report a marked improvement in the demand for West Virginia coal during the past year over that of the preceding 12 months, and the prices have advanced with the demand.

Statistics

The statistics which follow are for the fiscal year ending June 30, 1912: The total coal production during the fiscal year was 59,581,774 gross tons of coal or an increase of 5,548,588 gross tons over that of the year ending June 30, 1911, or 10.26 per cent. The coke production was 1,992,697 net tons, a decrease of 701,350 net tons under that of the year ending June 30, 1911, or 26.03 per cent.

The total value of the coal produced this year was $56,602,685.30 and the total value of the coke was $3,605,781,57. Thus the coal produced, netted the operators an average of 95c. per ton, f.o.b. cars at mines, and the coke brought an average yield to the operators of $1.81 per ton at the same point.

*Chief of department of mines, Charleston, W. Va.

During the year the mines worked an average of 224 days, employing, includ ing superintendents, mine foremen, fire bosses, store managers, store and office clerks, miners and other mine workers, a total of 79,781 persons. Of this number there were approximately 50 per cent. white Americans and 13,403 negroes, the balance being foreign labor.

Accidents

There were 409 lives lost in connection with mine operations, 392 of which number were killed inside and 17 outside the mines. There were 840 nonfatal accidents, 759 of which occurred inside and 83 outside. This shows an increase of 79 fatal accidents and 21 nonfatal accidents over the preceding year. This increase was due to explosions in the Standard Pocahontas Coal Co.'s mine (Aug. 1, 1911), the Bottom Creek Coal & Coke Co.'s mine (Nov. 20, 1911), and in the Jed Coal & Coke Co.'s mine (Mar. 26, 1912). Had it not been for these unfortunate accidents, the number of persons killed and injured by usual causes would have been reduced substantially.

Exclusive of the lives lost in the explosions, most of the fatalities were caused by falls of roof and coal. We find that 85 per cent. of them are caused from carelessness.

Rocky Mountain Coal Mining Institute

A local chapter was organized in Trinidad, Colo., Dec. 28, 1912, by a number of members of the Rocky Mountain Coal Mining Institute. The chapter is to be confined to members living in Las Animas County, Colo.

The following officers were chosen: J. S. Thompson, president; F. P. Bayles, vice-president; B. W. Snodgrass, secretary-treasurer. These, with J. E. McLaughlin and M. O. Danford, will constitute the executive committee. Other members present were W. J. Murray, D. J. Griffiths, R. McAllester, O. C. Cook, F. L. Miller and W. Morgan. It was decided to call the first regular meeting of the chapter on Jan. 25, 1913, and to notify all members residing in Las Animas County.

Large Coal Mines

There are 735 coal mines in the United States that are producing more than 200,000 short tons of coal each annually. In 1911, according to a statement by Edward W. Parker, of the United States Geological Survey, 269 bituminous mines and 168 anthracite mines in Pennsylvania produced in excess of this amount. The average production of these Pennsylvania bituminous mines was 321,773 tons and of the anthracite mines 444,697 tons. The largest anthracite mine had a production of 1,020,420 long tons (1,142,870 short tons). The largest bituminous production from one mine (a Pennsylvania operation) was 1,285,483 short tons. Thirty anthracite mines produced over half a million tons each. Illinois was second to Pennsylvania in large mines, having 93 mines which produced more than 200,000 tons; West Virginia was third, with 59; and Ohio fourth, with 38. The total production of these 735 first-class mines was 253,459,639 tons, or 51.7 per cent of the total production of the country.

Coal and Coke Production in the United States

The following tables have been compiled largely from data communicated by the several state mine inspectors, estimates having been made only where no such statistics were available, but in all cases upon the basis of good information.

PRODUCTION OF COAL IN THE UNITED STATES

States	1911 Short tons	1912 Short tons
Bituminous:		
Alabama	15,040,267	18,500,000
Arkansas	1,950,700	2,120,000
California	5,000	2,500
Colorado	10,197,595	11,300,968
Georgia	165,330	150,000
Illinois	50,336,559	(b) 57,685,700
Indiana	14,209,661	(c) 14,940,628
Iowa	(b) 7,729,674	(b) 6,820,828
Kansas	6,390,207	6,850,000
Kentucky	13,929,450	15,479,500
Maryland	4,166,236	(a) 4,300,968
Michigan	1,476,074	(a) 1,550,000
Missouri	3,760,607	3,710,992
Montana	2,913,397	(d) 3,143,799
New Mexico	3,148,158	3,369,201
North Dakota	468,700	545,000
Ohio	30,342,039	(a) 32,700,000
Oklahoma	3,074,242	3,300,000
Oregon	45,000	48,200
Pennsylvania	144,754,163	150,000,000
Tennessee	6,451,208	(a) 6,522,000
Texas	1,974,593	(a) 2,000,000
Utah	2,501,471	3,088,356
Virginia	6,864,667	(a) 8,000,000
Washington	3,550,906	3,650,000
West Virginia	59,920,207	(a) 60,000,000
Wyoming	6,755,196	7,522,294
Total bituminous	402,121,307	427,655,966
Anthracite:		
Colorado	65,500	60,545
New Mexico	41,200	47,892
Pennsylvania	90,419,856	84,200,000
Total anthracite	90,526,556	84,308,437
Grand total	492,647,863	511,964,403

PRODUCTION OF COKE IN THE UNITED STATES

States	1911 Short tons	1912 Short tons
Alabama	3,172,102	3,050,000
Colorado	937,952	969,688
Georgia	48,515	47,200
Illinois	1,420,209	(a) 1,684,000
Kansas	10,000	8,000
Kentucky	71,907	89,100
Montana	62,504	68,400
New Mexico	379,203	400,180
Ohio	312,416	(a) 321,000
Oklahoma	39,707	(a) 40,000
Pennsylvania	22,460,917	28,492,275
Tennessee	341,009	345,000
Utah	212,368	347,356
Virginia	907,604	1,101,000
Washington	35,621	40,000
West Virginia	2,100,500	2,300,000
Other states	2,460,000	(c) 2,500,000
Total	34,972,534	41,803,199

(a) Estimated. (b) Fiscal year ending June 30. (c) Includes output of byproduct coke for Massachusetts, Maryland, Minnesota, New York, Michigan, Wisconsin. (d) Year ending Oct. 31. (e) Year ending Sept. 30.

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Coal Mine Accidents in Washington

By D. C. Botting* and H. M. Wolflin†

The death rate in the coal mines of Washington is considerably higher than in coal-mining states of the eastern and central part of the country. At first glance the reason for this is not evident. The percentage of English-speaking miners and laborers about Washington mines is higher than in many other states, but these men, while more intelligent than the foreigners are often much more reckless and take chances which they should avoid.

The death rate per thousand employed underground was 3.19 in 1905. This figure increased to 9.17 in 1910. In 1911, it fell to 4.99, which is lower than in any year since 1905.

High Death Rate Due to Pitch

On closer study, it is seen that mining conditions are more dangerous in Washington than in most of the states with lower death rates, but it is also apparent that there are more fatalities in the coal mines of Washington than there should be. The coal beds are nearly all quite steeply inclined and there are comparatively few miners who work on a "pitch" of less than 10 or 15 deg. to the horizontal, and the large majority work on pitches of from 20 to 90 degrees.

With the exception of a few sections, which cover special phases of mining, the state laws which govern the mines are entirely inadequate, and if it were not for the humanitarian view of the situation, taken by most operators, the death rate would be even larger than it is. At the same time the fatality rate is higher than in the Vancouver Island mines, yet the conditions, although somewhat in favor of the latter, are similar.

About one-third of the fatal and one-fourth of the nonfatal accidents, in the Washington mines for the past seven years, have been due to the steep inclination of the coal beds.

It is difficult, in fact almost impossible, to make laws which will prevent those accidents which are due to the steep inclination of the coal beds. Added to the common dangers of coal mining in flat workings are many of the dangers of metalliferous mining, consequently the number of accidents may be expected to be greater than in the coal mines of the central and eastern states, where these dangers do not exist.

Difficulties of Supervision

In Washington the number of assistant foremen, firebosses, shift bosses, etc., per hundred men employed underground is not high. Because of the steep inclination of the coal beds, one man cannot visit nearly so many working places in a given time as he can inspect in a mine where the beds are flat. The result is that working places are not visited with sufficient frequency by the mine officials.

This fact, coupled with the readiness of the average Washington coal miner to "take a chance" to save a little time or work, is responsible for a great many of the miscellaneous accidents. With the passing of the pick miner and the coming of the "coal blaster," the disposition to be reckless has developed to a surprising extent.

So far as we are able to suggest, the only effective method of reducing these miscellaneous accidents is to increase the number of mine officials and enforce a closer supervision of the workmen. Such a step would, of course, mean increased cost.

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During the past three and one-half years the United States Geological Survey has classified as coal land, 17,459,105 acres in the public land states, and this land has been restored to sale. The appraised value of this land, as fixed by the Survey as a result of geologic examinations, and promulgated by the General Land Office aggregates a total of $742,620,649. The minimum valuation for the same lands, at which they might have been purchased a few years ago before the policy of classification was adopted, is but $295,989,140.

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†Mining engineer, Bureau of Mines.

Our Export Trade During 1912

By F. R. Wadleigh*

SYNOPSIS—As a result of England's great coal strike during the year, American exporters had unusual opportunities for strengthening their position in the foreign markets. While the trade benefited in a substantial manner by this abnormal condition, the activity in our own markets developed to such proportions that the attention of those interested was diverted and the full possibilities of the situation were not obtained. Mr. Wadleigh and others are of the opinion that local exporters would do better by concentrating their efforts on the markets contiguous to the United States, rather than by attempting to establish control of the Mediterranean trade.

In reviewing our exports of coal during 1912, the coal shipped to Canada may be passed over with the bare mention of the fact that 80 per cent. of our total exports are to British America. That this is so, is not due to our superior product (although it is superior), or to our better salesmanship, but simply because of location, our coal fields being nearer to the more populous parts of Canada than are its own deposits, and the imports of United States coal have grown steadily and kept pace with the increasing population and more numerous industries.

Neither should the coal shipped to Panama, amounting to approximately 488,000 tons, be considered as export coal, as it is all shipped to the Canal Zone for use on the Panama R.R., owned by the United States, and in the work of digging the Canal it does not come into any competition with foreign coals, and therefore is not an export product any more than that shipped from Hampton Roads to New England. Coals shipped to Porto Rico and Alaska come in the same category: they are not export coals, but coals shipped to our own territory.

The elimination from our export tonnage of coals shipped to Canada, Alaska and Porto Rico, enables us to consider with truer perspective and better understanding the relation that our coal exports bears to those of the world, and especially to those of Great Britain, our greatest competitor in the world's coal markets.

Bright Outlook at the Beginning of the Year

The beginning of 1912 gave bright prospects of a large increase in the shipment of American coals to foreign countries, especially to those supplied from Great Britain. Ocean freights were only slightly above normal, and the certainty of a strike of the British miners, with both sides so far apart in their demands, that a prolonged dispute seemed probable, gave good promise to the local operators of a large foreign business, and an assurance of entrance into markets hitherto impossible or at best difficult of access. "If once we get a foothold in these markets," it was said, "the British coals can never drive us out."

In 1911 determined efforts were made by the United States shippers to increase their coal exports and three or four of the large selling companies had already, that year, sent men to England and Italy to establish offices for the purpose of selling trial cargoes and making contracts for additional ones. Considerable success attended these efforts; several cargoes were sold and a few contracts for specified tonnage running into 1912 were made, but on coal for this year's delivery, with one exception (when a freighting contract was made before closing any contract for coal) no allowance, or insufficient allowance, was made for any possible advance in ocean freights; then, too, the tidewater price of United States coals was at a low point. When the sudden, and to many, unexpected, rise in ocean freights came, followed by a gradual but steady advance in the price of the local coals, caused by increased home demands, strike prospects and a scarcity of labor, the export business did not look so promising, and the same old story was repeated, to some extent; that is, when the home demand becomes strong with a fair price, the foreign business fades into the distance and is not nearly so attractive.

The Strike in Great Britain

As the British miners' strike became imminent and assured, many inquiries were received on this side for coals to replace the British product. A number of foreign shippers and buyers sent their agents over here; our coal ports became congested, the tidewater prices went up to $4.50 per ton and the prospects for a large export trade became bright. Unfortunately for us, however, we were unable to increase our output (owing to labor troubles, and the scarcity and crippling of the railroads by severe storms and floods) sufficiently to take care of this increased export demand, before the British strike was at an end, and many foreign buyers, unable to get coal here, immediately went back to the British product, so that we really obtained little permanent business in foreign countries. About the same time, New England buyers began to call for heavy shipments on contracts so that foreign business was not followed up as it would have been otherwise.

The strike of the British miners was unexpectedly brief and caused comparatively little diminution in the stocks of British coals in foreign countries; about the time we began to feel the effects of the strike, the miners were back at work, and the British shippers were straining every nerve to make up for their lost tonnage, in order to oust the United States coals from what they considered their own markets. How well they succeeded in this is largely shown by the British export figures for the eleven months of 1912, which amounted to 61,070,000 as compared with 61,236,000 tons in 1911, or a decrease in the former year of only 166,000 tons, notwithstanding the strike. The British Channel ports, Cardiff, Swansea, Newport and Port Talbot, from which nearly 50 per cent. of their coal exports come, and are those with which the United States fuels compete, showed an actual increase of 40,200 tons in exports. Part of this recovery of tonnage was undoubtedly due to the increased demand and consumption, but the fact remains that they did recover most of the tonnage lost on account of the strike.

The unparalleled rise in ocean freights hit the United States shippers to foreign countries much harder than it did the British shippers, and made it difficult, with the rise in local prices, to hold the business they had gained

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and almost impossible to get any new business. For instance, in September, notwithstanding a difference of about a dollar per ton in the tidewater prices of good Welsh and the highest grade United States coals, the delivered prices in Rio Janeiro showed nearly two dollars' difference in favor of the Welsh coal.

Our Logical Markets

It is the opinion of many, of whom I am one, that the local exporters made the mistake of putting forth their strongest efforts, and in some cases their only effort, to get increased tonnage in the Mediterranean ports. Instead, they should have attempted to displace the foreign coals in South America, our natural market, where some other lines of trade are growing, not by steps, but by leaps and bounds. This market belongs to us by right, and we will have it, if we go about obtaining it in the right way.

It is true that the difficulty of getting return cargoes for steamships carrying coals to South American ports, make these markets seem difficult of entrance, but they *can* be taken possession of, and will do us more permanent good than all of the Mediterranean business. It is, however, a long distance to Buenos Aires or Valparaiso, and much easier to go to England and Italy and France, and hundreds of agents and representatives can be found in those countries quite willing to work for United States gold, to one in Brazil or the Argentine. In addition to this a knowledge of Spanish and of the people and their ways of going business is essential to the successful salesman, whether of coal or manufactured articles.

Progress Made

Yet notwithstanding the peculiar and unforeseen conditions that arose during the past year in the export coal business, our exports did show considerable increase, and certainly did alarm the British trade to the extent of showing a hitherto unknown interest in the quality of United States coals. This is shown by inquiries from buyers and editorials in two or three of the leading British trade papers, as well as in staff letters from correspondents. These latter generally consisted in running down the quality of the United States coals, and their preparation and appearance, but they at least felt obliged to take notice of them, something they had never done before. One of the two leading English coal papers had an editorial on "The Menace of American Coals," while the other, the *Colliery Guardian* had, some time previous, called the American coals nothing but "carbonaceous dust."

We did succeed in entering into markets that had never used our coals before, and had prices remained where they were at the beginning of the year, and ocean freights not gone up, our efforts would have shown most gratifying results. Now, at the close of the year, when cars are scarce and laborers not only few, but inefficient and unwilling to work, the export market is being lost sight of and shippers are hard put to fill their home contracts. In the early months of the year foreign business was taken at as low a figure as $2.10 per gross ton f.o.b. tidewater, while now the same grade of coal is selling at $3.25 to $3.50. Yet with all this increase there is a steady stream of United States coal going to foreign countries, more than at any other time under similar conditions; the tidewater price of the best Welsh coals has also increased from $3.81 per ton in January to $4.55 in December.

Necessity of Building Vessels

Before we can hope to compete for any considerable share of export business we must build our own ships to carry it in, as is now being done in the New England trade. We must also probably establish storage depots at the most important markets accessible to us, from which small or large quantities can be shipped as required. The course of ocean freights during 1912 has been unusual and has militated against our export business. Rates advanced steadily during the year to unheard of figures, and vessel tonnage was scarce at any price. These high rates continued until December when they began to show a decline.

It would seem that this scarcity of ships and consequent high rates was due to the unusual demand for tonnage owing to the increase of business all over the world, and not to any diminution in the number of ships. Just why the December drop in freights should have come so suddenly and have been so marked, it is hard to determine, and its duration is equally difficult to foresee. General business is just as good, if not better and the shipyards have an immense amount of work ahead, the effect of which may be felt later on, and which may result in a still further lowering of rates, although the ship owners say that these will go back to the previous high levels at the first of the year. It all puts the exporter in a quandary, and the wise man will be he who makes no c.i.f. contracts, unless compelled to do so, during the coming year.

Statistics

Full statistics of our export trade during 1912 are not yet available, but we give below complete figures from the principal Atlantic ports.

With the exception of the tonnage sent to Canada, not considered in this review, and small tonnages from the Gulf of Mexico ports, these figures give our true export trade.

	1912	1911
Philadelphia	825,234	791,506
Baltimore	628,712	479,096
Norfolk	1,475,485	1,071,130
Newport News	971,336	785,763
Total	3,900,767	3,127,495

These show an increase of 773,272 tons in 1912 over 1911, or 25 per cent., not a very brilliant showing for a year that began so well, and apparently held out such promising conditions for our export coal trade, but still a rather substantial gain.

Pennsylvania Leads in Minerals

Pennsylvania far outranks all other states in the value of its mineral output. In 1911 this state contributed, exclusive of pig iron, 24.7 per cent. of the total mineral output of the United States. The reason for Pennsylvania's undisputed leadership lies primarily, according to the United States Geological Survey, in its great production of coal. It is almost exclusively the source of anthracite, and produces over one-third of the total bituminous output. Pennsylvania ranks second, next to New York, in the value of its manufactures, and stands first as a mineral producer in cement, coal, coke, pig iron, lime, mineral paints, sand and gravel, and building stone.

The Connellsville Coke Trade in 1912

SYNOPSIS—Production in the Connellsville region for 1912 crossed the 20 million-ton mark for the first time in its history. Favorable conditions prevailed throughout the year with the exception of a labor shortage which curtailed operations to a limited extent. The year closed with quotations higher than ever before. Shipments totaled 20,000,873 tons representing a value of $38,401,676.

The Connellsville coke region shipped 20,000,873 tons of coke in 1912, which, valued at the average market price of $1.92, represents a value of $38,401,676.

The Connellsville coke trade for 1912 would have been at least 10% better if there had been a man for every job. As it was, both production and output broke all records, even if they did win by a scratch. Twenty million tons was very closely approached in 1906, but never was it over-lapped until now. The value of the output was often exceeded. In 1903, for example, with an output of only 13,345,000 tons the value was over $40,000,000. In 1906 and 1907, the value of the annual output rose to $55,000,000. As recently as 1910, with an output of 18,689,000 tons, the value exceeded $39,000,000. Prices of spot coke were never higher than they are now, but the average of the year was less than $2. If the business continues at the same gait it is now going, 1913 will be by odds the biggest year in the Connellsville coke business.

Coke Ovens and Labor Supply

There has been no increase in the number of ovens in the region, though there have been some changes from beehive to rectangular types. The operators have not been able to work all the ovens they have and there has been small incentive to build more. There are now in the region 38,884 ovens as follows: Beehive, 35,399; rectangular, 3335; byproduct, 110. There were 738 additional ovens constructed during the year and 746 abandoned.

A number of mechanical coke drawers were installed during the year. The use of mining machines became more general. The installation of these machines was prompted quite as much by labor necessities as by the desire for economical operation.

The greatest handicap the Connellsville coke trade had during the year was its inadequate and uncertain labor conditions. This labor shortage was not realized until an attempt was made to fire up several thousand ovens in January, when it developed that there were not enough men to be had to operate them to their capacity.

The year 1911 closed with 26,400 ovens in blast. During January, 4000 ovens were lighted, running the active total up to 30,400. March closed with 32,000 active ovens. In the meantime, the Frick Company had announced an increase in the mining rate from $1.35 to $1.41 per hundred bushels and other labor in proportion, and the merchant operators followed suit. A few more ovens were lighted and the first week in May saw 32,663 ovens fired, but production rose only to a little over 400,000 tons weekly, as against a capacity running full of 442,000 tons. Failing to secure enough men to operate the ovens in blast the operators reversed their policy and proceeded to regulate their active ovens to labor conditions. Over 3000 ovens went out in the ensuing three months.

In August the tide turned again. Through earnest and systematic effort the labor supply was gradually improved and the year closed with 32,700 active ovens. To attract labor, the operators not only advanced wages, but many of them, notably the H. C. Frick Coke Co., made earnest efforts to further improve working conditions at their plants and to make the workmen's homes pleasant and attractive. These efforts met with so small a measure of success only because of other conditions which could not be controlled.

CONNELLSVILLE COKE STATISTICS FOR 1912.

	Production			Shipments	
Week Ending	Merchant	Furnace	Total	Cars	Tons
Jan. 6	137,650	170,256	307,906	9,095	307,894
Jan. 13	141,372	174,060	315,432	9,341	316,138
Jan. 20	147,058	248,127	395,185	11,271	379,220
Jan. 27	138,521	238,076	376,597	11,113	375,955
Feb. 3	147,923	212,230	360,153	10,623	359,016
Feb. 10	145,114	209,455	354,569	10,580	351,404
Feb. 17	146,420	247,244	393,664	11,862	394,116
Feb. 24	145,664	245,589	391,253	11,738	389,597
Mar. 2	148,421	247,589	396,010	11,890	393,787
Mar. 9	151,419	247,296	398,715	12,124	401,643
Mar. 16	155,779	252,458	408,237	11,985	398,204
Mar. 23	150,619	247,228	398,847	11,615	385,541
Mar. 30	137,960	255,241	413,141	12,450	412,112
Apr. 6	158,732	256,732	415,464	12,314	413,595
Apr. 13	132,913	230,376	363,289	11,033	359,568
Apr. 20	148,097	248,223	396,320	11,654	392,165
Apr. 27	150,285	251,209	401,494	11,882	398,868
May 5	152,375	249,169	401,544	11,929	400,908
May 11	164,295	237,665	401,960	11,991	400,799
May 18	159,663	239,293	398,956	11,942	398,344
May 25	156,452	237,864	394,316	11,793	393,806
June 1	161,088	218,033	379,121	11,361	379,316
June 8	159,745	238,911	398,656	11,767	400,882
June 15	154,206	237,586	391,792	11,837	393,877
June 22	144,655	229,074	373,729	11,364	377,257
June 29	162,692	230,948	393,640	12,096	400,588
July 6	136,362	192,875	329,161	9,757	327,678
July 13	154,863	220,694	375,557	11,246	377,236
July 20	137,614	217,494	355,108	10,639	356,215
July 27	118,069	197,654	315,723	9,377	312,875
Aug. 3	146,728	232,429	379,157	11,369	380,734
Aug. 10	150,796	235,171	385,967	11,451	387,871
Aug. 17	147,352	226,749	374,101	11,101	377,730
Aug. 24	145,167	224,011	369,178	10,967	373,154
Aug. 31	146,585	225,330	371,915	11,032	374,893
Sept. 7	142,277	215,562	357,839	10,611	361,045
Sept. 14	149,882	222,899	372,781	11,028	374,680
Sept. 21	151,781	221,850	373,631	11,005	374,305
Sept. 28	157,267	225,360	382,627	11,168	380,515
Oct. 5	166,185	232,013	398,201	11,651	396,382
Oct. 12	166,089	231,408	397,507	11,524	391,370
Oct. 19	166,719	232,730	399,449	11,710	397,778
Oct. 26	166,825	232,980	399,805	11,754	398,448
Nov. 2	165,286	231,967	397,253	11,623	394,895
Nov. 9	166,583	232,559	399,142	11,763	398,371
Nov. 16	167,309	233,309	400,618	11,797	399,753
Nov. 23	167,584	237,068	404,652	11,985	405,801
Nov. 30	166,362	233,909	400,111	11,884	401,330
Dec. 7	164,134	228,872	393,006	11,626	393,540
Dec. 14	162,705	226,359	389,064	11,552	389,191
Dec. 21	166,747	245,371	412,118	12,828	431,683
Dec. 28	145,568	213,437	359,005	10,635	358,572
Dec. 31	48,523	71,146	119,669	3,544	119,524
Total	7,991,437	12,040,838	20,032,275	595,336	20,000,873

The United States Steel Corporation hints that there is another wage advance at hand. If it extends to the Connellsville coke region it may stimulate immigration hither and improve labor conditions.

The wages now paid are as follows: Pick mining and loading room and rib coal, per 100 bushels, $1.44; pick mining and loading heading coal, per 100 bushels, $1.58; pick mining and loading wet heading coal, per 100 bushels, $1.70; drawing coke, per 100 bushels, charged, 82c.; drivers and rope riders (shafts and slopes) per full run, $2.85; drivers and rope riders (drifts), per full run, $2.80; cagers, per full run, $2.85; firebosses, per day, $3.50; tracklayers, blasters and timbermen (shafts and

Note—Abstract from the "Weekly Courier," Jan. 2, 1913.

slopes) per day, $2.85; tracklayers, blasters and timbermen (drifts), per day, $2.80; assistant tracklayers and inside laborers, per day, $2.15; dumpers and tipplemen, per full run, $2.15; levelers, per oven, 13¼c.; chargers per day, $2.15; forking cars, 40,000 pounds capacity and less, $1.75; forking cars, 50,000 pounds and 60,000 pounds capacity, $1.85; forking cars, over 60,000 pounds capacity, $2.00.

Crushed Coke and Byproduct Coal

The crushed coke business, at one time a prominent feature of the Connellsville coke trade, but recently confined almost exclusively to outside districts has taken a fresh start. In spite of the desperate demand for furnace coke during the last quarter of 1912, approximately 40,600 tons of crushed were shipped out of the Connellsville region during the year.

Crushed coke is a successful rival of anthracite as a domestic fuel where it can be laid down at competitive prices. It is prepared in similar sizes to anthracite, known to the trade as egg, stove, chestnut and pea, the sizes bearing close relation to the articles whence they get their names.

Not all Connellsville coal is made into coke in the Connellsville region. Approximately 2,000,000 tons annually are coked in the byproduct ovens of the United States Steel Corporation at Gary, Ind., Joliet, Ill., and Sharon, Penn. About one-half of this coal, or some 60 cars per day, is shipped to the Sharon ovens and the remainder goes to the western plants where it is mixed with Pocahontas coal. It was the purpose of the Steel Corporation to use a mixture of Pocahontas and Illinois coal in the Gary and Joliet ovens, and for this purpose a large area of coal was purchased in the latter field, but it was found in practise that better results, chemically, physically and commercially, were obtained by the Connellsville-Pocahontas coal combination. Connellsville coal is now being shipped from the Gates and Filbert mines which have no oven equipment, and from the coking plants at Dorothy, Bridgeport and Colonial No. 3.

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The Petroleum Industry in 1912

There was no considerable change in the quantity of petroleum produced in the United States in 1912 compared with 1911. Nevertheless, according to David T. Day, of the United States Geological Survey, the year was as full of remarkable incidents as is usual in the history of this article of commerce, which depends for its statistical position more upon the chances of new discoveries and less upon trade demands than any other commodity except gold.

As a rule, the Eastern fields declined in production, because it was impossible to keep up the great output of 1911 without large additional discoveries of new pools in the older fields. The Eastern decline was, however, offset by the increase in California, where the San Joaquin Valley fields (Midway, McKittrick, Maricopa, etc.) are still at the height of the gusher stage.

It will take much time to calculate the amount of oil sold at the different prices of the year, but it is evident that the total value of the product increased markedly being about $150,000,000, compared with $134,114,752 in 1911.

An estimate of the production in 1912 and a comparison with the product in 1911 is given below:

PRODUCTION OF PETROLEUM IN THE UNITED STATES IN 1911 AND ESTIMATED PRODUCTION FOR 1912

(Barrels of 42 gallons)

State	1911	1912
California	81,134,391	87,000,000
Oklahoma	56,069,637	52,000,000
Illinois	31,317,038	28,000,000
Louisiana	10,720,420	10,000,000
West Virginia	9,795,464	11,800,000
Texas	9,526,474	10,500,000
Ohio	8,817,112	8,500,000
Pennsylvania	8,248,158	8,000,000
Indiana	1,695,289	1,200,000
Kansas	1,378,819	1,300,000
New York	952,515	700,000
Kentucky	472,458	500,000
Colorado	226,926	200,000
Other States	194,690	500,000
	220,449,391	220,200,000

Stocks—In all the fields except those of California and the Gulf there was a steady drain on stocks during the year, so that from a total of 81,789,390 bbl.—over half a year's output—on Jan. 1, the stock declined to 69,000,000 bbl. at the end of the year. This drain reflects the increased capacity of the refining plants of the United States, the greatly increased exports, and a gradual change in the general condition of the industry by which gasoline has become much more in demand, so that the trade is well satisfied with heavier grades of gasoline or naphtha. For this reason the dividing line between naphtha and kerosene has necessarily been drawn nearer to kerosene and a large quantity of oil has been distilled into the gasoline portion of the products and a less output of kerosene resulted.

On the other hand, the heavy residues which are marketed as fuel oils have come into greater demand, and owing to the over-evident effort to increase the yield of light products by splitting up these residues the supply of fuel oil has not kept up with the demand. The advent of internal-combustion engines, such as those of the Diesel type, promises still higher prices for fuel oils. The United States has been slow in the adoption of these new engines, but their general adoption abroad has pointed the way to rapid increase in their use here.

Prices

The general decline in production except in California would doubtless have been much greater but for the effort to apply laws of supply and demand by increase in price. Prices advanced so greatly during the year as to stimulate drilling, even in the old New York and Pennsylvania pools, and so checked the decline. Formerly this plan has not been so successful. In the mid-continent field also it checked the decline, so that the product will come within 4,000,000 bbl. of the maximum output (in 1910). In the Appalachian field, where higher prices and cheap methods of pumping oil wells make the decline slow in any event, the great rise in price from $1.30 to $2 per bbl. seems to have checked the normal decline and even to have effected a slight increase, which was gratifying.

Another feature tending to strengthen the position of oil in this country is the decrease in production in Russia, from 66,183,691 bbl. in 1911 to about 60,000,000 bbl. in 1912. Roumania increased its product slightly, but not sufficiently to offset the Russian decline. The chief decrease was in the old Baku field. The world's consumption of oil, according to Mr. Day, is now about a million barrels a day, the United States furnishing more than all other countries.

The Coal Markets During 1912

By A. T. Shurick

SYNOPSIS—A detailed review of trade conditions for the year 1912. The situation was abnormal in many respects, due to the protracted suspension in both the anthracite and bituminous fields, pending the fixing of the new wage scales. Anticipation of this curtailment in production caused heavy speculative buying and a temporary panicky condition, which was succeeded in midsummer by a period of extreme dullness. The markets gathered strength, however, towards the last of the year and closed firm and active in all departments.

The year of 1911 closed with the coal trade in a rather stagnant position. Some activity was noticeable the early part of December as a result of the car shortage, but with the concluding of shipments in the lake trade, the situation in this respect underwent a decided change with the result that plenty of equipment was available, and the market flooded with coal. This was further aggravated by the mild weather which caused a light domestic consumption.

The trade slumped steadily, although easily, during the course of the month but firmed at a rather low level toward the latter part, at which it held its own into the new year. This mild hardening of the market was due primarily to the cessation of work in the mining region over the holiday period, and offered only a temporary relief. The end of the year witnessed a slight activity in steam business due to an improvement in work at the steel mills.

January

The new year then opened with the market at a low level but steady. More seasonable weather appeared during the early part of January, which brought with it an increased domestic demand and a general improvement all along the line. Towards the middle of the month there was an abrupt fall in temperature, accompanied by severe storms which created a shortage in the market and resulted in the demand becoming quite heavy; requisitions became so numerous that operators were compelled to refuse further orders.

This condition continued for some two weeks, the trade reaching the strongest position it had been in so far that season. The return of mild weather again towards the close of the month, however, caused a slight easing off and more normal conditions were restored.

Consumption, which was apparently below normal at the end of the year, showed an improvement the first part of the month and became quite heavy towards the middle, responding quickly to the change in weather conditions; the reserve supplies of the consumers were drawn upon at this time. The return of milder weather toward the latter part of the month brought with it an easing off in the domestic consumption and a resumption of a more normal market. By reference to the accompanying diagrams it will be noted that no unusual features occurred during this period, as regards quotations. Prices remained at an even and rather low level, considering the time of the year, throughout the month.

The inclement weather towards the middle of the month restricted the movement materially. The transportation troubles became moderately grave during this time so that arrivals at the large consuming centers were far below normal. The heavy weather caused some losses at sea and made the coastwise movement slow and uncertain but the more equitable conditions towards the last of the month, effected a rapid change in the transportation situation and the tonnage movement became quite heavy. This increase is reflected in the rapid decrease in the surplus of idle coal cars, at this time, as shown on the accompanying diagram.

February

Contrary to expectation the return of mild weather the first part of the month did not result in any easing off in the sharp demand that appeared during the latter part of January. The large tonnages, accumulated on side tracks during the cold snap, were moved in and readily absorbed without any apparent effect. The situation, as regards anthracite particularly, became quite hard at this time, and none could be bought in the spot market. It was reported at some points that a number of steam plants were compelled to close down through the lack of sufficient fuel.

As the month advanced the demand gradually became more urgent, until the climax was reached shortly after the middle of the month, when the situation was verging on the acute. This was ascribed partially to the anxiety of the consumers over the possibility of a long shutdown in the mining regions April 1, but was more probably due to the low temperatures then prevailing.

Consumption for the month was quite heavy, and it was claimed by some that new records were established in this respect. Heavy shipments were made, but it appeared impossible for the production to keep up with the demand, and the supplies in the hands of both dealers and consumers were steadily depleted. This continued well up past the middle of the month, when a break in the weather occurred which brought with it much needed relief to the consumer. This did not, however, tend to soften the market, as supplies were uniformly low throughout the country and the demand urgent.

Prices continued fairly uniform on a somewhat higher level than during the previous month, as will be noted on the accompanying diagram. The close of the month however, marked the beginning of the sharp advance that prefaced the suspension in mining Apr. 1. At the beginning of the month quotations were ruling hard and firm, and continued to gain strength throughout the period. Toward the middle, a strong demand appeared for soft coals for storage upprposes, and these commanded good figures, finally reaching the point where they could be obtained only at fancy prices. The period closed with operators entirely in control of quotations, and with every indication of continuing so.

Coal shipments for the month were quite heavy. The large tonnages, which the severe weather in January had made it impossible for the roads to move, were now shipped in.

The car supply for the month was only fair. As will

be noted on the accompanying diagram, the surplus of idle coal cars fell sharply below that for January, but maintained the new low level throughout the month. Production during this period was undoubtedly being increased in anticipation of the expected suspension of mining Apr. 1. However, this was too remote at this time to effect any radical change, although it will be seen, by reference to the accompanying diagram of the monthly shipments of anthracite, that all the companies show a uniform, though slight, increase for the month.

March

With the prospective strike of both the anthracite and bituminous miners now only a month off, the demand became firmly established and quite insistent. It was becoming evident that there was a shortness in supplies of all kinds and in practically all parts of the country. Thus, instead of going into a protracted suspension of mining with large surplus stocks, as customary heretofore, the industry found itself with supplies low, and, in many cases, below all previous records. This was of particular significance in view of the fact that both the bituminous and anthracite agreements expired simultaneously.

It was inevitable under these conditions, that prices should experience an almost perpendicular advance which was the case, as will be noted on the accompanying diagrams. While this sharp increase in quotations tended to make the consumers cautious about purchases, the demand nevertheless continued quite strong all along the line. The activity in the market gradually increased and towards the middle of the month began to assume panicky proportions; severe weather appeared and the fear of a possible long shut-down at the mines had taken a firm hold on the consumers. There were many inquiries for April tonnages but operators refused to quote beyond Apr. 15. The situation was further aggravated by the large Trans-Atlantic steamers coaling at this end for the round trip, because of the strike in Great Britain.

Toward the last of the month the sensational advance in prices culminated at the high level of the year, as will be noted on the accompanying price diagrams. The demand became urgent in the extreme, and the general tone of the market throughout the country was uniformly panicky. The deliberations of the miners and operators had been entirely barren of any results, and it was now evident that the industry must go through a suspension of short duration at least. The market conditions were undeniably critical at this time.

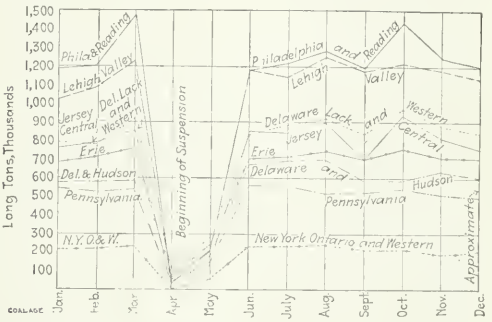
The car shortage began to ease off toward the latter part of the month, there again being a surplus on March 27. This enabled the mines to materially increase their production, and the close of the month witnessed the heaviest shipments in the history of the trade. This was particularly noticeable in anthracite. As will be seen by reference to the accompanying diagram of hard-coal shipments by the different companies for the year, these show a uniformly sharp advance for the month of March, and numerous new high records were established.

The month closed with the market in a decidedly tense condition with consumers and producers both keenly watching the results of the wage conferences, and many of the larger interests having special representatives at the meetings to assure prompt and reliable information on the situation. It was purely a strike market and interested parties on both sides were playing a waiting game.

April

The month of April opened with a general suspension in effect in practically all the organized coal fields of the country. Probably over 60 per cent. of the production was abruptly cut off. A feeling of hesitancy appeared to characterize the trade for the first few days, but reports to the effect that an agreement was being reached caused a softening in the market. As these were only tentative, however, and could not become operative in any event for some time, a heavy slump was prevented.

Prices therefore continued at the abnormally high level for from one to three weeks and it was the hope of the trade that the suspension would be of sufficient duration to permit them to work off the heavy stocks accumulated during the last of the preceding month. The



Anthracite Production by Companies During 1912

anthracite production, ordinarily quite heavy at this period of the year, was, of course, practically eliminated. Probably the most striking evidence of the effects of the suspension is shown by the rapid increase in the surplus of idle cars, which advanced from 4381 on March 27 to 46,578 on Apr. 11.

The middle of the month found the panic prices being liberally discounted in all parts of the country. Consumers showed every confidence in the belief that the referendum vote of the miners, upon which the bituminous situation hinged at this time, would be favorable, and, as a result, there was a heavy selling movement of speculative coal.

Later in the month, when it became evident that an agreement between the bituminous miners and operators had been effected, the trade was brought to an abrupt standstill. Consumers had prepared for a protracted shutdown, and the unexpected short duration of the suspension eliminated any disposition on their part to buy. A large number of dealers who had also stocked quite extensively, for speculative purposes, were compelled to throw heavy tonnages on the market, which tended to still further depress the trade. Much of this coal had been bought at high figures and wholesalers made every effort to maintain the high prices, but without much success.

The close of the month found the bituminous trade in the final stages of readjustment and approximately, on

a normal basis again. The mines were at work, though under curtailed production, which was, however, sufficient to meet requirements as most large consumers had stocked sufficiently to carry them over a 30-days' suspension and were not yet in the market. For the two weeks ended Apr. 25, the surplus of idle coal cars showed the greatest increase for the year, the total on that date being 92,548. Operators were slow in getting started at the mines and the month closed with the bituminous production far below the full rated capacity. Uncertainty in the anthracite situation still prevailed, but the harmonious sittings of the wage scale committees led to the belief that an agreement would be effected at an early date.

May

The heavy stocks, accumulated in anticipation of a prolonged suspension at the bituminous mines, had a decidedly depressing effect on the trade early in May. While some companies were still delivering on contracts, made at the high level in March, it was difficult to obtain anything more than normal prices at this time. Quotations were slowly but steadily easing off, and buyers were hesitating to purchase until they were assured that the bottom had been reached. Production was also at a low level, operators refusing to open up full blast until there was more pressure for coal. In the Middle West there was a total absence of any buying movement, and it was becoming evident that quotations must soon fall off to about the cost of production.

Later, the unprecedented action of the miners in rejecting the scale fixed by the joint committee caused some alarm and a further tightening of the situation in hard coal. This deadlock also helped the bituminous operators and, together with the opening of the lake trade, tended to check a further decline in this branch, which was now about holding its own. The situation was weak, however, and much difficulty was experienced in placing arrivals, which were again about normal.

The middle of the month saw a further relapse, due to the more general resumption of mining and consequent increase in production. Surplus stocks were still in evidence and the market was hardly in a position to absorb even normal tonnages; forced sales of demurrage coal were reported at some of the large distributing centers, and quotations again fell off. In anthracite, the situation had now become exceedingly tight and supplies quite short. Heavy premiums were being offered on every hand, and the market was in prime condition for a panic.

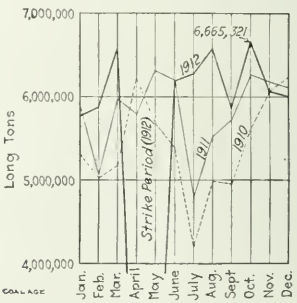
The end of the anthracite strike, toward the close of the month, was viewed with general satisfaction in trade circles. While this was accompanied by a slump in prices and a return to the usual summer lethargy, all uncertainty was, on the other hand, removed and the trade again established on a normal basis. Dealers immediately began storing up to their full capacity, in anticipation of the large shortage which must necessarily result from the long suspension in mining.

Toward the last of the month the new hard-coal circulars were announced, showing increases ranging from 15 to 50c. per ton. These advances were met with a strong protest on the part of the general public, and the demand eased up, consumers believing that little was to be gained by storing at the new quotations.

The bituminous outlook, toward the close of the month, was not encouraging. Production had been quite heavy, and with all hopes of profiting by the suspension at the anthracite mines now dispelled, it was obvious that prices could be maintained only by the most rigid curtailment. No attempts were yet being made to force the market by price cutting, but the outlook was disappointing.

June

The month of June opened up with the anthracite companies pressing their operating departments to the limit, in the endeavor to make up the shortage. The demand was not strong, however, consumers hesitating to buy at the new high prices. In bituminous, the only encouraging feature was the reports of a labor shortage in different parts of the country which, it was hoped, would effect a curtailment in production. With anthracite shipments again back to normal, the soft coals were obliged to stand on their merits and, while quotations were nominally being held, there were well defined rumors of cutting, and orders generally were scarce.



Anthracite Shipments

Opposition to the increase in prices made by the anthracite companies became stronger as the month advanced. Domestic consumers were unable to understand why the whole of the advance in the miner's wages should be added to the domestic grades, and the feeling became quite bitter at a number of points.

During the two weeks ended June 6 the surplus of idle coal cars fell sharply from 68,419 to 35,140, being the greatest decline for the year, so it is obvious that there was a large increase in production at this time.

The bituminous market was dull and quiet at the middle of the month, but not materially different from the average at that period of the year. There was no buying except at sacrifice prices, and consumers were not displaying much interest in these. The lake shipments continued to be the best feature of the market, and there was also some increase in the steel industry. On the whole the trade was not abnormally low considering the time of the year, and exhibited a rather healthy tone. Production continued to increase steadily throughout the month, as is shown by the steady decrease in the surplus of idle coal cars over this period.

Toward the close of the month, the first complaints about the small shipments of anthracite, began to appear in the East. It was becoming apparent that the Western

agencies were being favored by larger deliveries in order to get them stocked up while transportation conditions were favorable. As a result, arrivals at the Eastern distributing centers were below normal. Wholesalers were attempting to accumulate their winter stocks at the summer price level and became anxious over the situation with the result that the hard-coal trade began to assume an appearance of activity.

In bituminous, conditions were directly the reverse. The uncertainty in the political situation began to be felt with the result that the manufacting demand was showing a decided tendency to ease off all over the country. Domestic business was also slowly declining to the usual low ebb at this period of the year; consumers generally were hesitating to contract, and the trade was absolutely devoid of interest

July

A car and labor shortage developed the early part of the month which had a decidedly stimulating effect upon the trade. The former was ascribed to the remarkable activity in steel, a great deal of the coal equipment being diverted for use in this way. While the surplus of idle coal cars showed a decided reduction for the two weeks ending with July 4, it was not, however, at a low point by any means, so production was still low. The labor shortage was becoming an important consideration, and it was obvious that, if mines were working up to anything like full capacity, it would be impossible to obtain an adequate supply.

Prices took another general slump all over the country, those at Boston touching the low point for the year, as will be noted on the accompanying diagram. Cargoes were arriving at Eastern coastwise points on consignment and embargoes were being declared at some places. It was evident that prices could be maintained only by a rigid curtailment in production on the part of the operators.

The middle of the month found many of the Eastern anthracite dealers entirely out of supplies and the pressure became strong for shipments out of New York and Philadelphia. The relatively light production for June, which was announced at about this time, produced a noticeable feeling of uneasiness in trade circles. This was further increased by the urgent demand from the line and Western trade, the latter being still quite insistent upon having the first shipments.

There was an appearance of a better feeling among the Eastern bituminous dealers at this time. Although the existing conditions did not justify this, still consumers generally, had been out of the market since the suspension and it was becoming apparent that many had about reached the end of their supply, and were being forced into the market. There was also a steadily increasing consumption, along with the rapid advance in steel. In spite of this optimistic feeling, orders were more scarce than at any time during the season, and the market was so flat and dull that there was scarcely anything to report.

The position of the market was quite unique. Bituminous, normally dull at this period of the year, was down to even a lower point than usual, while the shortage of anthracite was regarded as quite serious. Dealers in the latter grade were rapidly getting farther behind on orders, and it was becoming difficult to see how they would be able to handle the heavy fall and winter business.

The month closed with low prices being quoted uniformly all over the country, although there was an effort underway in the Eastern bituminous market to maintain a higher level. Operators were, however, becoming more optimistic, shipments were more nearly down to requirements, while free consignments were seldom heard of and there were not the indiscriminate pounding of prices, so common during the preceding few weeks.

August

The first of August brought with it some tangible evidence of the improvement in bituminous, which the dealers had been looking forward to. This was general all over the country, with the possible exception of the Pittsburg district where prices broke to the low level for the year.

Deliveries generally were now only made on specific orders, and indications were that the low prices of June and July would not again be duplicated during the rest of the season. There were no longer any heavy accumulations, coal was being more closely held, and there was an entire absence of demurrage; the demand was more insistent than at any time since the suspension, and the business was on a fairly profitable basis. This was, no doubt, affected by the policy of rigid curtailment adopted by a number of the larger producers, together with a further tightening in the car supply, the surplus of idle coal equipment again showing a reduction for the two weeks ending Aug. 1.

Apparently, the only problem before the hard-coal producers at this time, was the provision of an equable distribution of their production in such a manner as to cause the least complaint. Eastern dealers were being obviously discriminated against in this respect; this was, however, to be expected, as the more remote Western points must be supplied while shipping conditions were favorable.

By the middle of the month, the bituminous market was on a strong basis, with every indication of holding its own for the remainder of the season. It was becoming apparent that the supplies in the hands of the consumers were low, as was anticipated, and while there was no heavy demand, the market was probably in a better position than normally at this period of the year.

The sales departments of the hard coalers were pushing the operating end to the limit, and it was apparent that the August production of anthracite would be heavy. President White, of the miners' union, made a visit to the anthracite field during the month, which interfered with work at the mines and caused some dissatisfaction among the producers. This was unfortunate at this time, as the shortage was becoming more serious, with stove coal almost entirely out of the market.

Bituminous operators began to foresee an active business the coming fall, and the market gradually assumed a strong, healthy tone. The possibilities of transportation troubles during the coming fall, began to be anticipated by some consumers who started accumulating surpluses; This had a further stimulating effect upon the situation.

Mining generally was becoming restricted. In the Pittsburg district the car supply was poor, with occasional

embargoes being declared on shipments from some districts, and there was an insufficiency of labor, together with frequent small strikes at the mines. The car shortage in Ohio was so pronounced that mines were being subjected to an occasional shut-down. For the two weeks ending Aug. 29, there ceased to be any surplus of idle coal equipment and a shortage of 1715 was reported for the second time during the year; this shortage was not again eliminated during the remainder of the year.

The month closed with the demand for anthracite still far in excess of the supply, and with the production being as readily absorbed as ever. Dealers were beginning to receive inquiries from the consumers, and it was evident that the winter trade would open up in earnest soon. The soft coal market closed active and firm, with prices unchanged but being much more rigidly held. Consumers were seeking to cover their requirements against a possible car shortage and the rumors of the slow movement were making them anxious.

September

The early part of September found bituminous operators becoming cautious about future commitments, and old prices being gradually withdrawn. The labor troubles in the Paint Creek field had proved another disturbing factor in the situation, deliveries were slower and consumers less inclined to be particular about quality. Production in the Pittsburgh district was now practically equal to any previous record, and would have been still heavier were it not for the insufficiency of labor and inadequate supply of equipment for loading. Manufacturing demand was increasing and shipments to the lake becoming quite large.

Inquiries for October and November deliveries of anthracite at this time, were being met with the reply that no forecast could be made as to the situation then. While every effort was being made to meet the constantly increasing demand, the Eastern dealers were becoming more concerned over the situation, and premiums were steadily advancing. By the middle of the month coastwise dealers were down to a hand-to-mouth business, and the companies were taking the stand that they could look after none but old customers.

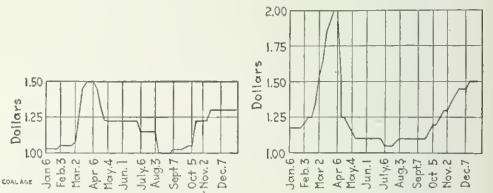
Bituminous production had become quite heavy by the middle of the month, but no surpluses were reported at the large distributing centers. Considerable of the West Virginia coals were being diverted into the Western markets which caused a shortage in the East, and arrivals were only about sufficient to meet contract obligations. Current shipments were going into immediate consumption, and no supplies were being accumulated. Prices in the Pittsburgh district were stiffer, without having experienced any advance, with the exception of domestic which had gone on to the usual winter schedule. Eastern dealers generally, claimed they had more business than they could handle, shipments were up to the maximum rate for the period, and the season showed every indication of being a prosperous one.

As the month advanced coastwise bituminous prices became more firm and there was more or less detention at all the piers. The West continued absorbing an unusually large percentage of West Virginia products, and shippers were going slow on new business. Production appeared to be only about equal to contract requirements.

Operators and jobbers in Ohio had all the business they could handle, and the inadequate car service was still curtailing production. There had been a continued heavy demand, with a limited supply, at Hampton Roads, and this finally resulted in an advance in the schedule at about this time. There was considerable business offered at good figures, which the operators were unable to take advantage of, and there was no evading the fact that there was a perceptible shortage.

The fall demand for anthracite began to open up toward the end of the month. Premiums asked in the retail trade were reaching a prohibitive level, and dealers generally were finding it easier to sell than purchase fuel. It was reported that a number of towns were practically bare of supply, and, while the clear weather caused an improvement in the coastwise movement, the scarcity at the terminals was making the loading slow.

At the close of the month it was becoming apparent that the anthracite coastwise dealers were unable to make any impression on their orders, and the trade was getting in a serious condition. The movement was being interfered with by the inadequate car supply, the demand still increasing faster than the shipments, and some consumers were being forced to substitute bituminous and coke for hard coal.



Minimum Mine-run Prices at Pittsburgh, Penn. — Boston Prices for Clearfields, f.o.b Mine

Characteristic Price Curves for the Year 1912

The close of the month, also, saw the beginning of the abrupt advance in bituminous quotations, as will be noted on the accompanying diagrams. The shortage of coal equipment had been growing steadily, although not rapidly worse through the month, which ended with the bituminous market undeniably on a firm basis in all departments.

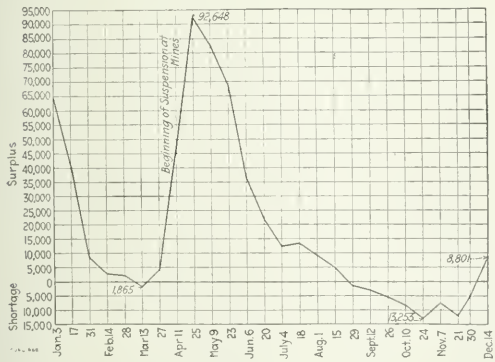
October

October opened with the bituminous market in a decidedly feverish condition. Buyers were appearing in the mining regions in the hopes of being able to pick up some loose tonnages, and the demand was urgent in all departments. The car shortage in the East has become so pronounced that operators could make no promises ahead about deliveries, and there was detention with practically all shippers. Companies were being pushed to take care of their contracts, and some began issuing instructions to their salesmen to accept no more orders. Most of the West Virginia product was still going into the Western market, and there was every indication that it would continue doing so until Eastern consumers bid up prices.

The appearance of higher temperatures toward the

middle of the month gave the anthracite dealers all over the country a welcome respite. Anticipation of the results at the closing of the heavy Western and lake trade began to be looked forward to, even at this early date. The opinion was freely advanced that the demand was abnormal by reason of many orders being placed in duplicate, and that with the appearance of these extra tonnages in the Eastern market, there was a probability of the trade experiencing a sharp recession. It was generally conceded that the operating companies were dealing with a hard situation and handling it to the best possible advantage.

The heavy demand for anthracite now began to swing onto bituminous, with the result that this branch became practically as hard as the former. There was a heavy movement of all kinds of freight, making the congestion worse and seriously affecting coal shipments particularly to tide. There were no free tonnages of the better grades to be had, tonnage consignments of all kinds were being detained, prices were correspondingly firmer, and consumers more concerned.



Surpluses and Shortages of Coal Cars During 1912

Ohio operators were now entirely at the mercy of the railroads, production was only about 40 to 50 per cent. normal, and the new circular of Oct. 1 was being maintained in every particular; manufacturers were seeking surplus tonnages and dealers were attempting to cover their requirements, but without much success. Demand and prices were improving in the South, and slightly larger tonnages going into the Northwest. Quotations continued ruling firm past the middle of the month, with requisitions insistent and the trade strong in every particular.

In spite of the assurances of the anthracite producers, it was generally believed toward the close of the month that the first appearance of severe weather would precipitate a runaway market; there was, however, some indication of an easing off in this branch, due to the mild weather. Eastern receipts of hard coal continued small, and apparently below those for the preceding few weeks and the end of the month found the dealers becoming imperative in their demand for fuel.

Toward the close of the month the scarcity of bituminous became so acute that consumers began purchasing outside of their contracts. Eastern arrivals were still curtailed due to the heavy movement West. Quality became a secondary consideration, the poorer grades took an almost spectacular advance, while operators became more cautious about future commitments. For the week ending Oct. 24 the shortage of idle cars touched the low point for the year, and it was obvious that production was heavy at this time.

Pittsburgh operators were now confining their entire attention to filling contracts and were reserved about accepting future business. There were no free tonnages of any description, and shipments were down to about 50 per cent. of normal capacity. Contracts were being freely made for the year or six months after Dec. 1 at the regular season circular adopted early in the spring, but which was so flagrantly cut in midsummer. By the close of the month sufficient tonnages had been closed to justify an advance in the circular for the year, and it was believed that this new high level would shortly be the minimum.

Eastern bituminous operators, who had contracted so freely in the spring, were, at the end of the month, becoming apprehensive over November and December deliveries. There was a dearth of steam coal in all markets, production reports for the mining regions were discouraging, while operators were evincing every confidence over the future.

November

The month opened with the anthracite operators responding to the heavy demand being made upon them to the best of their ability, but still showing little or no indication of getting ahead. The steam grades were the only easy branch of the trade and the domestic sizes were still going into immediate consumption as fast as received. Originating companies were withdrawing their Eastern fleets because of the dearth of domestic grades for shipment, hindrances and delays in both production and transportation were now the rule, and it was evident that the hard coalers would find it impossible to overcome the tremendous shortage. While the duplication of orders by the consumers had doubtless created an artificial demand, there was no doubt but that the trade was facing a strenuous situation.

The bituminous producers at the first of the month were finding it difficult to meet their contract obligations and there was no free coal in the market with the possible exception of a few odd tonnages of the lower grades. A strong off-shore demand developed which further complicated matters at the piers; detention of from one to two weeks became the rule and the situation was further aggravated by the anthracite roads withdrawing bituminous equipment for use in the hard coal regions. A number of embargoes were declared and the shortage in the Pittsburgh district reached the most serious proportions of the year. Contracts were being made at the full season circular, and mostly for the year, though occasionally for six months.

The announcement of the record-breaking production of anthracite for October was made at about this time but did not give any tangible evidence of relief. The situation was undoubtedly grave and the coast dealers who ordinarily had their full supplies by the close of navigation, Dec. 1, were beginning, towards the end of the month, to make extensive preparations for obtaining shipments throughout the season. The expected winter

demand began to get definitely under way, and, while large tonnages were being distributed, they were not sufficient to permit of the accumulation of any surpluses.

The coastwise bituminous market began to fluctuate so spasmodically toward the close of the month that it is probable there was considerable buying on speculation at that time. There was a freer movement to tide and some spot business developed, but supplies were so short that a number of companies were offering their fleets for rechartering. The Pittsburgh market was also fluctuating considerable, due to the uncertainty as to what conditions would be after the closing of navigation on the Lakes.

The car situation again tightened up toward the close of the month, there being a shortage on Nov. 21 of 12,005, this being the second greatest shortage for the year. The effects of this were quite noticeable in Ohio where the situation was probably the most acute at any time during the season. West Virginia operators were being pushed by their Western connections for final shipments before navigation closed and at the same time, the demand at the piers was so heavy that detention of from three to four weeks was quite common. The number of vessels awaiting cargoes fell off at the close of the month and more favorable weather conditions tended to lessen the anxiety of domestic consumers generally in the South, but the same uneasiness prevailed among the steam users.

The close of the month found the anthracite dealers with supplies probably shorter than they would admit to anyone except the producers. The comparatively mild weather had prevented any extensive runs on the producers and relieved what might have otherwise been a serious situation at this time. The results of the closing of lake navigation were now being eagerly anticipated.

December

The last month of the year opened with an appearance of a break in the anthracite market, the first for many months. This was due to a combination of heavier shipments into the Eastern markets and mild weather. While the situation could not be termed easy, particularly in the more remote localities, there was nevertheless a sharp decline in quotations at several points; indications were at this time that the hard-coal markets would shortly assume average normal winter proportions. Premium prices were further reduced as the months advanced and shipments continued heavy although all arrivals were going into immediate consumption. The unusually mild weather had been a great help to anthracite distributors up to this time.

Stocks of bituminous in the East were becoming shorter at the first of the month and the trade was on a firm basis, but there was an absence of pressure for coal and quotations remained conservative. Shipments to the lakes had entirely ceased shortly after the first of the month, and it was hoped that there would be an improvement in the car supply. A large proportion of the business in the Pittsburgh district for 1913 was put under contract during the first week at the prevailing circular and some large coke contracts were also let. Larger tonnages were being moved in Ohio and the situation in regard to supplies was somewhat easier. No quotations were obtainable on smokeless at Hampton Roads, the high volatiles were bringing record prices, and the movement on contracts continued heavy. Toward the middle of the month the shippers were troubled a great deal by the railroads confiscating coal *en route*. Shipments were confined almost entirely to contracts and consumers were pressing the operators for their maximum allotment of tonnages.

By the middle of the month the expected improvement in the car situation, due to the suspension of shipments to the lakes, had failed as yet to materialize; some operators reported a fair supply, but others stated that conditions were less favorable than formerly.

In the coastwise anthracite trade, reports were general, by the middle of the month, of dealers being down to the bottom of their stocks and the situation was being furthur aggravated by thick weather which was interfering with the water movement. Consumers were, however, becoming more reluctant to pay the high premiums, believing, apparently, that the diversion of the Western tonnages into the Eastern markets must shortly effect a material relief to the latter. The markets were undoubtedly much easier, but it was doubtful if they would continue so when the real winter weather appeared.

Toward the close of the month the hopes of the coastwise dealers to obtain better supplies were dispelled by a succession of storms; vessels were overdue and many barges were waiting power to move them. Premium prices, however, were now definitely established at a considerably lower level, particularly at points more contiguous to the mining regions.

The middle of the month found the soft-coal dealers beginning to anticipate the customary suspension in mining over the end of the year, at which time a slight activity was expected, and quotations for the new year were being discussed. Prices in the Pittsburgh district were down to only a slight advance over the circular but were being rigidly maintained; operators were receiving a fair allotment of cars, probably sufficient for average needs. The steam trade in Ohio gradually became more active towards the end of the year and production was quite heavy, operators getting up between 75 and 90 per cent. capacity. At the close, the car supply was fair and there were indications that a shortage was developing; it was obvious that a spell of cold weather would undoubtedly precipitate an active market. Hampton Road shippers were gradually catching up on orders, but there were still a number of vessels awaiting tonnages at the piers. The December loading greatly exceeded that for November and it was clearly evident that this point was rapidly gaining in favor for bunkering and export tonnages among these consumers.

The year closed with those bituminous operators who were not under contract getting handsome profits while a still greater advance was expected with the appearance of more winter. The demand however, was spotty and confined mostly to smaller tonnages, although all arrivals found a ready sale at relatively good prices. Supplies were undoubtedly restricted and anticipation of the loss in production due to the holidays caused consumers generally to increase their committments.

It was evident at the end of the year that the anthracite situation was swinging around to more normal conditions. There was a slight improvement in receipts and the demand at the close was strong, but with premiums being freely discounted.

Coastwise Trade Conditions in 1912

By G. G. Wolkins*

SYNOPSIS—The year was one of much anxiety and uncertainty. Many wholly independent circumstances combined to relieve situations which otherwise might have been disconcerting, if not disastrous, to the trade. The prices on Pennsylvania grades were high at the beginning and end of the year, but low during the summer. They averaged better however than in the previous twelve months. Water freights moved up and down with the demand for coal, and were on the whole unsatisfactory. The anthracite situation in New England was far from what might be desired, and the tendency toward extreme prices is something difficult for the populace to understand or the dealer to explain.

To some extent, 1912 justified expectations; it was marked by uneven prices and a surfeit of anxiety over discouraging possibilities. The early adjustment of labor troubles, in the bituminous region a day or two in advance of the expiration of old agreements, and in the anthracite field after a few weeks' suspension, deprived the year of a place with 1902, and yet it was a record twelve months for bituminous tonnage and lent zest and variety to an industry accustomed to turmoil and strife.

The collapse in both the American and the British strike situations came just in time to allow consumers to replace at low prices the reserve stocks of bituminous that had been wiped out by seven weeks of exceptional cold, and in anthracite there has been a joining of weather, of traffic, and trade accommodation that has just about enabled the average retail dealer to get along on a hand-to-mouth basis.

In January and February, for weeks at a time, rivers and inlets ordinarily open to navigation were frozen over and some loss and much inconvenience ensued. In April a high freight market and a sharp "flurry" in steam coals gave way almost at once to a state of extreme dullness. Buyers who had practically stampeded for supplies "to last until May" now found their storage filled for months to come and there was generally an utter lack of interest in bituminous from any quarter.

Shippers soon grew cautious over commitments, even the spring contract prices were gradually withdrawn, and by mid-August it was plain there need be no worry about returns for the rest of 1912. The pressure was rather toward obtaining coal than being relieved of it. A labor shortage became increasingly evident during the fall months, the Western demand went from active to brisk, and by late September the loading of all the favored coals had begun to be subject to two or three weeks' notice and in some cases indefinite delay.

Buyers have been obliged to buy outside of contracts, and those Pennsylvania operators, in the Clearfield region particularly, who from one reason or another are free of obligations at least for a part of their output, began in October to reap a harvest in fancy prices.

The lines grew tighter until the end of December, when $2@2.15 at the mine was found an easy sale, with very little question as to quality. So the year ended as it began; with a pronounced shortage of the coals on which this market usually relies, and a prospect of panic prices, "if the weather turns cold."

Pocahontas and New River

The bituminous market in New England hinges largely on the output of the Pocahontas and New River fields, and the question of whether they are in long or short supply is always a determining factor. With the exception of the dull months from April to July, three grades were in strong demand and the average price return was much higher than for 1910.

January opened with slow loading at all three of the Hampton Roads terminals and prices were firm at $2.70

RECEIPTS OF BITUMINOUS COAL BY SEA AT BOSTON, SHOWING PORT OF SHIPMENT*

	Baltimore[1]		Norfolk[2]		Newport News		Philadelphia		New York		Totals		Foreign[3]	
	1911	1912	1911	1912	1911	1912	1911	1912	1911	1912	1911	1912	1911	1912
January	155,962	100,198	58,323	122,696	87,463	77,108	13,927	9,148			315,675	309,150	26,220	21,450
February	128,546	124,610	80,846	144,579	78,397	71,958	19,360	6,986	1,433		308,582	348,133	19,670	39,820
March	133,989	125,943	73,399	163,033	71,899	58,555	43,862	12,201			323,149	359,732	18,990	29,449
April	141,130	125,585	87,121	116,909	85,794	89,787	44,783	20,520		893	358,828	353,694	18,250	18,700
May	139,198	119,187	102,406	185,600	70,161	101,416	32,205	59,991		4140	343,970	471,634	30,749	27,800
June	147,678	106,506	93,490	151,609	65,356	90,563	26,448	29,882			332,972	378,560	19,036	25,500
July	176,871	105,320	80,420	159,866	75,821	53,042	27,895	19,298			361,007	339,256	12,751	25,250
August	115,306	128,054	139,102	163,995	54,713	120,663	55,235	20,752			364,356	433,464	25,000	26,300
September	90,498	129,114	116,296	156,038	75,606	97,836	32,146	30,737	1,493	600	316,039	414,325	26,024	21,450
October	114,170	92,340	115,401	158,609	80,282	106,765	15,149	49,925		1064	325,002	408,703	17,801	20,600
November	113,226	86,843	129,399	164,019	93,926	29,173	41,258	39,081	850	1100	378,659	320,216	19,950	27,600
December	119,823	114,564	142,188	149,797	81,802	48,937	29,693	23,813		1542	373,506	338,653	29,420	25,207
Totals 1912		1,361,994		1,836,750		945,803		322,334		9,639		4,465,520		309,126
1911		1,576,397		1,218,391		921,220		381,961		3,776		4,101,745		363,861
1910		1,595,554		795,475		1,243,857		292,636		25,515		3,954,251		296,564
1909		1,302,729		561,388		1,088,412		436,164		4,730				228,297
1903		481,111		314,505		596,439		595,824		93,940		3,393,423		1,226,131

*Courtesy of the Boston Chamber of Commerce, Statistics Department

[1] Includes small shipments from Washington and Georgetown. [2] Lamberts Point and Sewalls Point. [3] Almost exclusively from Louisburg, Cape Breton, except during 1903 when a large part came from Great Britain.

for what small amounts could be had outside of contract. Early in March a season price of $3.80 on cars, Boston, was made by one of the agencies as against $3.30 the year before, although part of the increase was due to an active freight market.

The Eastern dealer or manufacturer whose old contract was expiring was obliged, in effect, to bid against the offshore trade in order to get fuel for April, May and June. The flurry then at its height soon subsided, however, and the middle of April saw the usual short-lived celerity in closing season business on price bases anywhere from $2.50@2.70. The buying power was only moderate at this time and purchases were extremely conservative.

Loading conditions improved very fast during April, but there was lack of orders and late in May recourse was had to the usual and time-worn expedients.

It was difficult, after such months as January to April,

*50 Congress St., Boston, Mass.

to get output back to an off-year basis, but when the June receipts at tidewater accumulated to such a degree that car embargoes were threatened and it was a matter either of demurrage at Norfolk or losses here, the more far-sighted interests resolved upon $2.70 ($1.30 at the mine) or nothing. A general curtailment followed. Then, with a scarcity of labor and the foreign demand already mentioned, it was but a few weeks before conditions were well on the mend.

This concerted move to send coal to tidewater only on actual orders, was perhaps the most hopeful sign of the whole season in West Virginia. It showed that at last the Pocahontas and New River producers were tiring of the old practice of throwing away great tonnages of highest grade fuel just for the sake of making a dent in the market.

Three dollars and a half, f.o.b., was the level reached in November and December and, as an outcome of the year's generally flourishing business, there is an effort on foot to try for a contract price of $3, f.o.b., and to make the coal year begin Jan. 1 rather than Apr. 1.

Georges Creek

The receipts of Georges Creek, chiefly via Baltimore, were heavier than in 1911 and this would have been a record year for the Maryland output, but for the extreme car shortage that seriously affected shipments after Sept. 1.

A number of anthracite barges were engaged in freighting Georges Creek coal at low rates and the call for Pennsylvania coals was narrowed in consequence. But when prices at Hampton Roads dropped to $2.50@2.60, much of the early advantage was lost in materially reduced consignments for June and July.

The sluggish tone of the market did not cause the Georges Creek shippers to waver on price, however, and they thus furnished an object lesson to their more southerly competitors. The price remained firm, but beginning with September, slow loading was the rule at Baltimore and receipts the last of the year were trifling.

Only limited amounts came through for loading at Philadelphia or New York and supplies of Georges Creek for this market were practically out of the question for November and December. At the close of 1912, there was almost no offering by any of the numerous shippers, but if there had been, it would have commanded $2.15 @2.25 net at the mines.

The Pennsylvania Grades

It can safely be said the Clearfield, Somerset and other bituminous districts in Pennsylvania have enjoyed a satisfactory year. While in some sections prices were for several months no higher than in 1911, not enough even to pay for the advance conceded the mine-workers, yet profits averaged much better in 1912.

During January and February receipts at tidewater were so light that spot coal of the inferior kind was marked up to $1.25 and even to $1.40 at the mine, and there it fluctuated until the preferred grades disappeared from the market in March and up to $3.25 was paid the selling agencies for anything that was known to be *en route* when a country-wide strike was supposed to be imminent. The slump was so rapid in early April that operators were slow to realize what had happened and for some weeks the lowest figures were maintained in cleaning up the speculative coal that high prices had called forth.

Quite a volume was sacrificed down to 90c. and $1.00; then with slow resumption of mining, prices swung back to normal and the market settled into an unusual dullness. There was practically nothing forwarded except on orders and there was no surplus to be absorbed. The Cambrias and Somersets again went out of the market, shippers finding their hands full to furnish contract requirements, and Aug. 15 saw quotations 5c. @ 10c. up and by Sept. 1 old prices had been withdrawn.

The contract basis for fair Clearfields was about $1.15 @ 1.20 and for Somersets $1.25 @ 1.30 or 5c. higher than 1911 on all grades. The fancy brands of Cambria commanded $1.40 in most cases. Late in September all the popular coals were well sold up and from then on there was an advancing range of price on all the Pennsylvanias, varied only occasionally by an uneven demand.

TOTAL ANTHRACITE SHIPMENTS FOR THE PAST 12 YEARS BY MONTHS.

	1901	1902	1903	1904	1905	1906	1907	1908	1909	1910	1911	1912
January	5,192,290	4,538,138	5,964,950	4,134,245	4,408,578	5,458,084	5,249,496	5,618,339	5,183,345	5,306,618	5,904,117	5,763,696
February	4,123,594	3,741,253	5,070,608	4,326,269	3,922,601	4,712,099	4,563,720	4,503,756	4,576,004	5,031,784	5,070,948	5,875,968
March	5,002,315	3,818,767	5,211,450	4,375,033	5,258,567	5,797,167	5,235,814	4,766,158	6,332,474	5,174,166	5,996,894	6,569,687
April	3,715,295	4,924,830	5,044,998	5,407,786	5,278,041	488,203	5,916,583	5,987,221	5,891,176	6,224,396	5,804,915	266,625
May	4,693,562	1,708,892	5,156,449	5,285,079	6,005,158	3,254,230	5,994,272	6,088,116	5,063,873	5,679,661	6,317,352	1,429,357
June	4,792,443	92,203	5,436,497	5,728,795	5,844,052	5,676,018	5,976,906	5,704,852	4,904,858	5,398,123	6,215,357	6,191,646
July	3,699,628	239,079	5,377,495	4,623,227	4,546,743	4,981,448	5,069,024	4,541,506	4,020,765	4,202,059	4,804,065	6,285,153
August	4,711,517	321,774	5,169,402	4,325,734	5,401,858	5,400,511	5,795,347	4,599,093	4,198,273	4,996,044	5,331,796	6,576,591
September	4,379,143	455,883	4,654,444	3,967,600	5,082,232	4,527,886	5,512,717	5,211,047	4,416,120	4,967,516	5,730,935	5,876,496
October	4,938,033	1,276,257	3,925,642	5,131,542	5,205,694	5,384,768	6,108,065	5,977,497	5,579,759	5,622,095	6,269,179	6,665,321
November	4,697,329	4,984,384	4,091,147	5,124,068	5,421,584	5,182, 53	5,743,522	5,839,491	6,027,800	6,071,746	6,193,314	6,165,536
December	3,623,453	5,099,431	4,259,748	5,063,144	5,395,113	4,836,028	5,343,477	5,827,938	5,775,438	6,231,578	6,115,427	5,944 502
Total	53,568,602	31,200,891	59,362,830	57,492,522	61,410,201	55,698,595	67,109,393	64,665,014	61,969,885	64,905,786	69,954,299	63,610,478

Transportation

Throughout the year water freights moved up and down with the demand for coal. The March "flurry" and the anxiety to cover tonnage before 1911-1912 contracts expired, caused a run up in rates from $1.00 @ 1.10 in February to $1.40 @ 1.50 on large vessels, Hampton Roads to Boston. With old business out of the way and the Virginia terminals catering mostly to off-shore steamers, together with a considerable amount of anthracite transportation freed from its usual service, vessel freights eased off to 70c. in May and carriers went begging. Owners preferred tying up to accepting less than 70c. A brisk demand early in September moved the current rate to 95c. and $1 with short time guaranteed for loading. Then the extreme detention at Hampton Roads and at Baltimore so discouraged vessel owners that at the end of December many had chartered into other trades.

Receipts were so light in the Chesapeake the last of the year that some of these colliers have also closed for other freighting, two at least taking grain to Europe. For the most part 1912 was a profitless year for sailing vessels.

Several small vessels took freights up to $2.00 out of New York for eastern points, in October and November.

Anthracite

New England has had a troublous year in anthracite. From Jan. 1, there was no time when more than hand-to-mouth deliveries could be had, and a more trying year to the distributor, wholesale or retail, would be hard to imagine. A prolonged season of extreme cold followed on the shortage that had been apparent since Sept. 1911. The smaller producing companies were out of business so far as the East was concerned, and to provide a climax a bitterly fought anthracite strike Apr. 1 seemed a foregone conclusion.

The "suspension" actually lasted only to May 23, but the loss of practically two of what are normally heavy months for production put the market several million tons in arrears, and 1912 ended with New England still far behind on its usual tonnage. Dealers everywhere had more than they could do to keep abreast of their trade even though every known expedient was resorted to.

New circular prices were announced June 1, with 25c. advance on all sizes as compared with prices effective the same month in 1911, or 45c up compared with April, 1911. In addition to the increased contract price on broken announced Jan. 1, 1912, $5.00 instead of $4.75 alongside Boston, an advance in pea was effective Nov. 1, making the new price $4.25 instead of $4.00 alongside Boston. In December another change was made by some of the companies shipping from New York, namely; a 15c. higher water freight on anthracite barges, or 65c. to Boston and Boston points rather than the 50c that had obtained for more than a dozen years.

All this scaling up is of great interest to the public and there are many signs of restiveness. Retail prices through New England were from 75c @ $1.50 higher than the same season in 1911. This is difficult for people generally to understand and quite as difficult for dealers to explain.

The saving factor in the whole situation was the wonderfully consistent mild weather all the later months, a circumstance that has enabled the companies to send east certain supplies that would otherwise have been directed to the big city markets. This was shown very plainly when a slightly colder day in New York practically closed the gate for consignments outside the harbor

Retailers here were therefore sparing in deliveries and conserved their small stocks. Had the weather been otherwise there is no saying what distress might have followed. Boston retail prices were advanced to $8.25 for stove and chestnut Oct. 1 and were held there through the rest of the year.

The past twelve months have fulfilled certain predictions that were freely made; that a new high figure would be reached for the volume of business and hence also for the movement of freight. Railroad equipment had not kept step with the prospect and we had our great shortage of cars.

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The Situation at Hampton Roads in 1912

SYNOPSIS—Dumping at Hampton Roads for 1912 exceeded that for the previous year by one and a half million tons. Trade was quite good on the whole and prices entirely satisfactory. Many improvements and additions are under way which will greatly increase the capacity of the port.

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Hampton Roads has experienced the most unique year in its history. Over a million and a half tons more was dumped than during any preceding year. Altogether it has been a very prosperous year for Hampton Roads shippers; no failures are recorded in the coal industry, and on the other hand, new organizations have appeared in the field, and the older ones have broadened out and grown in proportion with the gradual increase of business. The value of the coal put afloat at these ports in 1912, estimating it at $2.60 a ton, which is a fair average price, is about twenty-nine millions of dollars.

Naturally the railroads have played their part in the prosperity of the port, and made numerous improvements, purchased equipment and locomotives, and improved in other directions in order to better serve the mines located on their respective lines. Both the Chesapeake & Ohio and the Norfolk & Western have begun work on new piers during the past year, which when completed will further the efficiency of Hampton Roads as a coaling port. It is still a matter of speculation as to what effect the completion of the Panama Canal will have on the export of coal from Hampton Roads, but it is the consensus of opinion that this port will very shortly be surpassed by few in volume of business handled and by none in facilities and supply of high quality coal; these facts are already being more and more recognized by domestic as well as foreign traders and consumers.

Curtailment in the Early Part of the Year

During the months of March and April, when the light demand is felt for steam coals, and curtailments in mining are generally resorted to, local shippers found a ready market for their product, which was placed with consumers heretofore using practically none other than British coals, this stroke of good fortune being brought about by the British coal strike. Even though this strike was of only a few weeks' duration, during this period not less than a quarter million tons of steam coals moved out of Hampton Roads bought by foreign dealers for consumers, until then, using only British coals. Prices at this time ranged higher than known here for ten years. New River-Pocahontas mine-run coal being readily taken up at upward of $1 a gross ton f.o.b. the local piers. Incidentally a long sought opportunity was here given to place American coals with users of British fuels, and to better acquaint such consumers with the efficiency of the smokeless grade especially. The results in the latter respect were highly gratifying and aside from the "smalls" (as continually dwelt upon by foreign coal-trade papers), Hampton Roads smokeless coals were found as high in efficiency as the best grades of Welsh coals. (It will be noted that about this time we find the largest dumping for one month during 1912.)

During the early summer months the demand for steam coal held up remarkably well, an unusually large tonnage being moved to New England ports. While it has been

customary for a number of years to curtail shipments during the summer, the good demand for coal here obviated the necessity of such a step to any noticeable extent. As soon as the lake season opened up the greater portion of the coal from the New River-Pocahontas district was moved West. The market at tidewater not being flooded with large quantities of unsold coal, prices remained quite firm. About this time large tonnages of coke were exported from here and for a time it looked as if this feature of the business would assume proportions worthy a second consideration, but during the closing months of the year, the tonnage dumped did not measure up to expectations based on the summer performance. Nearly all the coke during the year was handled by the Norfolk & Western Ry. The Virginian Ry. handled none, and the Chesapeake & Ohio only a few hundred tons, at Hampton Roads.

Early in the fall indications pointed to a good winter business. Predictions came true, materializing earlier than expected, and by the middle of October it was difficult to obtain any quantity of standard smokeless coal at any price. The car-shortage question became serious on the Norfolk & Western, and Chesapeake & Ohio railroads about this time and continued to grow worse daily. So bad were conditions that a number of the mines only worked two and three days a week. What free coal was now on the market was eagerly taken up at prices ranging from 50c. to 75c. a ton higher than that at which most of the year's contracts were closed. This demand did not lessen to any extent, as the year came to a close, although during the early part of December (due to the moderate weather prevailing during the entire fall) the demand weakened slightly and prices seemed destined to decline somewhat, but on account of the curtailed output brought about by an inadequate car supply and insufficient labor, no accumulation of coal was effected, and consequently prices remained high; what few sales of standard smokeless coal were made, came near to the high-water mark of the year.

The high volatile (free burning) coals which had been shipped to Hampton Roads in limited quantities from time to time, on account of the light demand in the open market, were readily taken up during the stringent smokeless period by consumers who heretofore would entertain the use of smokeless coals only, but being unable to obtain these, found the Hampton Roads high-volatile coals an excellent substitute. It is well to mention here that during December, the Virginian Ry. overtook and passed the Chesapeake & Ohio Ry. in point of number of tons of coal put over their Hampton Roads piers, the Virginian's total for the month being 256,457 tons, while that of the Chesapeake & Ohio was 226,344.

Increase in Bunkering Trade

A marked increase in the bunkering business was noted during the closing weeks of 1912. This was attributed by some to the cheapness of supplies here as compared with other ports, although traffic in American waters, especially cotton from Southern ports, was unusually heavy during this period. Late in December prices for coal for steamship use during 1913 were announced, and found to be 30c. a ton higher than during the closing year.

Prices prevailing on smokeless coal during 1912 were as follows:

	High	Low		High	Low
January	$2 70	$2.50	July	$2.70	$2 45
February	2.70	2.50	August	2.70	2.50
March	5 50	2.50	September	2.80	2 50
April	4 50	2.50	October	3.25	2.60
May	3 50	2.50	November	3.25	2.60
June	2.70	2.45	December	3.55	2.60

A statement of the dumpings during 1912 over the piers at Lamberts Point, Norfolk, Sewalls Point, and Newport News, in detail follow:

Month	N. & W.	Virginian	C. & O.
January	403,881	171,806	321,210
February	413,897	190,689	308,898
March	468,883	207,552	340,521
April	571,187	166,176	475,301
May	511,785	189,689	370,885
June	424,167	174,324	290,622
July	442,818	215,637	311,751
August	423,571	223,150	332,194
September	404,016	243,272	282,492
October	406,606	239,161	275,024
November	347,255	182,242	228,373
December	361,062	256,457	226,344
Total	5,213,773	2,473,145	3,763,615

Grand total for three roads during 1912 was 11,450,533, as compared with 9,981,431 for 1911.

The Philadelphia Coal Trade

By C. B. Beers

The closing of the year 1912 ended or rather was the culminating point of one of the best seasons of business that has been enjoyed in this vicinity for several years past. In fact, it may be said to have been a banner year. It is true that scarcity of coal prevailed throughout this entire period, and that it was almost impossible to get sufficient supplies to satisfy the trade, but from the standpoint of business, it was a year never to be forgotten. It was not so much a question of securing business, for there was plenty of that, but the difficulty seemed to be that there was not sufficient of the necessary coal to go around. It is true that this condition of affairs become more apparent after the resumption of mining on June 1, but even before the strike, which lasted two months, there was no one day or week, when it could be said that there was any surplus of anthracite coal.

The beginning of the year 1912 saw the trade in a very satisfactory condition. The demand was good for all sizes, from broken to barley. On Jan. 1, 1912, there was an advance in the price of rice coal from 65c. to 85c., but it is understood that notwithstanding this increase, contracts were, as a rule, renewed at the new figure. Broken coal at tidewater was also advanced 25c. per ton.

All through the months of January and February the market readily absorbed the entire receipts of anthracite coal sent in this direction, and March found little if any coal in the yards of the dealers. Then came the first mutterings of trouble with the miners. The month of March registered the next to the largest production of anthracite coal in the history of this commodity.

Large users of the steam sizes who, as a rule, begin to be a little chary about laying in any unusual supplies at this time, utilized every inch of space they could spare for the storage of coal, some of them going to considerable expense in renting for a certain period, plots of unimproved property for the storage of additional fuel.

Dealers, as a rule, during the month of March, limit their purchases to their actual necessities, but winter extended itself well into this month, and with the prospect of strife with the miners, they were all anxious to secure supplies for possible householders who were not willing to take any chances on securing their winter requirements, having in mind the discomforts of the year 1902.

What the dealers had predicted or rather felt would be the case, came to pass. When every indication pointed to trouble with the miners, orders came in faster than they could be filled comfortably, and it is a fact, that the business in this vicinity for the month of March, 1912, far exceeded the business for any corresponding period.

Then came the suspension of work at the mines. During this time, while there was a complete cessation of production, the large companies were successful in disposing of quite a quantity of the steam sizes of coal they had in stock. The domestic sizes had been pretty well cleaned out by the demand of the winter previous.

After settlement of the strike, it was perfectly apparent that there was going to be trouble in securing sufficient supplies of coal. During the summer, while the demand was good, it was not insistent in this vicinity, and it was not until the early fall that dealers were unable to secure as much tonnage as they required. It came as welcome news to the dealers that mining operations had been resumed, but it might not have been so welcome, if they had known what difficulty and trouble they were to have in getting supplies of coal later in the year.

Early fall found the dealers very short of all sizes, and this condition continued chronic. The city of Philadelphia receives, almost without variation, about 4,000,000 tons of anthracite coal annually. It is understood, with the year ending Dec. 31, 1912, there will be a falling off in this amount of anywhere from 15 to 20 per cent., owing to the unusual situation that has prevailed since the resumption of mining. There is every indication that this dearth of supplies is likely to last well on into the spring of 1913.

Premium coal came to this city in fairly large quantities, although it is not too much to say that the amount has been probably exaggerated, isolated cases sometimes being taken as a general condition.

It was encouraging to note that the best of harmony seemed to exist among the dealers, and price cutting on any of the sizes was not heard of. Of course, it was an unusual year, but under favorable circumstances, the temptation to secure good business has sometimes resulted in the shading of figures.

With the close of the year retail prices remained: Egg, $6.75; stove, $7; chestnut, $7.25, and pea, $5.25 to $5.50.

The wholesale market enjoyed, of course, its large season of prosperity, being a reflection of the extraordinary demand prevailing, and the operators were hard pressed to know who and what to serve. However, there is every indication that the distribution of what they had was made as equitably as possible, every effort being made to see that each dealer received his fair proportion, and with the handicap of a 12,000,000 to 15,000,000 shortage staring them in the face, it was doubtless very often a difficult matter to place the output where it would do the most good.

Taking the year as a whole, it has been a very prosperous one, referring to one's peace of mind, and the balance sheet of both the wholesale and retail operator is likely to show up on the right side, and compare very favorably with any previous years.

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The Pittsburgh District in 1912

By B. E. V. Luty*

SYNOPSIS—Production in the Pittsburgh district during 1912 was quite heavy, but labor troubles and lack of adequate transportation facilities disturbed operations to such an extent that the year proved to be another unsatisfactory one from a financial standpoint. The most important episode of the year was the favorable decision obtained by the Pittsburgh operators in the Pittsburgh-Lake Rate case, the effects of which were, however, immediately eliminated by an equal reduction on roads in competitive fields. In the Connellsville coke regions, determined efforts on the part of both producers and consumers to control the market, resulted in spectacular fluctuations in quotations, with prices ultimately reaching the highest point in the history of the district.

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The Pittsburgh district coal operators, as a whole, experienced another unsatisfactory year in 1912, from the standpoint of financial results. Our review of 1911 noted that the results of that year had been unsatisfactory in this way also. The prospects for 1912 were better, and the tonnage on the whole was good. The cost of mining was increased, through the wage advance, but operators allowed for this. They made close prices and, figuring on a much larger tonnage than in 1911, expected to make a fair profit through reduction in overhead charges per ton. The unsatisfactory financial result, the disappointment in view of the expectations entertained, is attributed to the fact that, on account of short car supply and insufficient labor, operations were very intermittent and the cost of production was accordingly much higher than was anticipated. The supply of cars and labor was not uniformly bad throughout the year, but it was frequently poor, and irregularities, by disturbing plans, produced possibly worse results than would have occurred with a uniformly inadequate supply, which would have caused the plan of attack to be different.

The coal market was seriously disturbed by the unexpectedly quick settlement of the biennial wage scale, an agreement being reached between operators' and the miners' representatives at Cleveland on Friday, March 29. While the men did not return in a body until the referendum vote was completed, the suspension lasted only about three weeks. Probably the general expectation among consumers was that it would last four to six weeks, perhaps longer, and stocks had been laid in accordingly, so that the early resumption of mining found the trade with little demand. Possibly the operators were hastened in reaching a settlement by the fact that on March 1 more than a million men quitted the English coal mines, but that strike did not give the United States the demand that was expected. The wage settlement, for the two years to the end Mar. 30, 1911, was on the basis of an advance in the general mining rate of from 95c. to $1, following a similar advance made in the 1910 settlement.

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The year opened with circular prices on the basis of $1.15 for mine-run, and these were fairly well held in the first three months, owing to there being a demand for stocking-up purposes against the expected suspension of mining. After the settlement, circular prices were promulgated on the basis of $1.22½, but there was heavy cutting to below even the $1.15 basis, and mine-run coal for a considerable time was easy at about a dollar a ton. With a heavy lake movement, and materially increased demand from manufacturing consumers, prices began to stiffen in the summer and by September a general shortage of coal had developed. The Pittsburgh district could do little toward overcoming this, being handicapped by an insufficient supply of both cars and labor. The difficulty was as much with irregular working by the men as it was with a shortage in the actual number. In October, Pittsburgh coal for prompt shipment practically disappeared from the market, small lots commanding fancy prices. Towards the close of the Lake season one large operator named circular prices on the basis of $1.25 for mine-run, but later, on Nov. 4, the Pittsburgh Coal Co. issued quotations on the basis of $1.30, slack being 90c., nut and slack $1.05, nut, $1.25, mine-run, $1.30, ¾-in., $1.40 and 1¼-in., $1.55.

The scarcity of coal was entirely relieved at the close of the lake shipping season and the market became relatively easy, though with no serious price cutting. Operators showed a fresh determination to secure a reasonable price for coal, and allow for the contingency of irregular working in figuring the cost of production and will no doubt, consider this in the future.

An event of some importance in the Pittsburgh-Lake trade was the reduction ordered in the freight rate, to go into effect May 1, 1912. For many years the rate had been 88c. and the Pittsburgh district operators, in what was called the Boileau case, demanded a reduction to give the district a portion, at least, of the advantage which its location would give it over the West Virginia and Kentucky fields. The Commission ordered a reduction to 78c., but the railroads followed this by lowering the other rates also, so that the discrimination still remained; the operators took up the case again, in their brief No. 3853, but without avail. Upon complaint of the Pittsburgh Vein Operators' Association of Ohio, submitted Apr. 6, 1912, and decided June 6, 1912, the Commission ordered a reduction in the rate from Pittsburgh No. 3 field to Lake Erie from 85c. to 75c., to restore the former differential between the Pittsburgh district and Pittsburgh No. 8.

Connellsville Coke

From November, 1911, to December, 1912, the Connellsville coke region saw the most spectacular advance in prices in its whole history, the advance occurring chiefly in 1912. In November, 1911, furnace coke for prompt shipment could easily be secured at $1.50, and the early contracts made for the first half of 1912 were at $1.55, and $1.60, contracts for the whole year being made at $1.60 and $1.65. Toward the close of December the prompt price advanced sharply, a normal performance as shipments are usually deficient over the holidays. In January, however, the market did not recede, but reached higher levels for prompt, while contract coke sold above $1.75. In April there occurred further advances, coke becoming scarcer on account of coal shipments due to the mining suspension in the union coal mining districts, and prompt furnace coke sold at $2.50 and $2.60.

Half Year Contract Prices Mount to $3.50 Per Ton

Then a number of operators decided to market their product through a Pittsburgh brokerage firm and a price of $2.50 was asked upon second half contracts. The furnace trade immediately arose in arms and a long deadlock ensued. Finally, towards the close of July, with charges and counter charges of bad faith, the brokerage firm withdrew, taking with it a number of contracts it had made for the purchase of coke. Several of the operators thus released made an arrangement with a Uniontown brokerage firm and a period of competition ensued. A condition of great activity in the iron trade had meanwhile produced a heavy demand for coke, while the capacity of the Connellsville region, little if any increased, nominally during the three years preceding when the blast furnace capacity had been materially increased, was not fully available on account of scarcity of labor. To a disinterested observer, the conditions in August seemed to justify a $2.50 contract price much more than did those in June when that mark was set, but contracts were made in August at $2.15 and $2.25. Later, when the question of contracts for 1913 came up, the Uniontown firm sold freely at $2.50. When it was sold out the market continued to advance, and in December the contract market for 1913 was close to $3.50 for the half year and near $3.25 for the year. The nearest recent approach to such prices was in October, 1909, when for a short time the market for 1910 was $2.90 to $3, with a few contracts placed at that range.

The understanding which certain sellers attempted to maintain in the summer seems to have retarded rather than to have accelerated the advance. The final figures of the year were reached under open competitive conditions, and were caused by the very simple fact that the coke producing capacity of the country, at least with the labor supply available, was insufficient to supply the furnaces for the pig iron output for which there was an assured demand. From November, 1911, to December, 1912, the advance in prompt furnace coke was from $1.50 to $4, and in contract from $1.55 and $1.60 to $3.25 or $3.50. As about 2200 lb. of coke are needed to make a ton of pig iron, the advance in the contract price increased the cost of making iron by approximately $2; the advance in this latter over the same period was approximately $4. An advance in ore occurred, increasing the cost of making pig iron by $1 a ton. At the low point for pig iron, there was an actual loss for the average furnace, and with raw materials advanced an equivalent of $3 a ton, the $4 advance simply allowed the merchant furnace to break about even.

The circumstances all showed clearly that the coke producing capacity of the country is insufficient. The building of blast furnaces proceeded more rapidly in the five years 1907 to 1912 than the development of coke making capacity. The capacity of the Connellsville region was practically stationary, naturally enough when at the prevailing rate of output the region would be exhausted in 25 to 30 years.

Market Conditions in Ohio During 1912

By J. W. Lehman*

SYNOPSIS—The year as a whole was fairly satisfactory with an increase in production of about 10 per cent. over 1911. This result was attained despite a month's idleness in April and two periods of car shortage. Perhaps the most striking feature of the entire year was the demand for steam coal which was merely the reflection of industrial prosperity.

The year 1912 was a fairly good one in the Buckeye State both from a tonnage and a price standpoint. Although the former was not as much as in 1910, which was the banner year, but is estimated to be about 10 per cent. over the output of 1911. The estimated production during the calendar year was in the neighborhood of 33,340,000 tons.

Prices were more satisfactory from start to finish. While coal operators and jobbers did not make a large profit on their investment during the year the returns were in the main much more satisfactory than in 1911. Price cutting was less prevalent during the past twelve months and small operators and shippers were able to sell their coal without resorting to shaving quotations. The general tone of the market was healthier and the year 1913 appears with a much better outlook.

The circular put into effect Sept. 1, 1911 by Hocking Valley operators prevailed during the greater part of the year. This circular was generally lived up to although during the summer months there was some discounting from the list and some price cutting. But generally speaking, all operators who had a good grade of coal to sell could get the circular figure. Domestic lump was quoted at $1.50 and ¾-in. screened at $1.35. Mine-run was quoted at $1.15 and nut held at the same figure. The market for the fine sizes such as nut, pea and slack and coarse slack was varied and depended exclusively upon local conditions. Some small inflation occurred just previous to April 1, when large users of steam grades and many railroad companies stocked up to guard against emergencies. The two-year mining scale between operators and miners in the central competitive district expired at that time and there was considerable doubt of an early adjustment. Accordingly many of the larger manufacturing plants laid in a goodly fuel supply and the larger railroad systems stocked thousands and even hundreds of thousands of tons.

Then came the suspension which lasted a full month. In Eastern Ohio districts some of the mines resumed before the month was up, but generally speaking there was an almost complete cessation of work during April. After negotiations which lasted a week or 10 days the new scale was reached, which provided an increase of 5 cents per ton, on the pick-mine plan. Other branches of labor were given a like increase. District meetings were held and the various minor problems were mostly worked out by May 1, when mines in every district were opened. It required several weeks however for the mines to get into full operation.

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The fact of the suspension, coupled with the noticeable revival in manufacturing business after June 1, caused a good demand for all grades. Another aid was the good lake traffic as the docks of the Northwest clamored for all the tonnage possible. The extra severe winter of 1911-1912 had the effect of using all of the surplus tonnage in that section and accordingly there was an unusual demand.

The next circular was issued Oct. 1, the advance being about 10 cents per ton. This was caused by the steady demand for all grades coupled with an increasing car shortage. Domestic lump was quoted at $1.75; ¾-in. screened at $1.55; and mine-run at $1.30. Domestic nut was sold at about the same price as mine-run. The prices on the small sizes again advanced in sympathy and 95c. to $1.10 was the usual figures.

An insistent demand together with a greater scarcity of cars caused another advance Oct. 21. Instead of advancing the price a small amount, the jump was fully a quarter and domestic lump was quoted at $2.00. For ¾-in. the price was strong at $1.80 and mine-run and nut were sold at $1.50 and even higher. Fine sizes were sold on the open market at anywhere between $1.10 and $1.35.

While no special circular was issued in November prices gradually became stronger until $2.25 was the usual quotation for domestic lump and ¾-in. was quoted at $2.00. Run of mine and nut were held as high as $1.75 and even stronger. It was during this period that fine coal at some points reached the $1.50 mark and even higher.

Mild weather caused a slump from the top prices of November and by Dec. 1, the usual quotations had been decreased to the circular figures of Oct. 21. During the latter part of the year a slight improvement was noted in the car supply which coupled with the higher temperatures which prevailed caused a softening. But no great weakness developed and the market is now at the complete mercy of weather conditions and the car supply.

In the other sections quotations ranged about the same, relatively as in the Hocking field. Pomeroy Bend, which is getting to be one of the important mining districts of the Buckeye State has maintained a slightly higher schedule than the Hocking Valley. The differential is somewhere between 15 and 25 cents. The field succeeded in maintaining a $1.65 circular for domestic lump the greater part of the summer although at times some coal was sold at $1.50. But with the appearance of the car shortage, which affected Pomeroy Bend more severely than any other section, prices were jumped until in October and November they were $2.35 to 2.50 for domestic lump and $2.15 to 2.35 for three-quarter inch. Fine coal in this field ranged as high as $1.65 but that point was not maintained for any length of time.

Prices in Eastern Ohio were the last to respond to the increase in other fields towards the latter part of the season. During the early part of the year ¾-in. was quoted at $1.15 and $1.20 and mine-run as low as 95c. and $1. But with the approach of the car shortage in September

prices were strengthened, but it was later before any great increase was noted. During the period of inflation in October and November three-quarter inch was sold as high as $1.65 and mine-run up to $1.50. Course slack, the grade of fine coal produced in that field was sold up to $1.25 but soon fell to $1.10 and $1.15 where it closed the year.

While figures on the year's production are not yet available authorities are busy estimating the output of the Buckeye state. As stated above it is generally conceded that there is a slight advance, likely 10 to 12½ per cent. over the previous year. This means that the production is somewhere between 33,400,000 and 34,000,000 tons.

The largest increase in any field will be in Eastern Ohio although no great development work was done in that section. Belmont County as in previous years shows up the best in point of production with possibly Jefferson County second. In the Hocking Valley, Athens County is the leader with Perry County, second. In the Cambridge field, Guernsey County will show up well with a production estimated as over 3,000,000 and possibly 4,000,000 tons.

Generally speaking the Hocking Valley will have only a slight increase if any over the records of 1911. This is due to the insufficient car supply and to a number of petty strikes which tended to curtail the production. In Meigs County which is the whole of the Pomeroy Bend field the production is estimated at 750,000 tons which is about 10 per cent. increase over the previous year.

The records of the Toledo docks of the Hocking Valley railroad for the year 1912 in comparison with 1911 are very interesting. They show the tonnage handled from Ohio and West Virginia during the past year to be in excess of 1911, 75,000 tons. The modern dock machinery at Toledo is one of the factors of the Lake trade and aids in having the Hocking Valley R.R. act as final carrier in many coal shipments from West Virginia.

Steam prices during the coming year will be much more satisfactory to the operator. Contracts which are being renewed at this time are at a more profitable rate. The lower ones are being increased or dropped altogether and the better ones are being renewed at the old figures. In the department of railroad fuel the most radical changes are contemplated. The low railroad fuel contracts are believed to be a thing of the past in the Buckeye state and this branch of the business will be looked to for its share of profits.

Practically no development work was done in the state during the year. This is partially due to the fact that 1911 was a lean year both as to tonnage and prices and as a consequence there was very little encouragement for any new mines to be opened. But in some instances mines were enlarged and the tonnage increased which makes the net result a better output in Ohio. Very few mines were abandoned because they were worked out and the small tonnage thus lost is more than counterbalanced by increased output from other workings.

Outside of the suspension of a month in April when the wage scale was signed there was practically no labor troubles during the year. Generally speaking labor was plentiful and petty differences were not as numerous as usual. One of the largest and most important troubles was the strike ordered at the mine of the Hisylvania Coal Co. at Glouster where the right to discharge for carelessness is involved. It is expected this strike will be settled in the near future.

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A Brisk Buffalo Market in 1912

SYNOPSIS—Buffalo is a center for shipments to Canada and an important port for upper Lake shipments. Some of the prices asked during the year were fictitious, the jobbers who were shipping coal being temporarily undesirous of local trade.

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The history of the coal trade throughout showed little incident during the early part of the year. Bituminous coal was still dull, as it had been for the whole of the past year or two. The consumer was entirely in control of prices, on account of the light consumption and the over production. Operators complained that they were not always able to make running expenses and some old members of the Allegheny Valley operating trade became so discouraged that they declared without hesitation that they could see no future before it. With the thin seams, so expensive to work, and the price always decidedly lower than that of Pittsburgh coal, it looked hopeless. There was always quite an amount of coal land for sale, but there were no buyers among those who understood the conditions. All that saved the market and kept the mines running was the diversion of Pittsburgh coal to other points on the lakes. Moreover, higher freight rates kept the cheaply-mined West Virginia coal out of the market.

The bituminous jobber was more hopeful. He had less at stake and he always insisted on a profit, though he often worked on a margin of 5c. a ton. In order to make any showing it was necessary to handle a big tonnage and as a rule this was done. Buffalo covers a wide district, not only in this state and eastward, but through Canada, making shipments via Detroit as far west as London, Ont., and getting into Montreal in the other direction and competing with the coal from Nova Scotia. This railroad market does not cover the upper lakes, however. The rate of freight from the mines to the lakes is sufficiently above that from Pittsburgh that such trade is entirely cut off.

On the other hand, the lake movement of anthracite is largest here, having no competition as to tonnage except from Erie, Oswego and one or two minor Lake Ontario ports, which latter usually confine their shipments to ports on that lake or the St. Lawrence River, so that Buffalo ships about five-sixths of the coal which goes by water to the upper lakes.

It has been the custom of certain leading mine owners in Pittsburgh to make a Buffalo price, covering, of course, the freight rate of $1.25 from that district. The price for 1911 had been on the basis of $2.40 net for mine-run. This had been fixed to take effect on Apr. 1, 1911, and business was so dull that even the fall trade did not materially change it and the figures were still in force at the opening of April, 1912. There had been an increase

of mining wages, however, and it was felt that some return must be demanded on that score, so the Buffalo price was made $2.47½ for mine-run, with three-quarter 15, and lump 25c. higher and slack about $2, but subject to more fluctuation.

This price grew steadily stronger as consumption increased through the summer, and anthracite became scarcer, till on the week ending Sept. 20 it advanced to $2.50, with the following further fluctuations through the year: Oct. 11, $2.55; Oct. 18, $2.70; Oct. 25, $2.85; Nov. 22, $3.15; Nov. 29, $2.65 for contract; Dec. 6, $2.90.

Here is a steady advance of 40c. from the low point, which had been maintained for more than a year, or over 17 per cent. In spite of the fact that a great part of the bituminous coal had been tied up in the spring by contracts at $2.10, or so, this at once put the trade on its feet, where it will remain so long as the consumption exceeds the output. An explanation is needed of the peculiarly sharp advance made for a short time in November and the prompt decline a short time later. The prospective closing of the lakes with insufficient coal shipped by that route to last till spring caused the mines in that trade to issue price quotations which were in a sense fictitious, in order to shut off orders. Soon after the closing of the lakes a surplus was produced, and in adjusting itself the market for a short time was too low.

The Allegheny Valley market, which does not depend on the lake trade, did not show either of these fluctuations, and though its coal commonly sells at 15 to 25c. less than Pittsburgh, there was for a short time the anomalous state of the two markets which placed Allegheny Valley coal above Pittsburgh prices. There is not so very much competition between the two, as a rule, as each finds its own market.

In the anthracite trade the shortage has been so great that the year has shown many peculiarities While the larger mines made no advance in price on that account, the independent interests were released from the old arrangement of turning over their coal to the roads at 65 per cent. of the tidewater price, and they at once went into the open market and sold their coal at a premium.

Aided by a hue and cry from the daily press that "coal" was about to advance to $10 a ton, the independent operators early began to get a premium, which in some cases where quick delivery could be assured, rose to $2.50 a ton, and would doubtless have remained there but for the warm fall. On Dec. 20, the premium had fallen to $1.25, on account of the gain made on their shortage by the bigger anthracite companies. On that date a leading shipper declared that with a continuation of the mild weather he would cut out the premium entirely in ten days.

It is common for the anthracite shippers to load a large amount of coal in Buffalo harbor during the winter. The larger sizes commonly accumulate during the latter part of that season, and it is cheaper to put such coal afloat at an extra freight of 10 to 15c. a ton than to stock it, especially since it enables the lake shipments to begin in full strength on the opening of the lakes. So hard was the winter, however, that no coal could be so loaded last spring, and with a two-months' mining suspension to face, there were only 650 tons shipped by lake in April and only 39,600 tons in May, so that the resumption of mining at the end of the latter month found the lake shipments of anthracite from Buffalo about 700,000 tons behind that of former seasons. Only by mighty efforts have they been able to make up that shortage. The following figures will show that this has practically been done:

LAKE SHIPMENTS OF ANTHRACITE BY MONTHS

	1910	1911	1912
March	25,541	.....	.....
April	418,638	193,325	650
May	482,289	412,694	39,600
June	430,800	590,265	440 250
July	493,450	711,539	606,885
August	522,550	573,466	713,547
September	331,190	428,280	681,421
October	426,250	470,760	759,300
November	486,300	498,650	614,600
December	21,600	38,450	68,600
Totals	3,639,368	3,917,429	3,925,003

The late start in 1911, shown by the above table, is on account of late lake opening, but the suspension of mining is responsible for the lateness in 1912.

TOTAL COAL AND COKE EXPORTS FROM BUFFALO

	Anthracite	Bituminous	Coke
1912, January	99,957	254,267	29,136
February	78,154	276,267	27,476
March	113,845	305,831	35,977
April	19,285	290,492	36,651
May	3,123	169,201	42,275
June	94,013	124,107	26,517
July	168,274	149,590	38,993
August	160,454	199,239	40,353
September	137,131	193,371	29,869
October	154,075	211,971	35,175
November	106,515	199,459	33,239
December	99,734	235,294	47,823
Totals, 1912	1,234,564	2,609,702	423,524
Totals, 1911	1,695,035	2,620,727	416,069
Totals, 1910	931,378	2,014,762	420,805

Birmingham, Ala.

SPECIAL CORRESPONDENCE

The coal market for the year 1912 has been a cause of much satisfaction, when the whole year is considered. All the owners of well managed mines have profited beyond their expectations and are highly optimistic in regard to the prospects for 1913.

The winter of 1911 and 1912 was about the severest ever experienced and coal business was correspondingly good. To add to this favorable situation the English strike lasted well into spring. The season was unusually cold and wet, and from the first of the year to July 1 all output records were beaten. The expectation of a strike in Pittsburgh on Apr. 1 served to stimulate the market and many users stocked up heavily for fear that the trouble might become nation wide.

During the summer months this artificial market reacted and worked a hardship on many of the mines for a short while. The car shortage has been and is still serious on some of the railroads in the district, and this reduction in tonnage during the fall and winter resulted in abnormal prices on both steam and domestic coals.

The coke market as a whole has been satisfactory and the average price a fair one. The estimated coal output of Alabama for 1912 is 18,000,000 tons which is about 2,000,000 tons higher than the record of 1910.

MONTHLY PRICES OF CAHABA FANCY LUMP DOMESTIC COAL

	1908	1909	1910	1911	1912
March	2 00	2 00	2 10	2 10	2 25
April					
May	2 25	2 25	2 30	2 30	2 35
June	2 35	2 25	2 40	2 40	2 50
July	2 50	2 50	2 55	2 55	2 60
August	2 65	2 50	2 65	2 65	2 70
September	2 75	2 75	2 75	2 75	2 85
October					
November					
December	2 75	2 75	3 00	3 00	3 00
January					
February					

These figures will be interesting to parties who are not in the coal trade and who are prone to condemn the retail coal dealers on account of high profits apparently made by them. However, in justice to the mines producing Cahaba domestic coal, it must be understood that these prices are on Fancy Lump coal, which is the cream of their product. The average price obtained for the entire output of the mines is probably less than one-half the prices quoted.

Mississippi Valley Trade in 1912

By E. J. Wallace*

The year 1912 comes to a close as a rather successful one for the operators in the high-grade fields of Williamson, Franklin, Perry, Jackson and Saline Counties. The prices for the entire year have been above the average, and while, as usual, there was a car shortage that kept the buyer and large consumer in a rather uneasy position, yet it served to keep the price for the greater portion of time above the cost of production, in a field where the supply exceeds the demand.

The threatened suspension of last spring was a stimulant to the market until the bubble burst in April, and there was a curtailing of tonnage from that time until July 1, in order to get the market in a healthy condition. From then on, however, the demand has continued to grow, and with it the price, until at the close of 1912, the Illinois operator has a better looking profit column than for the past three or four years.

The Illinois field lost considerable ground in various sections during 1912, especially in Louisiana, Texas and Arkansas, on account of the expansion of the gas and oil fields. It also lost a large tonnage in the northern markets to the smokeless coals of West Virginia, and is failing to get its proportion of the business in the extreme Northwest on account of the growing popularity of better coals from the states of Wyoming and Colorado. With all this, however, the tonnage in the Illinois field the past year will show an increase of from 8 to 15 per cent.

Very few mines during the past year have been abandoned, while a considerable number of new ones have been opened, and the producing capacities of several others have been increased from 25 to 50 per cent. There are no complete figures at this time to show what the production for 1912 has been, but it is estimated at between 55,000,000 and 60,000,000 tons. The mines of the state can produce fully 100,000,000 tons, while the market for Illinois coal cannot take care of more than a little over half that amount. The over-production has occasionally forced Illinois coals into foreign markets at a price below cost.

The year 1912 has seen the starting of a coke industry in the state, at Joliet and other points in the northern and central sections. This coke is of a byproduct nature and will be used by the United States Steel Corporation and allied companies, in their own plants with little if any going to the open market.

In the inner belt field, which embraces the counties to the east of St. Louis and within a radius of 50 miles, there has been an increased output, but on account of the irregularity of its production it is hard to estimate its amount. This field has been kept down to such an extent that it is doubtful if a majority of the operators will make any money, as they have been practically running their mines without breaking even on the selling end of the business.

In the face of these conditions, new mines are gradually being sunk and the capacities of others increased, and it is a problem as to where this tonnage will move to in the course of the coming year.

St. Louis Coal Trade

Everything considered, the St. Louis market has been unusually good during 1912, as compared with other years.

The year started discouragingly, but the severe weather that followed and the threatened suspension kept the market in a healthy condition until the controversy between the miners and operators was settled. This event had a very distressing effect upon every coal field that caters to St. Louis, for it developed so hastily that hundreds of cars of coal that were being held in storage or which were in transit from outside fields, were thrown upon the market and sold at far less than the producing cost. This kept a poor market from March to July.

Since Aug. 1 there has been a gradually growing demand, with which prices have kept pace so that by the first of October the market went as high as at any time previous to the threatened suspension of last spring. The car shortage and lack of motive power on the principal coal roads in the Illinois field (from which St. Louis draws practically its entire supply) helped keep the prices up until the close of the year.

The past year has seen a big increase in the consumption of smokeless coal and coke—at least 75% greater than 1911, and smokeless fuels will continue to grow in favor. The amount of domestic coke consumed in the St. Louis market for 1912 is estimated at 175,000 tons net. The estimated West Virginia smokeless tonnage at from 75,000 to 100,000 tons. The coke and smokeless coals have displaced a large tonnage of anthracite in 1912, on account of the scarcity of the latter. As a rule there is an annual call for about from 250,000 to 300,000 tons of anthracite, but the irregular movement this year has brought the 1912 tonnage down to perhaps 150,000 net tons.

The Arkansas semi-anthracite field contributed largely in past years to the St. Louis market, but not more than 5000 tons have moved in during 1912. No Missouri coal enters, and only during strike times is there any movement of coals from Indiana or Kentucky.

*St. Louis, Mo.

Lignite in the United States

J. A. Holmes, director of the Bureau of Mines, gives the following table to illustrate the extent of lignite deposits in the United States:

	Lignite. Sq. miles.	Sub. Lignite. Sq. miles.
Alabama	6,000	
Louisiana	8,800	
Tennessee	1,000	
Arkansas	5,900	
Texas	53,000	
North Dakota	31,000	
Montana	7,000	8,800
Wyoming		21,360
Washington		1,100
New Mexico		5,000
Colorado		5,910
Idaho		1,200
Totals	116,700	43,370

EDITORIALS

Statistics of reasonable commercial accuracy, published promptly, are of much greater value to technology and trade than are figures corrected to the last unit, which are printed six months or a year later. We are sure there is a real need for an annual statistical number such as we are publishing today. Considerable time has been spent in an effort to make this issue of COAL AGE worthy of careful attention, and we believe the approximations given in the different reviews will prove to require only slight, if any, revision.

A Suggestion to Mine Operators and State Inspectors

It is a fact that this country, of all the more civilized nations producing coal, is slowest in getting out accurate yearly production statistics. The U. S. Geological Survey, through its Division of Mineral Resources, makes an effort to fill the need for prompt and authentic coal-mining data, but the results have been unsatisfactory.

Perhaps the fault is largely with the federal officials, and undoubtedly the different state mine inspectors as individuals are greatly to blame; however, the owners and operators of mines are not above criticism. Frequently the companies delay their production returns for no reason other than negligence, and thus the work of issuing final figures showing total output is greatly hampered.

There is no reason why complete production figures for every coal company in America should not be in the hands of the chief state inspector one week after the close of the year, and the industry should have the final corrected totals before the end of January.

Then there is the matter of a common fiscal year for each and every state. In a number of cases the year closes June 30; in other instances, Sept. 30 is the time specified. Why can we not have all reports made out for the calendar year ending Dec. 31? Surely this plan would be simpler.

Every coal man in every state is vitally interested in the industry as a whole. Those inspectors who wish to improve both the efficiency and general value of their work, and at the same time gain a reputation for prompt, definite action, would do well to entertain the idea of abolishing the dilatory tactics now so prevalent. Of all abominations to the average mind, none is more abhorrent then archaic facts.

Danger from Water Hammer

The liability of long steam lines to failure through water-hammer is a source of danger not generally recognized around mines. When pumps, fan engines or similar apparatus connected to such lines are shut down, unless they are continuously drained, a large amount of steam is certain to condense in the piping. This should be gradually and thoroughly drawn off before any attempt is made to start the machinery again.

After such a period of idleness even the sudden opening of a large drain valve near the end of the line may have disastrous results. Such a procedure puts the steam and water in the pipe in motion and the latter, provided its amount is sufficiently great, acts precisely as a liquid plunger or piston and strikes any obstruction or sharp bend in its path with the force and suddenness of a blow. This action is particularly destructive to cast pipe or fittings.

A recent accident in an English colliery, which resulted in the destruction of a portion of a long steam line connected to a fan engine, was attributed to this cause. It should be mentioned also, that, in disregarding the instructions of his superior and entirely closing the drain valve while his engine was shut down, and then attempting to draw off the water quickly by fully opening this valve, the unfortunate attendant paid the penalty of his disobedience with his life. Even in coal mining it usually pays to be careful and to obey instructions.

Revision of the Pennsylvania Anthracite Code

The sub-committee of the commission appointed to revise and codify the present anthracite mining laws have recently submitted their report.

The commission appointed by Governor Tener, under the act of 1911, consisted of the folowing: Sterling R. Catlin, state senator, Wilkes-Barre; E. E. Jones, Harford; James E. Roderick, chief of Department of Mines, Harrisburg; H. C. Morgan, Scranton; Martin A. Nash, Glen Carbon; W. G. Robertson, Scranton; Peter O'Donnell, Wilkes-Barre; William D. Owens, West Pittston; William R. Reinhardt, Shamokin.

The commission organized by the election of Senator Catlin, chairman, and Peter O'Donnell, vice-chairman; William W. Hall, Wilkes-Barre, was appointed secretary and counsel. A sub-committee was then chosen to draft a suitable code for presentation to the commission for their consideration. The sub-committee consisted of James E. Roderick, Peter O'Donnell and William D. Owens.

The experience of Mr. Roderick, in the compilation of the first anthracite law (1870), and its amendment in 1885 and, later, as a member of the mine commission, appointed (1907) to revise the bituminous law, together with his knowledge of conditions as chief of the Department of Mines, rendered him capable of outlining to a large degree the work of the committee.

To say that the work of drafting such a code is gigantic, expresses but feebly the measure of the task. The difficulty of adjusting the many conflicting conditions would be and *is* superhuman, except as the several con-

tending parties, each striving for individual interests, are willing to recognize each others' rights, and enroll under a common standard, in the onward march of progress.

Carroll D. Wright, former commissioner of labor, is credited with saying that the difficulties surrounding the adjustment of interests between capital and labor are practically insurmountable, except by a mutual full recognition of the Golden Rule and the application of the principles of Christianity.

This statement, coming from one having the broad understanding of Commissioner Wright, is worthy of the most careful study and earnest consideration. Without the "mutual recognition" of the rights of another, we cannot hope for harmony; and without harmony there can be no permanent progress. Ignore the Golden Rule and it becomes impossible to frame a mining code that will be satisfactory to the operator and miner alike.

The first essential of a mining code is *equity*. The code must define clearly the responsibilities of employer and employee alike. There is no paternalism in the operation of a mine. Every man employed in the mine is responsible, to a degree, for his own safety and that of his fellows. SAFETY is the first consideration, to which the cost of operation must always be subordinate. The responsibility for safety is twofold; it does not rest wholly on the employer, but devolves alike on the employee. This division of responsibility must be clearly defined by the law governing mine operations.

The responsibility of the owner or operator ends with the provision of a recognized reasonably safe equipment and management of the mine and its operations, in conformity to the terms of an adequate mining code. The responsibility of the miner begins when he enters the mine. He must exercise reasonable care, observe proper precautions, possess a fair amount of knowledge of mining conditions, and obey absolutely the regulations of the mine and the instructions of the mine officials and fulfill all the requirements of the mining laws.

To every practical mining man nothing is plainer than the fact that every mineworker must assume certain legitimate risks common to his calling. A mining company does not run an insurance business or guarantee protection of life to employees, beyond a liability for accident due to the neglect or mismanagement of an official, or inefficient equipment.

Speaking of liability for accident, there are at least four responsible sources to which liability for accident may attach, and of these the first two are the only ones that can be said to offer a fair chance of recovery. They are as follows:

1. Neglect of government to provide adequate laws and inspection service;
2. Neglect or mismanagement of officials or inefficient equipment;
3. Neglect, carelessness or ignorance of a fellow workman;
4. Self-neglect, carelessness or ignorance.

Government that does not provide a fair degree of protection for the citizen does not fulfill the purpose of its existence, and such failure is culpable. The failure on the part of any person charged with the official management, supervision, inspection, or operation of certain work, machinery or men, to properly perform his duties, renders the corporation, company, owner, or employee liable for the results of such failure.

The law, however, distinguishes between the act or neglect of an official, for which the company is clearly liable, and that of a fellow workman, for the result of which it is generally held the employer is not responsible more than for accident due to one's own act or neglect.

What the commission will finally do with the report of its committee remains to be seen. An open session is announced to be held Jan. 14, 9:30 a.m., at which time the operators will be given a hearing. Following this, on the 15th, the miners will be heard. Little is to be expected, in the way of harmony, from these hearings. The commission will listen attentively to the presentation of each side; but to devise measures that will satisfy both parties and insure safety is a difficult problem.

One of the contemplated changes in the present law is the return to the previous system of appointing mine inspectors instead of electing them by popular vote, in each district, as has been the practice in the anthracite region since 1901. There can be no doubt, in any unprejudiced mind, that it is an unmitigated evil to expose any official whose duty is that of inspection to the caprices of a popular election. It is clear to the candid mind that such a law tends to develop an artful politician rather than a fearless inspector.

Let us get back once more to the principles of civil-service reform, and work to remove, as far as possible, the office of mine inspector from the influence and control of politics. Let us demand a high grade of intelligence, an ample mining experience and acquaintance with practical conditions in and out of the mine, and a character above reproach, of all candidates for this important office.

The qualifications we mention are rarely combined in man, and when found are not appreciated by contending parties at the polls. The strongest proof of qualification and fitness for office is efficient service, and no one knows better the character of the work performed by state inspectors than the highest state officer, who is ultimately responsible for their every act. This fact alone should recommend the appointive system to every member of the commission who seeks the best interests of mining.

COAL AGE will watch with interest the work of the commission, and will gladly voice the comments of contributors.

Spontaneous Combustion Underground

Depth from the surface is not always a determining factor in the matter of underground mine fires. An example can be given of two collieries working at identical depths and having apparently similar conditions, fires occurring frequently in one case and being unknown in the other. It is clear, however, that if a seam is predisposed to spontaneous combustion, the greater the depth, the greater the danger. The grinding action of the roof will be increased and the natural temperature of the coal will be higher at 2700 ft. than at 2000 ft.

One experimenter recently took the temperature of the strata at a depth of 2660 ft. It was 93½ deg. F. This is exactly the temperature obtained by calculation, allowing a constant temperature of 50 deg. at a depth of 60 ft. and an increase of 1 deg. for every subsequent 60 ft. The British Royal Commission on Mines has fixed the greatest workable depth of coal at 4000 ft. The temperature in such a bed would be 114 degrees Fahrenheit.

DISCUSSION BY READERS

Cost of Mining Anthracite Coal

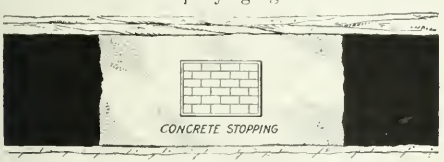
In the excellent article by Eli T. Conner, COAL AGE, Nov. 23, p. 708, he speaks of the propriety of including, in the cost of operation, the charge for coal consumed at the colliery, as is done at well managed bituminous mines. He further states that this is not done, to his knowledge, in the anthracite region.

While it may not appear in the cost sheets of any of the anthracite coal companies, yet it was once the custom with one of the then largest individual producers of anthracite coal, to always include this item in the costs, charging it up on the basis of the price of its cost at breaker. The effort was also made to use but the very small sizes, for local consumption: except in cases where locomotives, which used a larger size, were used, or in cases where there was not a sufficient amount of the smaller sizes made. In such cases the coal for the boilers was often transported from other near-by collieries where the coal was more brittle and small sizes were in excess of the requirements and brought a lesser figure in market. Mr. Conner is correct in stating that this fuel supply should be included, since these small sizes cost as much to produce, less the royalty, as the larger sizes that are sold to the trade. Moreover, no statement of the cost of operation is complete without this item of fuel.

Emergency Stoppings—A Suggestion

Referring to the question of short-circuiting the air current in a coal mine, as suggested in the recent discussion of reversible fans, it occurred to me that the following suggestion of what might be called an emergency stopping would be of value, in this connection.

For some time past I have been building, at certain principal points in the mine, a stopping similar to that shown in the accompanying figure. The chief feature



A So Called Emergency Stopping

in this stopping is that it contains a central opening from 2 to 3 ft. square, supported by a wooden frame, or pit rails may be used for this purpose. This opening is closed by brick masonry, which can be bumped out by a mine post, in case of need. By this means, the air can be quickly short-circuited without damaging the stopping. The main body of the stopping can be of concrete or of brick and masonry, as desired.

F. P. Mank,
Mine Foreman, Pittsburgh Coal Co.
Fair Haven, Penn.

Firing Shots by Electricity

In Coal Age, Dec. 14, p. 832, Geo. M. Brown described the conditions under which a violent explosion occurred Nov. 20, 1912, in mine No. 38 of the Rock Island Coal Co., at Alderson, Okla. An electric shotfiring system was in use at the mine, the shots being fired simultaneously, by throwing a switch at the surface when all was ready. The holes were charged and tamped by shotfirers, who also connected the wires. This was the second explosion, in this mine, since the electric shotfiring system was installed.

As the system of firing shots by electricity has been adopted at a number of mines in Oklahoma, the managers of these mines are naturally concerned to know whether this method of firing shots is particularly dangerous or or whether the explosions in Mine No. 38 were the result of local conditions.

The question is: Is it safer to fire all the shots in a mine, together or at one time as a single blast, than to fire the same shots singly, at fixed intervals? A definite answer to this question can only be given with the full knowledge of the conditions in each case. There are, however, certain general features pertaining to shotfiring that should be carefully considered before a final conclusion can be reached regarding the choice of methods in firing shots.

I have often stated that, in my judgment, the presence of a concentrated dust-carrying, return-air current acted upon by a shot's flame, is sure to start a dust explosion. If this be true, it appears that the margin of safety claimed for the method of firing shots singly may be much reduced or wiped out entirely through the absence of anything to prevent the concentration of a strong dust-laden, return current at the face where the shot is fired.

On the other hand, the firing of all the shots in a mine, at one time, may have some dangerous features that are absent in firing a single shot at a time. These dangers, however, may be minimized or eliminated altogether through the prevention of the draft concentration to which I have referred, toward one point. For example, if 100 shots are fired simultaneously their combined power to produce strong draft is, of course, much greater than the draft-producing power of a single shot; but the effect on each shot is very much less. My point is that if every one of the 100 shots fired simultaneously, produced an equal effect, the draft affecting each shot would be less than, say 10 per cent. of that which would be felt by any one of these shots fired singly. Should two or more of the 100 shots fired together develop more heat than the others the greater induced draft toward them would probably still be insufficient, under ordinary circumstances, to produce explosive results.

If then the division of dangerous draft can be considered a protective feature, it would seem that the more extensive the firing area and the greater the number of

shot fired at the same time, the less would be the amount of draft affecting each shot and the more remote the danger of an explosion. From Mr. Brown's statement it appears that, in the mine above mentioned, the shots were fired in sections and not simultaneously all over the mine. This method produced a strong concentration of draft into each section as it was fired; and this may have had considerable influence in starting the explosions.

Regarding the ventilation of mine No. 38, Mr. Brown states: "The ventilating fan is always stopped when the shots are fired, but in this particular mine the natural ventilation is strong. * * * * * I believe that the natural ventilation should be stopped to prevent fresh air from traveling along the entries while the shots are being fired." I share Mr. Brown's belief in this regard. It has been shown in several instances, where dual explosions had set coal or timbers on fire, that subsequent explosions occurred at short intervals and did not cease until the mine openings were sealed air-tight. If the closing of the mine openings prevented explosions in these cases, why not in others?

About a year ago I answered an inquiry asking for my views regarding the value of emergency doors at all the mine openings and in part I gave my opinion as follows: "I believe that, under certain conditions, the use of such doors will prove a great aid in the prevention of dust explosions." When I made that statement one of the conditions I had in mind was the simultaneous firing by electricity of all the shots in a mine. If such emergency doors are used they must be substantially built and be practically air-tight; and they must be rigidly fastened so that they cannot be opened by the force of reaction. This is essential to secure sucess. Explosions have occurred with the shafts partly blocked, they occurred with the shafts nearly sealed up, they ceased to occur after the sealing was complete.

If a theory is right, it is right all the way through. If the manager of a mine, where electricity is used in firing all the shots from the surface, believes that the admission of strong draft during shotfiring time is a menace and shows his belief by stopping the fan, why should he hesitate about closing the mine openings tight at firing time, especially in view of the fact that nobody's life is placed in danger thereby and that the doors need be kept closed only for a few minutes?

JOHN VERNER.

Chariton, Iowa.

Trolley Guards in Low Coal

I was interested in the inquiry of Robert J. McTaggart, COAL AGE, Dec. 7, p. 808, in regard to suitable protection for the trolley wire, in mines. I am familiar with the conditions in Mr. McTaggart's field, and, as our own conditions are similar, and we have experienced the same difficulty, I thought the following suggestion would be helpful.

In our mines we have adopted a system that I believe to be vastly superior, cheaper, and more convenient than anything so far described. The system is in use at our Carney mine, and has proved very satisfactory. Holes are drilled in the roof and ⅝-in. expansion bolts are used to support a stirrup, as shown in the accompanying Fig. 1. This stirrup is a piece of strap iron 1x⅜ in., bent so as to provide a 4-in. hook or hanger on each arm of the stirrup. The stirrup straddles the trolley wire without touching it, and supports 4-in. pieces of yellow pine, 1 in. thick and 14 ft. long.

These wooden strips form a sufficient guard for the protection of the trolley wire. They possess the advantage that they are easily put up or removed at any

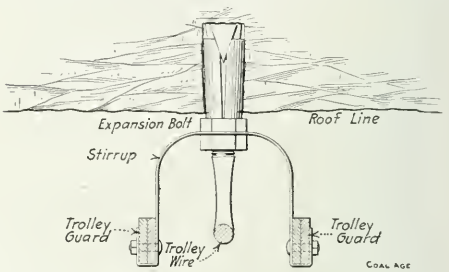


FIG. 1. SHOWING A SIMPLE FORM OF TROLLEY GUARD

time when desired. In our experience, we have found no nails or fastening of any kind necessary to hold the boards in place, although many prefer to bolt the strips to the stirrup, using a ½x3½-in. bolt for this purpose.

THOMAS FISH.

Latrobe, Penn.

Another Letter—The swinging board forms what may be called a shield for the trolley wire and serves several purposes. It has the following advantages: It is easily installed and, because of its swinging motion, the board is not as easily broken or torn down by being struck by anything passing under it.

The cut shown, Fig. 2, explains clearly the manner of hanging the boards by means of drift bolts in the roof. The drift bolts are of the ordinary expansion type having a hook at the lower end of the bolt. The eye hasps are

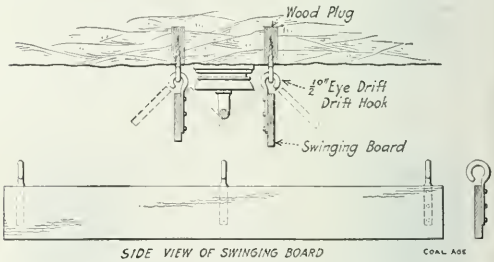


FIG. 2. A SWINGING BOARD TROLLEY GUARD

secured to the boards by ⅜x1½-in. bolts, or they may be nailed firmly to the board. These hooks should be turned outward and at right angles to the trolley wire, while the eye of the hasp is parallel to the board or wire. The hooks are first placed in position in the roof and care must then be taken to space the hasps at the same distance apart on the board. The dotted lines, in the figure, show the position to which the board swings when struck by anything passing under it. For shielding the wire on curves, shorter lengths of boards can be used.

E. J. CHRISTY, Electrician,
The Troll Mining Company.

St. Clairsville, Ohio.

EXAMINATION QUESTIONS

Illinois Examination Questions

(*Answered by Request*)

Ques.—In what time can an engine of 40 effective horsepower pump 4000 cu.ft. of water from a depth of 360 ft.?

Ans.—The weight of water to be lifted is

$$4000 \times 62.5 = 250{,}000 \text{ lb.}$$

To lift this weight of water from a depth of 360 ft. will require

$$250{,}000 \times 360 = 90{,}000{,}000 \text{ ft.-lb.}$$

With 40 effective horsepower, there will be available to lift the water

$$40 \times 33{,}000 = 1{,}320{,}000 \text{ ft.-lb. per min.}$$

The time required to raise this water is then

$$\frac{90{,}000{,}000}{1{,}320{,}000} = 68.18 \text{ min.; or 1 hr., 8.18 min.}$$

Ques.—With a water gage of 0.4 in., a fan is making 80,000 r.p.m. and producing, at this speed, 35,000 cu.ft. of air per minute. What quantity of air will this fan produce, at the same speed, under a water gage of 0.8 in.?

Ans.—Assuming the efficiency of the fan remains unchanged, the power on the air will be the same for the same speed of the fan. The power on the air remaining constant, the volume of air in circulation varies inversely as the pressure per square foot. In other words, the volume ratio is equal to the inverse pressure ratio. Calling the required volume of air x

$$\frac{x}{35{,}000} = \frac{0.4}{0.8} = \frac{1}{2}$$

$$x = \frac{35{,}000}{2} = 17{,}500 \text{ cu.ft. per min.}$$

If the fan is properly designed, the efficiency of the ventilator will be increased, under the increased water gage; and, as a result, a larger proportion of the power becomes effective on the air and a less indicated horsepower of the engine is required to produce the same speed of the ventilator; but, for a *constant* power of the engine, the volume of air in circulation may be considerably increased under the increased water gage. It is difficult to tell what any particular fan will do, under these conditions, because so much depends on the type and construction of the fan and the speed for which the fan is designed.

Ques.—There is 10,000 cu.ft. of air passing on an airway, having a rubbing surface of 24,000 sq.ft. and a sectional area of 20 sq.ft.: what is the water gage producing this circulation?

Ans.—The unit of ventilating pressure, in this case, is

$$p = \frac{ksq^2}{a^3} = \frac{0.00000002 \times 24{,}000 \times 10{,}000^2}{20 \times 20 \times 20} = 6.0 \text{ lb.}$$

The water gage corresponding to this ventilating pressure is, then

$$w.g. = \frac{6.0}{5.2} = 1.15 \text{ in.}$$

Ques.—What horsepower will an engine exert when yielding 60 per cent. of duty (efficiency 60 per cent.) and circulating 100,000 cu.ft. of air per minute, under a water gage of one inch?

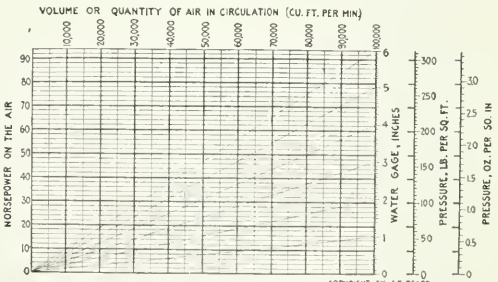
Ans.—The work performed, or the effective work per minute is

$$H = \frac{Qp}{33{,}000} = \frac{100{,}000 \times 1 \times 5.2}{33{,}000} = 15.75 \text{ hp.}$$

If the efficiency of the engine is 60 per cent., the indicated horsepower of the engine is

$$I.hp. = \frac{15.75}{0.60} = 26.25 \text{ hp.}$$

For the sake of illustration, we insert here a convenient diagram for finding the horsepower required to pass



POWER-VOLUME-PRESSURE DIAGRAM: To find the power required to pass any given volume of air against any given pressure of water gage, follow the diagonal line corresponding to the given water gage to its intersection with the vertical line corresponding to the given volume and read this point of intersection on the power scale at the left of the diagram. For example, it requires 50 hp to pass 80,000 cu. ft. of air per minute, under a 4-inch water gage or, reversing the order, 30 hp will pass about 96,000 cu. ft. per minute under a 2-inch gage. Since the power is proportional to the quantity and pressure alike, in order to deal with higher values than those given in the diagram, it is only necessary to treat these as multiples of the values given in the diagram. Thus, 100 hp. would pass 160,000 cu. ft. under a 4-inch gage, or 320,000 cu. ft. under a 2-inch gage. The horsepower in this diagram is the power on the air, which is commonly, in fan practice, 60 per cent. of the horsepower at the engine or the i.hp.

any quantity of air under any given water gage or pressure, expressed in pounds per square foot, or in ounces per square inch. In fan ventilation, the ventilating pressure is often expressed in ounces per square inch. The diagram needs no further explanation than what is given.

Ques.—A mine is producing 40,000 cu.ft. of air per minute, with 10 hp.; how many horsepower will be required to produce 60,000 cu.ft. per min., in this mine?

Ans.—The effective horsepower or the horsepower on the air varies as the cube of the quantity of air in circulation. In other words, the horsepower ratio is equal to the cube of the volume ratio. Therefore, calling the required effective horsepower, in this case, x

$$\frac{x}{10} = \left(\frac{60{,}000}{40{,}000}\right)^3 = \left(\frac{3}{2}\right)^3 = \frac{27}{8}$$

$$x = \frac{10 \times 27}{8} = 33.75 \text{ hp.}$$

This relation does not hold in regard to the indicated horsepower of the engine, since there is a change in the efficiency of the engine, as the speed of the fan is increased.

Chronology of Coal Mining in 1912*

JANUARY

Jan. 1—Virginia Iron, Coal & Coke Co. secured a $9,000,000 contract for furnishing locomotive fuel to the Boston & Maine R.R.

Jan. 4—Meeting of the Western Federation of Miners at Denver, Colo.

Jan. 5—Shops and engine house at the drift mine of the Davis Coal & Coke Co., at Thomas, W. Va., destroyed by fire. Loss, $12,000.

Jan. 7—Portion of the plant of the Galloway Coal & Coke Co., Carbon Hill, Ala., destroyed by fire. Loss, $50,000.

Jan. 10—Committee appointed by Gov. Tener to revise and codify anthracite mining laws of Pennsylvania.

Jan. 15—U. S. Supreme Court rendered decision upholding an employers' liability act as constitutional.

Jan. 16—American Federation of Coal Operators permanently organized at Chicago. The 23d annual convention of United Mine Workers of America met at Indianapolis.

FEBRUARY

Feb. 2—Breaker and colliery building of the Connell Anthracite Coal Co., Bernice, Penn., destroyed by fire. Loss, $150,000.

Feb. 6—Boiler and engine houses of the North Breeze Coal Mining Co., Breeze, Ill., destroyed by fire. Loss, $50,000.

Feb. 18—Plant of the Knickerbocker Briquette Co., Murphysboro, Ill., destroyed by fire. Loss, $100,000.

Feb. 22—Fire in No. 5 mine of the Western Coal & Mining Co., Lehigh, Okla., resulted in the death of eight men.

Feb. 29—Over 1,000,000 coal miners in Great Britain went out on strike for a minimum wage.

MARCH

Mar. 13—Anthracite operators formally rejected mine workers' demands.

Mar. 15—Officials of the United Mine Workers refused counter proposition of the anthracite operators.

Mar. 19—Interstate Commerce Commission ordered a 10c. reduction on the Pittsburgh-Lake freight rate.

Mar. 20—Conference between bituminous operators and miners opened in Cleveland, Ohio.

Mar. 29—Compromise agreement effected between bituminous operators and miners in conference at Cleveland.—Supervision of work in anthracite mines of Pennsylvania was ordered by offinials of United Mine Workers.—Bill providing minimum wage for miners became a law in Great Britain.

APRIL

Apr. 2—Complete suspension of work at anthracite mines of Pennsylvania, and at a large percentage of bituminous mines in central competitive field.

Apr. 6—Coal strike in Great Britain officially declared at an end.

Apr. 10—Bituminous miners ratified Cleveland wage scale agreement.—Conference of anthracite operators and miners opened in Philadelphia.

Apr. 18—Fifty thousand miners in Pittsburgh district returned to work.

Apr. 20—Central Pennsylvania miners and operators agreed on a two-year contract.

Apr. 25—Two-year bituminous wage scale contract formally signed at Indianapolis.

MAY

May 1—Wage scale agreement reached in Kanawha field of West Virginia.

May 2—Representative of anthracite miners refused to accept agreement reached by subcommittee of miners and operators, Apr. 25.

May 6-11—Serious rioting in various parts of anthracite field.

May 7—Illinois miners voted to accept wage scale and returned to work. Contract signed May 17.

May 11—Miners of western Kentucky voted to return to work, pending arbitration over wage scale.

May 15—Wage scale agreement for Hocking district, Ohio, signed.

May 18—Convention of anthracite miners voted to accept agreement of Apr. 25. Contract signed, May 20; general resumption of work, May 22.

May 29—Iowa miners voted to accept proposed agreement and return to work.

May 30—Wage scale contract signed for Missouri, Kansas, Oklahoma and Arkansas.

May 31—Wage scale contract signed for bituminous field of Indiana.—Miners attacked guards in Paint Creek district, W. Va.

JUNE

June 1—Striking miners evicted from company houses of Great Lakes Coal Co.

June 3—Miners on strike in Terre Haute section, Indiana, returned to work.

June 10—Wage scale agreement between operators and miners of Pomeroy Bend, Ohio, signed.

June 21—Interstate Commerce Commission denied further reductions on bituminous coal from Pittsburgh district to Great Lakes.

June 28—Fire at Twin shaft, Pittston, Penn.

JULY

July 1—Attorneys representing miners of Paint Creek district asked court for injunction to restrain coal operators from maintaining guard system.

July 8—Majority of mines of the Spadra anthracite coal field, Arkansas, started up.

July 23—Union mine of Sullivan, Ind., idle during miners' strike, resumed work.

July 25—Continental Coal Corporation opened up five new mines at Wallsend, Ky.

AUGUST

Aug. 1—Extension of the Western Maryland R.R. to Connellsville, Penn., put in operation.

Aug. 7—Girard colliery at Ravens Run, Penn., destroyed by fire. Loss, $175,000.

Aug. 9—Fifteen hundred more miners went on strike in Kanawha field, W. Va.

Aug. 12—Western Allegheny R.R. Co. placed in hands of receiver.

SEPTEMBER

Sept. 12—Experimental mine explosions conducted at Bruceton, Penn.

Sept. 20—Eight thousand men went on strike at Pottsville, Penn.

Sept 25—Several small railroads in southwestern Pennsylvania consolidated with the Baltimore & Ohio R.R.

OCTOBER

Oct. 12—Forty-five perished in fire in North Mount Lyell mines, caused by blowing out of a motor fuse.

Oct. 25—Strike in Kanawha field spreads to Solvay Collieries Co., Kingston, W. Va.

Oct. 26—First anual field day of Penn. Soc. Mine Foremen.

Oct. 29—Celebration of John Mitchell Day in anthracite region.

NOVEMBER

Nov. 2—One thousand miners employed at the No. 5 mine of the Lehigh and Wilkes-Barre Coal Co., went out on strike owing to the employment by the company of nonunion men.

Nov. 11—Mines of Lawrence County, Ohio, terminate a two-year strike and men return to work.

Nov. 13—First meeting of the Rocky Mountain Coal Mining Institute, Denver, Colo.

Nov. 16—Martial law again proclaimed in Paint Creek district.

DECEMBER

Dec. 9—December meeting of the Kentucky Mining Institute held at Lexington, Ky.

Dec. 10-11—Winter meeting of the West Virginia Mining Institute, at Parkersburg, W. Va.

Dec. 13—Remainder of troops withdrawn from West Virginia strike zone.

Dec. 18-19—Meeting of Coal Mining Institute of America at Pittsburgh, Penn.

*Accidents and explosions have been omitted.

COAL AND COKE NEWS

Washington, D. C.

Prof. Emory R. Johnson, of the Isthmian Canal Commission, in a statement this week concerning the effect of the Panama Canal on the cost of shipping coal, says that attention should be called to the fact that in trading with Pacific countries the fuel expenses of steamers engaged in the commerce of the eastern United States would be less than the expenses of steamers operated over routes between Europe and Pacific countries.

The cost of coal at Panama would be at least $1 per ton less than at Mediterranean ports and at the Suez Canal, according to his estimate, and the coal at stations along the Eastern seaboard of the United States would be fully $1 per ton less than at European stations. Relative fuel expenses via the Panama and Suez routes will work to the advantage of the Panama Canal and of the commerce of the United States carried on through that canal with Pacific countries in competition with the commerce of Europe carried through the Suez Canal to the Orient and Australia.

In considering the relation of the canal to the development of American trade, factors other than transportation facilities should receive careful attention. In fact, transportation costs and facilities, though of great importance, are only one influence affecting the volume and direction of international trade.

Professor Johnson's analysis of the situation at Panama is being read with great interest by members of Congress who have concerned themselves with the competitive side of canal operation.

A DECISION OF THE INTERSTATE COMMERCE COMMISSION

The Interstate Commerce Commission has rendered a decision in the case of the Thomas W. Gilmore Co. vs. the Chicago & Northwestern R.R. Co. This case related to carload shipments of bituminous coal to the complainants at Rose Hill, Ill., the freight charge being 20c. per net ton in excess of the charge for similar transportation to Ravenswood, Ill., a point in the Chicago switching district. On anthracite coal the charge to Rose Hill is 10c. per ton greater than to Ravenswood.

It was held that this rate situation subjects the complainants to unjust discrimination and Rose Hill to undue prejudice and disadvantage, and the differential was reduced on interstate shipments to not over 5c. per ton on coal in carload lots to Rose Hill—such 5c. to be in excess of the charge for similar transportation to Ravenswood. The decision is of some interest as an incident in the general rate controversy between anthracite and bituminous shippers.

ANTHRACITE PRODUCTION DECLINES IN 1912

According to data compiled by the government, all records for the production of coal in the United States were beaten in 1912, taking hard and soft coal together, although the production of hard coal alone fell below that of many previous years. It appears that taking the figures up to the beginning of December (those for that month not being yet available), and assuming that the month's shipments were the same as in December of last year, the total tonnage of anthracite for the year 1912 will amount to 63,781,503 tons—a smaller tonnage than for any year in the last six except 1909, when the shipments were 61,909,885 tons.

Omitting the quantity sold to the local trade and to employees, which may be estimated at about 3% of the total shipments, it would appear that the total marketable output of anthracite in 1912 was 65,694,948 tons, as compared with 72,000,000 in 1911. This does not include the coal used in the operation of the mines themselves.

Suspension of work for about seven weeks last spring is accepted as the cause for the falling off in output. The idleness of the mines during the period in question caused a loss of about 11,000,000 tons, but after the suspension, the mines were operated on a full-time basis in the attempt to make up some of this deficiency. This cut the deficit of 11,000,000 tons down to about 6,000,000.

Retail prices, it is reported, have been maintained at the regular figures by the larger companies, but premiums of from 50c. to about $1.50 per ton have been paid up to the first of January for independent coal. It is believed that the closing of navigation on the Great Lakes will now concentrate shipments in the Eastern markets, so that there will be an ample supply of coal for all consumers during the coming winter.

PENNSYLVANIA

Anthracite

Centralia—The strike, which was declared here because mine officials discharged several union men who refused to work over-time, ended Dec. 30. Fifteen hundred employees have returned to work after an idleness of two weeks.

Wilkes-Barre—Thomas Kennedy, president of the anthracite mine district No. 1., has served notice that the union miners throughout Pennsylvania would fight the proposed changes in the mining laws which are expected to come up at the coming Legislature.

On Dec. 27, miners from all parts of the anthracite region formed a meeting of the State Mine Code Commission to show their contempt for the proposed changes in the mining code. Mine leaders have brought delegations to fight against allowing the Governor to name mine inspectors instead of letting people elect them.

Four hundred employees of the Dodson No. 12 colliery of the Plymouth Coal Co. have been thrown out of employment as a result of a fire which started two weeks ago in the west plane of the Red Ash vein. The flames still remain unextinguished, although excellent headway is being made by those who are fighting the fire. Until they have been subdued, the colliery will remain idle.

The walling in of the fire in the Kidney vein of the Parrish Coal Co. is progressing so rapidly that it is expected that the 500 men thrown out of employment as a result of this fire will be back on the job in a short time.

Reading—Fire which burns stubbornly at Mt. Carmel, and which has hampered the fire fighters in their efforts to battle with the flames has destroyed about $29,000 worth of property.

Scranton—The breaker boys and a number of the outside hands at the Capouse colliery of the Scranton Coal Co. in Keyser Valley, went on strike because of the refusal of a half-dozen men and boys employed about the breaker to join the miners' union. The colliery was closed down for the day, when the boys left the chutes, laying about eight hundred men idle for the day. Within an hour after the strike had been called, the non-union men had agreed to join the union, but by that time the boys had scattered, and no attempt was made to resume work for the day.

Tamaqua—Eight of the nine miners entombed behind a barrier of coal and rock in the East Lehigh colliery for forty hours, were rescued alive standing in 4 ft. of water. One of their number had met death by drowning, and his remains were discovered soon after the rescue of the others.

Bituminous

Charleroi—The Union Supply Co. distributed more than 50,000 presents among the thousands of youngsters about the coke plants of the Connellsville region on Christmas day. Not only were the youngsters taken care of, but the poor and needy were also remembered in a suitable way.

Williamsport—Soft coal miners from central and western Pennsylvania have appeared before a committee of the Legislature and presented four bills which they would like to have enacted. One bill provides that a man has to serve two years in the capacity of laborer before being granted a certificate. This is similar to the law governing anthracite mining. Another bill prohibits electricity in gaseous mines. The third is directed against the use of machines with which to rob pillars, and the fourth has to do with certain age limits.

Pittsburgh—Director J. A. Holmes, of the United States Bureau of Mines, is quoted as saying that Pittsburgh is the proper place for the mine testing station and that he would be sorry to see it removed.

WEST VIRGINIA

Charleston—It is reported that the situation in the strike zone on Paint and Cabin Creek is again growing threatening. Outbreaks on the part of striking miners would cause little surprise at any time. The fact that no proclamation lifting martial law was issued when the troops were withdrawn two weeks ago leads many to believe that martial law is still in effect.

Notwithstanding the labor troubles in the Kanawha coal field during the greater part of the year, the coal production of West Virginia for 1912 far exceeded that of any other year. This is a statement issued Dec. 30 by Edward W. Parsons, coal statistician of the Geological Survey. The total production in the state for the year ending June 30, 1912, is reported as 66,731,587 tons.

OHIO

Columbus—A decision in the case of the Government against various railroad and coal companies handed down Dec. 30, which declares the companies guilty of restraint of trade in violation of the Sherman law, makes imperative the sale of 100,000 acres of coal land now owned by the roads involved and the Sunday Creek Coal Co., together with stock in other railroads by which the alleged monopoly was formed.

The decision further orders that the joint ownership of the Kanawha & Michigan by the Chesapeake & Ohio and the Lake Shore & Michigan Southern must be terminated.

Flushing—An explosion in the Lafferty mine of the Pittsburgh & Belmont Coal Co., near Morristown, Dec. 31, resulted in the death of one man and the serious burning of another.

INDIANA

Clifton—Deering Mine No. 1., where an explosion occurred nearly two years ago, costing the lives of two shot-firers and damaging the property, has resumed work. A new system of shot-firing, calculated to make the work safer, has been adopted. More time will be demanded of the men firing the shots. The first coal loaded out was two cars which was left from the firing of the two men who were killed.

ILLINOIS

Springfield—The governor of Illinois has appointed as members of the Illinois Mine Rescue Station Commission, Thomas Moses, General Superintendent of the Bunsen Coal Co. as one of the operators in place of the late W. W. Taylor, and J. M. Zimmerman, representing the United Mine Workers of America, in place of Charles Krallman, recently resigned.

The following members have been appointed on the Mining Investigation Commission: H. H. Stoek, J. A. Holmes, J. E. Williams, Richard Newsam, G. W. Traer, Thos. Jeremiah, Benj. Williams, Geo. McArtor, Wm. Hall.

This commission was authorized by the last session of the Illinois Legislature and was given power and authority to investigate methods and conditions of mining coal throughout the state with special reference to the safety of human lives and property, and the conservation of the coal deposits.

UTAH

Salt Lake City—Word has reached here of the discovery of quite a bed of anthracite coal in the southern part of Utah, near Cedar City.

The existence of coal in this locality has been known for some time, but it fell to the present prospectors to determine the quality and extent of the deposit.

Of late a large amount of work has been done, the main portion being confined to what is known as Tunnel No. 3. This tunnel has been cleaned out and extended until it is now approximately 180 ft. in length. It has been timbered the entire length and is in good condition.

This tunnel encountered five veins of coal, vein No. 2 measuring 18 in. of pure semi-anthracite, vein No. 3 has 4 ft. of the same quality, while veins Nos. 4 and 5 have a minimum of 5 ft. of the best kind of fuel.

If further investigation confirms the report that the coal is semi-anthracite, there is no doubt but that a ready market can be had in Utah and California. The field is located to the east of the San Pedro, Los Angeles & Salt Lake R.R., and it would be necessary to build a spur in order to open up the deposit.

At present the anthracite consumers are supplied by the Pennsylvania and Colorado mines and a good development in the intermountain territory would be welcomed and no doubt would draw its share of the trade. Such a development should also be able to successfully meet any price competition.

PERSONALS

President Walker of the Illinois section of the United Mine Workers has been selected to represent the American Federation of Labor at the British Trade Congress.

Burke H. Keeny has been appointed Western manager of the Bewley-Darst Coal Co., Bristol, Tenn., with offices at 505 Neave Building, Cincinnati, Ohio. He will thus be enabled to handle the business of the company in the states of Kentucky, Ohio, Indiana, Michigan and the West.

OBITUARY

James M. Laing, aged 43, was instantly killed at Berlin, on Cabin Creek, West Virginia, by a runaway car on an incline. Mr. Laing is a wealthy coal operator in the New River, Kanawha and Elk River districts, and is the brother of John Laing head of the state department of mines. He is survived by a wife and children.

TRADE CATALOGS

Publicity Magazine; devoted to the interests of the Jones Stoker. February, 1912. The Underfeed Stoker Co. of America, Chicago, Ill.

Rescue and Recovery. Bulletin of a few cases where "Proto" (Fleuss-Davis' patent) breathing apparatus has been used in England. Seibe, Gorman & Co., Ltd., London, S. E. H. N. Elmer, Monadnock Block, Chicago, general agent for North America.

Condensed Catalogue and supplement of mine and industrial electric supplies; Electric Service Supplies Co., Philadelphia, New York and Chicago. Showing new and improved devices and revised listings pertaining to material covered by general catalogue No. 4, Vol. 3 of mine and industrial supplies.

RECENT COAL AND COKE PATENTS

Bucket Conveyor. A. T. Perkins, Chicago, Ill. 1,040,005, Oct. 1, 1912. Filed June 18, 1909. Serial No. 502,882.

Gas Producer. W. Climie, Bo'ness, Scotland. 1,040,148, Oct. 1, 1912. Filed Sept. 13, 1911. Serial No. 649,002.

Hoisting Apparatus. J. W. Hammond and J. F. Donahue, assignors to Mead Morrison Mfg. Co., Cambridge, Mass. 1,039,733. Oct. 1, 1912. Filed Nov. 8, 1907. Serial No. 401,264.

Miner's Combination Tamping Tool. L. and A. W. Shaffer, Duryea, Penn. 1,040,037, Oct. 1, 1912. Filed Oct. 4, 1911. Serial No. 652,885.

BOOK REVIEW

CARBONIZATION OF COAL: A Scientific Review of the Formation, Composition and Destructive Distillation of Coal for Gas, Coke and Byproducts. By Vivian B. Lewes, professor of chemistry, Royal Naval College, Greenwich; 315 pp., 5½x8½, 27 ill. John Allan & Co., 8 Bouverie St., E. C. Clothboards, 7s. 6d.

This book is a reprint with considerable modification of Mr. Lewes' interesting Cantor Lectures delivered in the winter of 1911 before the Royal Society of Arts. Much of the introductory part we have published in its original form. We have also made frequent reference to it editorially, and found it necessary to dissent from some of the conclusions reached.

Mr. Lewes frankly says "Many of my views will not, I fear, be acceptable to all my readers." We cheerfully acknowledge that whether intended for us or not, it describes us to a nicety, for, to many other things we may yet take

editorial exception. But it is not an inferior book which we have to review, or it would not arouse our fighting spirit.

We are afraid that the clippings we have made from the Cantor lectures will give a false impression of the present work. Much is purely chemical, it is true, but a description of present and past coke ovens and gas retorts together fill 50 pages and in these occur most of the illustrations.

There are several pages on tar, its formation, use, and decomposition, some on coke, the nitrogen and sulphur of coal and their recovery, and a concluding chapter on modern coal gas. Every manager and engineer today should be preparing himself for the rapid introduction of byproduct ovens and for the technical skill that introduction will involve.

We are sure that all such far-sighted men will want to read this inquiry into the carbonization of coal. The reader may frequently bristle with dissent, but he will be interested, for the book is by no means dull and we owe a debt to Mr. Lewes for his willingness to propound theories which are sure to aronse dissent.

A common English fault is that of writing long sentences, which turn the reader from an analysis of the thought to a consideration of the grammatical structure. It is strange that in the land of Tyndall, there are so many offenders. We formerly classed V. B. Lewes among them, but a disintegrator seems to have gone to work at his sentences and broken them up into "prepared sizes." As a result our anticipated criticism is almost entirely disarmed.

CONSTRUCTION NEWS

Monongahela, Penn.—It is said the new plans for the improvement of Mongah mine embrace among other things a new main entry, which will be much lower than the present opening.

Duluth, Minn.—The Lehigh Valley Coal Co. is tearing down parts of a coal dock structure built several years ago at its Tower Slip plant in order to make room for modern improvements. It is understood that the present coal dock will be converted into a hard coal storage plant.

Birmingham, Ala.—The Pratt Consolidated Coal Co., one of the largest coal concerns in the southern field, has just awarded a contract to the Roberts & Schaefer Co., for the designing and building of a complete 1000-ton Stewart coal washing plant, storage bins, and steel tipple to replace the structures recently burned at their mines at Banner, Alabama. Approximate contract price $60,000.

NEW INCORPORATIONS

Portsmouth, Ohio—The Cliff Coal Co.; increase from $30,000 to $40,000.

Indianapolis, Ind.—The Pan Handle Consolidated Coal Co. has dissolved.

Peoria, Ill.—The Eastern Coal Co.; number of directors decreased from 5 to 3.

Boonville, Ind.—The Wilson-White Coal Co. has changed its name to Cypress Creek Coal Co.

Wilmington, Del.—The Electric Coal Co.; to do a general coal business; capital stock, $100,000.

Indianapolis, Ind.—The Terhune Coal & Mining Co. and the Central Coal & Mining Co. have been dissolved.

Louisville, Ky.—The Low Ash Coal Co.; capital stock, $25,000. Incorporators, C. R. Hunt, E. N. King, W. O. Alden.

Danville, Ill.—The Beech Flats Coal Co.; capital stock, $100,000. Incorporators, W. G. Hartshorn, Grant Holmes, C. J. White.

Ashland, Ky.—The Big Sandy Fuel Co.; capital stock, $10,000. Incorporators, Ralph Chatfield, V. M. Chatfield, O. P. Chatfield.

Pittsburgh, Penn.—The Fleschter Coal Co.; capital, $200. Incorporators, Alfred Fleschter, Roca Fleschter and Paul Fleschter.

Nokomis, Ill.—The Fayette County Coal Co. has been organized and will take up at once 32,000 acres of coal in this county.

New York, N. Y.—The Carter Coal Co.; capital $5,000,000. Incorporators G. L. Carter, S. R. Jennings, J. C. Stone, Johnston City, Tenn.

Ottawa, Canada—The Canadian Gazette announces the incorporation of the London Land & Coal Co., of London, Ont., capital $2,000,000.

Wilmington, Del.—Bronx Mining Co.; capital stock, $325,000. Incorporators, J. M. Frere, Jos. Zurita and C. L. Hearn, Wilmington, Del.

Astoria, Ill.—The Astoria & Woodland Coal Co.; name changed to the Eclipse Coal Mine and capital stock decreased from $2400 to $1200.

Elmore, W. Va.—Mead Pocahontas Coal Co.; authorized capital, $60,000. Dr. J. A. Wood, J. Edward Cox, J. C. Sullivan, W. G. Hubbard and E. H. Mead.

Tice, Ill.—The Coal Bank Mining Co.; capital stock, $1000; mining and marketing coal. Incorporators, J. P. Grosbill, H. V. Nelson, Mrs. M. N. Grosbill.

Mullens, W. Va.—Trace Fork Coal Co.; authorized capital, $75,000 Thos. F. Bailey, Jr., J. C. Sullivan, W. G. Hubbard, K. S. McClanahan and E. F. Hoover.

Queens, N. Y.—Home Coal Co., Inc., real estate, etc.; capital, $25,000. Incorporators are H. A. Beiler, H. W. Hach, Richmond Hill; J. C. Garbe, Woodhaven.

Montgomery, Va.—Red Eagle Coal Co. filed articles of incorporation. Capital $50,000. The home offices of the company will be located at Blocton in Bibb County.

Portland, Me.—Jaulin Alaska Mines Co.; capital $2,000,000. Promoters, Albert F. Jones, T. L. Croteau, Albert A. Richards, B. M. Maxwell, N. B. Farnham, Portland, Me.

Manhattan, N. Y.—Alaska Kougarok Co., Inc.; mines and mining rights; $200,000. Howard I. Seney, William Kennelly, Felix Valdes, 237 Lexington Avenue, Manhattan, N. Y.

Grafton, W. Va.—The Preston Fuel Co.; capital stock, $300,000. Incorporators, Buckner Clay, G. E. Price, R. M. Price, A. C. Collins, R. S. Spillman, all of Charleston.

Clearfield, Penn.—An application will be made Jan. 14 to the Governor of Pennsylvania for a charter for an intended corporation to be called the Nevling Coal Mining Co.

Tallula, Ill.—The Menard County Coal & Mining Co.; capital stock, $20,000; to mine coal, manufacture ice and deal in both. Incorporators, T. A. Tomlin, John Schome, S. O. Savage.

McAlester, Okla.—The Lane Coal Co.; capital stock, $50,000. Incorporators, S. W. Lane, Wewoka; W. J. Baber, J. Fred Miles, Tulsa; A. L. Latimer, McAlester; W. C. Ellis, Fort Worth.

Philadelphia, Penn.—Application will be made, Dec. 30, by James J. Reilly, Harold A. Schumann and L. E. Marter, for the charter of an intended corporation to be called the Schumann Coal Co.

Scranton, Penn.—Application will be made Jan. 13, 1913, by John R. Williams, Joseph W. Noble and William H. Jessup for the charter of an intended corporation to be called the Noble Williams Coal Co.

Columbus, Ohio—The Red Ash Pocahontas Coal Co.; capital stock of $10,000; to mine and deal in coal. Incorporators, W. H. Plant, Ethel M. Plant, P. W. Barricklow, Margaret M. Barricklow and E. W. Parker.

Cleveland, Ohio—The Pennington Mining Co.; capital stock, $100,000; mining and dealing in iron ore and coal. Incorporators, J. C. Merrick, G. W. Cottrell, C. C. Roads, F. W. Dellenbarger and Henry G. Dodge.

Waukegan, Ill.—The Waukegan Lumber & Coal Co.; capital stock, $35,000; to deal in lumber, coal and building materials. Incorporators, T. G. McGay, W. O. McKinney, Alexander Whan, D. Q. Hart and J. D. Pope.

Scranton, Penn.—Application will be made Jan. 21 by Archibald B. Mahon, James A. Waddell, Jno. Coyle, W. J. Welbasky and T. Ellsworth Davies for the charter of the Mining Engineering Co., of Pennsylvania. Frederic W. Fleitz, solicitor.

Altus, Okla.—A number of men of this vicinity have organized a coöperative coal company and have a mine at Blanco, south of McAlester. The name of the new company is the Tolleson Coal Co. Dr. E. A. Aberthnay is the sales director.

Pittsburgh, Penn.—The Buffalo Creek Coal & Brick Co.; capital $250,000; to purchase, take lease, hold, own and deal in coal and minerals of all kinds. Incorporators Charles A. Smith, Pittsburgh, Penn., R. Duranteer, McDonald, Penn., C. E. Meyer, Ingram, Penn.

Columbus, Ohio—The Taylor-Williams Coal Co.; capital stock of $25,000; to mine and sell coal. Incorporators, John W. Moore, S. E. Ranney, John M. Taylor, E. E. Learned and W. E. Runyan. The concern is the incorporation of a partnership which was conducted under the same name.

Florence, Colo.—The Rex Coal Mining & Mfg. Co. has filed papers of incorporation with the secretary of state for the purpose of taking over the coal mine formerly operated by the Rex Coal Co. and located on Newlin Creek. Incorporators, G. F. Stevens, M. Collins, Denver; R. M. Ramsay, A. M. Smith and E. R. Harris, Florence. It is the intention of the company to equip the mine with new and uptodate machinery as well as to provide transportation facilities for hauling the coal to market.

The company owns 160 acres of land which is underlaid by a number of excellent seams of bituminous coal.

INDUSTRIAL NEWS

Danville, Ill.—The new coal shaft belonging to Frank Woodard has been completed, and miners have begun to take out coal for the country trade.

Philadelphia, Penn.—The Pennsylvania R.R., transported 6,097,290 tons of coal and coke in November, an increase of 136,152 tons over October.

St. Clairsville, Ohio—When the total production for Belmont County for the year 1912 has been compiled it is expected that the figures will reach the 10,000,000-ton mark.

Philadelphia, Penn.—The output of the Consolidation Coal Co., for the year up to Dec. 24 aggregated 10,200,000 tons. This was an increase of 1,125,000 tons over last year.

Hazelton, Penn.—The Lehigh Valley Coal Co. took advantage of the snowstorm Dec. 27 to burn the abandoned Yorktown breaker. The structure has been replaced by a modern washery.

Newcastle, Ala.—About 250 ovens will be fired up at once by the Pratt Consolidated Coal Co. for the purpose of filling a 40,000-ton order to be delivered in the next six months. These ovens have been idle for the past 3 years.

Oak Crest, Colo.—George Campion, of Los Angeles and T. L. Darby of Denver, have been making investigations into the coal lands on Trout Creek. It is understood that arrangements will soon be made for the development of the land.

Pineville, Ky.—Two hundred coke ovens which have been idle at Straight Creek for years are being put in repair by the Continental Coke Corporation and will be operated at their full capacity. Thirty-three ovens were fired as a starter and their first coke was pulled.

Uniontown, Penn.—A tract of 655 acres of coal land in Greene County, Penn. and Wetzel County, W. Va., was sold Dec. 31 to a company of Connellsville men. The purchase price was $100 an acre. Operations will be begun at once for the development of the land.

Forrell, Penn.—The record output of coal in Mercer County in one day was broken by mine No. 7 of the Mercer Coal & Iron Co. at Stoneboro, Dec. 23, when the output for 9 hours was 1600 tons. The individual record was broken by Joseph Shasser who loaded 35 tons of coal in 8 hours.

Greensburg, Penn.—The Yukon Coal zone is developing rapidly at present. Harry Whyel Coke Co. made several purchases of coal in Sewickley township. This company now owns coal lands valued at over $100,000. A modern coal mine was constructed some time ago and the mines are running very well.

Butler, Penn.—The mines of the Great Lakes Coal Co. which have been shut down since April 1, resumed operations Jan. 2. The mines have been leased to the C. P. Munsch Coal Co. of DuBois. The Great Lakes Company had 23,000 acres of land in the Kaylor district and the plant is considered to be excellent.

Brownsville, Penn.—It is rumored that the Allicia Coal & Coke Co. is making arrangements to start operations with 200 new coke ovens, on the Fayette County side of the Monongahela River. On the Washington County side the Reliance Coal & Coke Co. is erecting 500 ovens in anticipation of a heavy coke trade.

Grand Forks, N. D.—The report of the state engineer to Governor Burke shows that there are 105 mines in operation in North Dakota, employing 2000 men. The beds of coal vary from 3 to 19 ft. in thickness and occur at depths of from 5 to 200 ft. Where the overburden is light the coal is mined by stripping.

Trinidad, Colo.—J. A. and W. H. Hardenbrook have leased the Sugar Loaf mine from P. N. Bissell, and are at work taking out some of the best coal it has produced.

J. R. Coleman, who broke into the coal business a month ago, has taken hold of the Gibbs mine and has a force of miners busy at that branch.

Hillery, Ill.—According to an unconfirmed report among the miners, another large tract of coal has been purchased near here, and a new shaft will be sunk within a short time. The Indiana Harbor Ry. Co., is said to be back of the deal and will likely put in a spur track on the northern limits of the town as soon as the mine is sunk. It is stated that the company has purchased all the mineral rights on the land in question.

Shelbyville, Ill.—It seems probable that 35,000 acres of coal land in the eastern part of Williamson County will soon change hands. This is the tract which was optioned this summer by Willard Heath, of St. Louis. After optioning the land, Heath's representative left and nothing more was heard from him until this week, when owners of the land received letters asking them at once to have abstracts made and ready for the deal to be closed.

Chattanooga, Tenn.—The Chattanooga Estates Co., which owns and is developing between 20,000 and 30,000 acres of coal and timber land on the north side of the Tennessee River, announces that it will operate freight scows by means of a tug from its property to inclines connecting with all roads leading into Chattanooga.

The work on one incline is already under way and as soon as it is completed others will be commenced. Three barges will be used and one tug.

Morgantown, Penn.—New machinery has been installed at the Rock Forge plant of the Connellsville Basin Coal & Coke Co., which has been shut down for more than a year, and the whole plant has been given a general and thorough overhauling. At present a double force of mechanics are at work putting in a new set of boilers. The ovens are being fired as fast as the coal can be supplied.

The company is short of men, but the force is being increased as rapidly as workmen can be secured.

Pittsburgh, Penn.—The Toledo & Ohio Central, which is controlled by the Lake Shore, an integral part of the New York Central Lines, is planning to compete with the Hocking Valley, owned by the Chesapeake & Ohio, in transporting coal from the West Virginia and Kentucky lines through the Toledo gateway, and has plans drawn up for new docks at Toledo.

When the docks are well under way the road will probably doubletrack its line from Toledo to Columbus.

Baltimore, Md.—It is rumored that plans are now on foot for the consolidation of the Durham Coal & Iron Co., and several other companies, representing between $12,000,000 and $15,000,000 capital. This will be one of the largest coal mergers ever put through in the South. It is said that C. H. Smith, vice-president and general manager of the Durham Company, is slated for the presidency of the new concern. Arrangements are being made to acquire about 20,000 additional acres of coal land. Extensive improvements will be made.

Birmingham, Ala.—All indications are that the Sayreton mine, operated by the Republic Company, will have the largest output in Alabama. The production of this mine is expected to exceed 360,000 tons. No. 3 mine of the Tennessee company at Ensley is expected to rank second, while the Republic mine No. 2 will probably stand third.

Other mines ranking high in the list are the Flat Top and Banner mines of the Pratt Consolidated Coal Co., and the Acmar and Margaret mines of the Alabama Fuel & Steel Co.

Steamboat Springs, Colo.—The financing of the Moffat road and the awakened interest of Denver people throughout the commercial bodies have turned the attention of the large coal interests toward Routt County.

Last week Geo. Morrison, superintendent of the Routt County Fuel Co., and John McNeill, consulting engineer of one of the largest coal using concerns in America, spent three days with Sam Adams, making a surface examination along the outcropping of the coal measures from Oak Creek through Twenty Mile Park, and as far west as the Wage and Lenox mines.

Washington, Penn.—The development of a large block of virgin coal south of Washington is believed to be assured by the closing of a deal Dec. 31, for the transfer of 2500 acres to a representative of a syndicate of Pittsburgh men. The amount involved exceeds $500,000.

It is also known that William Smith has sold 100 acres of coal and surface land east of Washington on the Baltimore & Ohio R.R. to D. L. Williams, W. S. Lockhart and Robert Young of McDonald, Penn. It is understood that the purchasers will co-operate with the Pittsburgh men in the development of the property. The price paid has not been made public.

COAL TRADE REVIEWS

GENERAL REVIEW

The open weather and consequent light demand for the domestic grades has undoubtedly proved the salvation of the anthracite trade so far this season. The situation continues to become a trifle easier each week, and while arrivals are not heavy and are going into consumption as promptly as received, it is noticeable that the consumer is not obliged to wait so long for delivery. The warm weather has undoubtedly developed a feeling of uncertainty in the market, and orders are fluctuating, but the independents are still commanding a fair premium for their product. In the Coastwise trade the storm of Jan. 3 and 4 resulted in light receipts and high retail prices are still being maintained.

The Eastern bituminous market is firm with buying on a large scale, stocks rather uneven, and demand fluctuating with the weather. An active market will be dependent upon the larger corporations, who have been relying upon districts from which shipments have been particularly bad, rather than upon the smaller consumers who appeared to be well stocked. On the whole there is a fairly large demand, and with supplies reduced and with a restricted output, due to the suspension over the holidays, prices are firm or advancing. The car supply is variously reported as both good and bad. It is stated that some roads are short, but making every effort to take care of coal consignments, while at other points the demand for equipment in other industrial branches is easing off which is helping the movement of coal. Supplies were undoubtedly reduced over the holidays, which is resulting in a temporary rush for stocks at the present time.

Demand for prompt delivery in the Pittsburgh district is relatively light, and production is again about back to normal; a fair amount of contracting was closed on Jan. 1, but most of this business here goes over until April 1. The local coke situation has eased off slightly. The softening of the domestic grades in Ohio, due to the unseasonable weather, has now disappeared and all sizes are again strong. Production at the mines has been fairly good, and the car supply much improved due to the intervention of the holidays; contracts are being renewed at slightly higher figures. The situation in the Southern market has eased off especially as regards the steam grades; a fair demand is anticipated, however, over the next two months. The order of the Louisville & Nashville Railroad, requiring all operators on their line to turn their entire output, during three days of the week, over to the company, has been rescinded, but it is doubtful if the road has acquired a sufficient supply, and the order may again go into effect at any time.

The trade in the Middlewest is described as being entirely a weather market, and the winter so far has been only an extension of the fall. At the present time supplies are plentiful, and the holiday dullness has effected a reduction in quotations; if the weather is as mild through January, as was the case in December, it is thought that summer prices will almost be reached. There is coal of all kinds on track, buyers are scarce, and a better supply of equipment on the railroads has resulted in heavy shipments. The same unsatisfactory conditions due to the mild weather, prevail in the Northwest, and operators are attempting to curtail production. Prices at this latter point are, however, being better maintained.

BOSTON, MASS.

Coal is firm with buying on a large scale and there is more inquiry for what bituminous is available. Stocks in New England are rather uneven and the demand from this territory will greatly depend upon the weather. It will also depend on loading conditions at Baltimore and Hampton Roads and if no improvement is shown, there will be an increasing call for Pennsylvania grades out of New York. The largest consumers are most likely to come into the market for spot coal. All-rail, the spot demand is not so insistent. The market in that direction does not yet justify any considerable volume of speculative coal and unless weather conditions become exceptionally hard, the call is likely to be limited at what are considered high prices.

Less anxiety over anthracite seems the rule, although there is little real occasion for it; all admit it is the influence of mild weather. The storm of Jan. 3 and 4, with its interruption to the barge movement will probably cause new anxiety over the light receipts. The almost spring like temperatures this week have reduced retail deliveries to a minimum, and this has enabled many a dealer to bear a cheerful front. Premium coal is still a ready sale at $7.35 @ 7.60 alongside Boston, and $8.25 @ 8.50 is a current price for stove coal on cars for shipment inland. The high retail prices that prevailed are still maintained and the shortage of stove coal continues the chief feature of hard-coal trade.

Current of quotations are about as follows:

Clearfields, f.o.b. mine,	$2.10	@	2.20
Clearfields, f.o.b. Philadelphia	3.25	@	3.40
Clearfields, f.o.b. New York,	3.55	@	3.70
Somersets, &c., f.o.b. mine,	2.15	@	2.25
Somersets, &c., f.o.b. Philadelphia	3.40	@	3.50
Pocahontas, New River, f.o.b. Hampton R'ds.	3.50	@	3.60
Pocahontas, New River, on cars Boston,	4.60	@	4.90
Pocahontas, New River, on cars Providence,	4.60	@	4.75

NEW YORK

Bituminous—In spite of the continued mild and unseasonable weather, the soft-coal trade is still holding its own, and if anything, becoming stronger. The effects of the curtailment in production over the holidays are now being felt, and local supplies are quite short, particularly in the better grades, which are practically unobtainable in the spot market. The conservative members of the trade believe that quotations are now approaching the high point for the season. It is thought that the next cold snap will see the maximum prices in effect, after which there will be a gradual easing off to the usual summer level.

A good car supply has been reported on practically all lines shipping the New York market. It is estimated that production in the Pennsylvania field has been up to about 75 per cent. of full-rated capacity. The labor shortage appears to be the worst feature of the industry, and the effects of this are being felt generally all over the mining districts.

New York bituminous prices experienced a further advance during the week, while anthracite has about held its own, prices now being quotable about on the following basis:

Anthracite	Upper Ports	Lower Ports	*Bituminous*	
Broken	$5 00@5 25	$5 00@5.25	West Virginia, steam.	$3 25@3 35
Egg	5 25@5 75	5 20@5 75	Ordinary grades, Penna	3 25@3 35
Stove	5 25@6 25	5 20@6 25	Fair grades, Penna	3 25@3 35
Chestnut	5 50@6 25	5 45@6 25	Good grade, Penna	3 35@3 45
Pea	3 50@4 10	3 45@4 10	Best miller, Penna	3 40@3 50
Buckwheat	2 60@2.75	2 35@2 70	Georges Creek	3 50
Rice	2 15@2.25	1 70@1 95		
Barley	1.75	1.25@1.70		

Anthracite—The hard-coal situation has become so easy that the head of one of the large local selling agencies went so far recently as to state that the unseasonable weather might cause the bottom to drop out of the market. With a shortage of 6,000,000 tons in the trade, such a view is obviously an exaggeration of the situation, but it is nevertheless pertinent as showing the better feeling which exists among the anthracite companies. The demand is still strong, but there is no doubt that warm weather is enabling the operators to rapidly catch up. There is no demand for the high-priced grades, but speculators who have acquired such are holding on firmly until the cold weather appears.

Egg coal has become so plentiful that there have been some cases of the individuals offering this down at the regular company's circular. Nut continues about normal with broken a little short. Pea is almost entirely out of the market, and rice and buckwheat are being substituted for this grade; as a result, this latter size is somewhat stronger. The market is flooded with barley, which it is almost impossible to dispose of.

PHILADELPHIA, PENN.

The second week in the new year finds the coal trade in this vicinity in practically the same position as when the year closed. As a matter of fact, the open weather has been the only salvation the dealers have had, enabling them to stave off, to some extent, the demands made on them. Taking it altogether, it may be said that the situation is a trifle easier. Every size is moving off almost as promptly as received, and the arrivals are not by any means heavy, but

householders do not have to wait quite as long to have their orders for certain sizes filled, as was the case a month or so ago. Stove and pea seem to still continue in the lead. Egg may be said to be a trifle easy, gaged by the fact that the individual operators are playing this size heavier than either stove, chestnut or pea, and quotations from them on this size are pretty close to circular; there have even been cases, it is understood, that a prompt order will take the coal at even less.

The present price of egg is almost a safe indication that this size is in fairly good supply. It is understood, however, that the large companies are having no difficulty in moving it off, although some districts are complaining that their orders for it are being shipped, while those for other sizes are ignored. The week really marked the beginning of full work at the mines, after the holidays. The output has been anything but normal, even when the collieries were reported as working, for in many cases, the full complement of men were not out.

The bituminous market shows little or no change as far as prices are concerned. The available supply, however, seems to be better, due no doubt to the fact that the mines were able to produce their normal output, but there is a ready demand just now, that is absorbing all that is sent to market.

PITTSBURGH, PENN.

Bituminous—Production of coal is almost back to normal, after the interruption of the holidays. Demand for prompt is relatively light. Shipments had been curtailed to some manufacturing consumers, on account of works being closed for inventory, but are again being resumed this week. There is little interest in contracts at this time. A fair volume of contract business was closed for various periods beginning Jan. 1 but the great bulk of this business will be for the twelve-month beginning Apr. 1. Circular prices are well maintained, and remain as follows: Slack, 90c.; nut and slack, $1.05; nut, $1.25; mine-run, $1.30; ¾in., $1.40; 1¼in., $1.55; per ton at mine, Pittsburgh district.

A rise in the river last week permitted a good tonnage of Monongahela River coal to go down the Ohio to the various distributing points.

Connellsville Coke.—The market for prompt coke has been easier than expected, there being no particular pinch on account of the curtailment of shipments during the holidays. While as high as $4.15 and $4.25 was obtained in a very few cases for prompt furnace coke, around Christmas time, the market has dropped back to $4, where it stood before the holidays, and sales at this figure have been rather light in the past week, less than 5000 tons; in several cases operators have sold to brokers at less than this figure. There is very little inquiry for early delivery coke and it does not appear that many furnaces allowed their old contracts to expire Dec. 31 without making fresh ones. Foundry coke continues relatively scarce. We quote: Prompt furnace, $4; contract furnace, first half, $3.25 @ 3.50; contract furnace, year, $3 @ 3.25; prompt foundry, $4.25 @ 4.50; contract foundry, $3.25 @ 3.75, per ton at ovens.

BALTIMORE, MD.

The new year had an auspicious beginning for the Baltimore coal trade, and if the remainder proves to be as satisfactory, especially from the standpoint of prices, local operators will have no cause for complaint. Naturally, the supply of coal was greatly reduced, owing to the holiday, and there was a rush for fuel on the part of consumers, resulting in an exceptionally strong market. Sales of the common grades at $2 per ton were the rule rather than the exception and operators who could deliver at this price found plenty of buyers. Other grades have shown corresponding increases.

The idleness at the mines, caused by the Christmas and New Year holidays, has resulted in a marked decrease in the output and this scarcity of coal is now being felt. The mines for the past two weeks have not worked more than six full days, and it can be easily seen that such a prolonged cessation will have a pronounced effect on this and other markets. Because of this condition, consumers who managed to stock up heavily before the holidays, have been compelled to draw largely on their supply with the result that they now have little on hand. Some were able to buy at the market, but others were not.

The car supply is about the same as it was the previous week. All the roads are still short of equipment, owing to the enormous traffic which is being moved but they are making every effort to take the best possible care of coal shippers. Considerable fuel was handled over the piers here, destined for New England and other ports. The weather was cold during the week, which stimulated the demand for anthracite fuel.

The market may ease up a bit when the mines again produce their maximum output, but the trade is of the opinion that there will be no cheap coal for some time to come. Baltimore operators do not believe that there is going to be any cessation in business, and that the demand for all grades will continue brisk. The cold weather also brought increased business to the anthracite trade. Many householders found that their bins were about empty the early part of the week, and were quick to put in an additional supply.

BUFFALO, N. Y.

There is a big demand for bituminous coal and with the output still light on account of the holidays, the prices remain firm. The trade, instead of hearing that coal is offered at cut prices, steadily reports the opposite, so that the former strength certainly holds out well. Quite a block of Allegheny Valley coal sold a day or two ago for $1.85, mine-run gross, at the mine, this same quality selling last summer as low as $1 or $1.05. This difference is fairly staggering, especially if it is a real indication of the advance that business has made since that time.

Prices are not quite as high in the bituminous trade as they were a month or so ago, but they are strong enough and nobody is complaining unless it be that they are not getting out as much coal as was planned for. Still the annual reports of output coming in are satisfactory when it is figured that quite a good percentage of it has been sold for at least 30c. a ton more than it would have brought a year ago.

There is much the same complaint of car shortage, though as a rule other branches of business are not demanding so much equipment as they were a month ago, so that coal will get the benefit after a little. The railroads are likely to take even more fuel for holding if actual winter sets in so that the private consumer is not in good position to get prompt deliveries as he was last fall. Complaint that the roads are not acting fairly in taking so much coal now continues, but it is not going to be easy to change their methods.

There is a little slacking off in the price of coke, though that was expected because it ran too high for awhile. Best Connellsville is not now above $6.25 and there is some stock to be had. In the bituminous market the quotations remain firm at $3 for Pittsburgh lump, $2.85 for three-quarter, $2.75 for mine-run and $2.50 for slack, with Allegheny Valley about 25c. lower. Side coal, such as cannel and smithing, are all strong.

The warm weather has kept the anthracite dealer and consumer very anxious. One day orders will be numerous and then the sunshine will occasion a number of cancellations but when the winter shows a disposition to return, it brings the orders back again. Independent anthracite still commands a good premium.

COLUMBUS, OHIO

With lower temperatures prevailing and a continuation of active business conditions generally, the coal trade in Ohio has been fairly active during the past week. The softening in domestic sizes, which resulted from the unseasonable weather, is now passing away and strength has appeared in all grades. The demand for domestic as well as steam sizes is good and the production in Ohio fields has been fairly large during the week.

Despite the fact that the one holiday interferred, the output was about 65 per cent. of normal during the week. The car supply was much better, due to the intervention of the holidays and also to the warmer weather which aided railroads in a better freight movement. The improvement in the car supply is expected to be only temporary as the underlying conditions have not improved in the least.

One of the strong points in the market has been the steam business. Factories are demanding a large amount of fuel and this is especially true of the iron and foundry concerns. Contracts, which are expiring now, are being renewed at slightly increased figures and the low railroad fuel contracts of last year will be a thing of the past. The requisitions on the part of railroads for fuel are large.

Retailers are now in the market for more stocks since the mercury has descended. Their supplies were not large and it only required a few days of wintry weather to exhaust them in most places. As a result orders for immediate shipment are now the rule and producers are able to accommodate the dealer because of the better car supply. There is a good demand for the fancy grades of domestic coals such as splints and Pocahontas.

The bad conditions of the streets has hindered deliveries on the part of dealers. Retail prices are strong at the same level which has prevailed for several weeks.

Quotations in Ohio fields are as follows:

	Hocking	Pittsburgh	Pomeroy	Kanawha
Domestic lump	$2.00	. . .	$2.25	$2.00
2-inch	1.80	$1.50	2.00	1.65
Nut	1.50	.....	2.00	.....
Nut, pea and slack	1 15	...	1 25	1.10
Mine-run	1.50	1.40	1.50	1.50
Coarse slack	1.00	1 05	1.10	0.90

CLEVELAND, OHIO

From the viewpoint of producers and shippers of coal, 1913 will be the banner year in the coal trade. The close of 1912 ends prices 25 per cent. higher than those which prevailed a year ago. With the unprecedented and, in many cases, the unexpected increase in traffic in the many lines of business, operators have every reason to believe that prices will continue to go upward.

The speculative movement of coal to this district has slightly diminished during the past few weeks, which, no doubt, has been due to the mild condition of the weather for the past 30 days. Transportation lines are handling a large volume of business, but consumers seem to be pretty well under contract for their requirements.

The following prices per net ton f.o.b. cars at the mines are quoted on the various grades of coal for spot shipment.

District	Three-quarters	Mine Run	Slack
Youghiogheny	$1 35	$1 25	$1.10
Pittsburgh No. 8	1 20	1.10	1.20
Goshen No. 6	1 45	1 35	1 20
Coshocton	1.75	1 50	1 20

The freight rate from the Youghiogheny district to Cleveland is $1 per net ton, and Pittsburgh No. 8, 90c.; the Goshen and Coshocton coals from the middle district take a 70c. rate. The demand for Massillon domestic coal continues to hold out: $2.50 for 1¼ in. is quoted for shipment at the mines. Foundry coke is selling for $4.50, f.o.b. ovens, while $4.25 is quoted on furnace. Anthracite is extremely scarce and dealers are experiencing great difficulty, due to this shortage.

Pocahontas lump and egg is bringing $2.75, run-of-mine, $1.50, and slack, 90c., f.o.b. mines, while $2.50 is quoted on Massillon, 1¼-in. lump at the mines. Foundry coke is selling for $4.50 f.o.b. ovens, while furnace coke is going at $4.

Small dealers are experiencing difficulty in securing anthracite coal. Substitutions are made freely, and those who have not been able to secure their requirements of hard coal, have been forced to utilize soft.

Railroads are operating to their maximum capacity and are demanding heavy fuel shipments from the mines. A large Canadian Road recently purchased from 50 to 75,000 tons of Pittsburgh No. 8 fuel for shipment into Canada prior to April first. The recent cold wave did not have much effect on the market and coal men believe prices will hold out.

LOUISVILLE, KY.

As predicted last week, the situation has eased up considerably, especially in the steam coal market; although the expected break in prices has not yet materialized, the falling off in the steam grades might well be designated as such, the difference being 30 to 40c. a ton below the high figures which prevailed during the worst of the shortage. For example, Western Kentucky pea and slack is on the market at 40 and 50c., and some sales have been reported as low as 35c., f.o.b. mines, of course; and nut and slack is selling in the same district at prices running all the way from 65 to 80 and 85c., depending largely on quality and location.

Some large consumers, however, whose supplies ran low during the recent scarcity of steam grades, and who have not yet been able to stock a sufficient amount over and above their current needs to assure them of a margin of safety, are now making strenuous efforts to remedy their deficits. They are consequently taking everything in sight, in many cases necessarily at figures higher than those quoted, especially outside of their contract requirments.

Western Kentucky is figuring strongly in this feature of the market, screenings from that field being shipped to the local industries in considerable quantities, and absorbed without any trouble. The usual Christmas lay-off affected Eastern Kentucky operators, although beginning on New Year's, the men were back on the job in most cases, and half a day's run was made. The week's output was light everywhere by reason of the holidays, however, and there has been no complaint of insufficient cars.

Seasonable snows and considerably lower temperatures than ruled through December may be expected to result in a stiffer demand for all grades, especially the domestic. So mild has been the winter up to the past two weeks, that even with the scanty receipts from the mines, there has been no real danger of a shortage, with buying so comparatively slow. The worst of the winter usually occurs in January, February and March, and a brisk demand is to be expected for this and the next two months, at least, with the usual stocking by the railroads to follow that.

The Louisville & Nashville, whose recent demand for three days' output from all Eastern Kentucky mines on its lines, adhered to its promise, releasing the operators from this requirement, some time around Christmas. It may be doubted, however, whether the railroad managed to lay in sufficient supplies to last for any time, and it is, therefore, to be hoped that the present relief in the car situation is not merely temporary. In Western Kentucky the receipt of a number of the Illinois Central's long expected new cars, has had considerable to do with the relaxation of the tension in this respect, in that district.

Eastern Kentucky prices, especially on domestic grades, have been showing indications of weakening, but there is not yet much of a concession in this respect. Block is quoted at $2.25 to $2.50; lump 10 and 15c. lower; round, $1.75 to $2; nut and slack, 65 to 90c.; run of mines, $1.25 to $1.50.

The prediction is freely made by well informed operators that the trade is on the verge of a sharp break. The domestic market has been gradually declining for 30 to 60 days, on account of the continuance of mild and open weather, and this in spite of the severity of the car shortage. The supplies of local dealers, however, have in all cases been ample to tide them over this period, and consequently there has been no shortage in domestic. The market in the steam grades, which has been extremely high, is also expected to ease off somewhat, as the car situation is gradually improving; the demand of the Louisville & Nashville was responsible for a more acute condition than had existed during the entire season, but the road has about satisfied its needs. Moreover, it has been returning cars very rapidly, unloading and sending them back promptly to the mines. This made the three-day loading to the railroad no more of a hardship on the operators than was absolutely necessary.

HAMPTON ROADS, VA.

A very heavy tonnage of coal has been loaded during the past few weeks for the Panama Canal. It is understood that work there is now being pushed to the full limit. The market price on standard smokeless coal still continues upward of $3.25, with very little available.

The demand for bunker and export coal for ships' use has grown steadily during the past few months. The cost of producing and handling, the latter especially, have been increased materially by changes in railroad as well as pier charges during the year. As bunker contracts are generally made only at the first of each year, shippers were obliged to stand these new charges until time to make new contracts with ship owners.

INDIANAPOLIS, IND.

The coal trade here is a weather proposition, and so far, the winter has been merely an extension of fall. It has finally had the effect of enabling mines and dealers to catch up with consumers' demands, after the great handicap at the beginning of the season caused by the shortage following the spring shutdown and the railroad transportation troubles. The usual holiday dullness brought a reduction in the domestic grades of about 40c. a ton, and on steam grades 10c. to 15c. a ton, since Dec. 1. The weather has also had the effect of practically ending the car shortage and mines are making few, if any, complaints of lack of equipment.

If January has the same mild weather as December, the summer schedule of coal prices will be almost certain to go in effect at the mines. Values of the steam grades have not suffered like the domestic because most steam coal is under contract, and there is only small buying in the open market. The easing off in domestic prices is not yet shown by retailers' quotations because the mines are still delivering to the yards on old orders, taken at the top of the market.

The following represents closely the Indiana mine prices, Indianapolis prices being 50c. higher, to cover freight:

No. 4 mine-run	$1 10	Domestic lump 5- and 6-in.	$1 65
Nos. 5 and 6 mine-run	1 00	Screenings, No. 4	0 70
No. 4 steam lump, 1½-in.	1 25	Screenings No. 5 and 6	0 60
Nut, No. 4	1.30	Washed coal, Nos. 1 & 2	$1.75@2.00
Egg	1 40	Brazil block	2.20
Domestic lump 2½-in.	1.50		

DETROIT, MICH.

Bituminous—The coming of the new year witnesses an unsatisfactory situation in the Detroit market. Operators are reluctant about making shipments to this point, preferring to wait until the weather conditions are more favorable. They are slow to cut the prices and cause a break in

the market, at least until it has been fully demonstrated that cold weather will not appear. On the other hand the operators and jobbers of Detroit look back with great satisfaction on the year of 1912, and are now predicting with great confidence that 1913 will be a banner one in the coal business.

One encouraging feature of the holiday dullness is the fact that the prices rule firm. There has only been a slight drop in quotations and the smaller sizes are still in great demand with very little to be had. Track coal is scarce and is being disposed of with little or no difficulty as fast as it arrives. The railroads are experiencing considerable difficulty in handling cars properly, which has resulted in embargoes on nearly all of them. However, these conditions are not as severe as they were a year ago at this time. On the coarser sizes and domestic coal, the existing conditions are quite different. There seems to be considerable of this kind of fuel in stock, which it is utterly impossible to dispose of, and a number of shippers are much worried about the outcome. The fact of the matter is that the prices on this grade are ridiculously low.

Local market conditions are as follows:

	W.Va. Splint	Gas	Hocking	Pitts. No. 8	Jackson Hill	Pocahontas
Domestic lump	$1 50		$1 40		$2 40	$2 40
Egg	1.50		1 40		2 40	2 40
Nut			1 90			
3-lump	1.35	$1 35		$1 25		
Mine-run	1.15	1 15	1.15	1 20		1 60
Slack	1.10	1 10	1 10	1 10		Open

Anthracite—The hard-coal situation is being relieved quite materially, abundance of the larger sizes are arriving and the market continues to be liberally supplied. However, it is predicted that 10 or 15 days of severe weather would bring quite a change in this situation. Were severe storms to come, in all probability the big shippers would send their fuel to eastern markets, rather than take any chance of it being tied up indefinitely in and about Detroit.

Coke—Demand for coke is not so keen as it has been. However, it seems to be holding its own as to price. Semet Solvay being quoted at $4.75, gas house at $4.50 per ton, f.o.b. ovens.

CHICAGO

With the beginning of the new year a soft market is confronting Chicago coal dealers. Moderate weather and a better supply of cars are assigned as the chief reasons. Coal of almost every kind is on track and immediate buyers are few, the only exception being in anthracite. Retail dealers are receiving a comparatively scant supply and are barely able to keep even with the demands of their customers.

There has been a decided slump in the demand for splint coal. Two weeks ago dealers were kept busy obtaining supplies of this variety, but now there are many carloads remaining on track unsold. The circular price is $2, but the market is considerably below this. Smokeless market also is weak. Carterville operators are holding their high-grade domestic product for $1.75, but the low-grade coals have not sold for much under $1.50. Furnace and foundry cokes are in good demand. The price of Springfield domestic lump ranges from $1.35 to $1.60.

Mild weather has had a bearing on the general situation and retail dealers have been taking coal only on previous orders. The Western demand for anthracite continues active and it is believed that the situation will become acute before long as shipments are expected to be light for some time.

Prevailing prices in Chicago are:

	Sullivan Co.	Springfield	Clinton	W Va
4-in. lump	$2.62			
Domestic lump		$2 32	$2 27	
Egg	2 52			$3 80 @ 4 05
Steam lump	2.07 @ 2 17	2.12	2.17	
Mine-run		1.97	1.97	3.45 @ 3.55
Screenings	1.62 @ 1.67	1 47 @ 1.57	1 57 @ 1 62	

Coke—Connellsville, $6.75@7; byproduct, egg and stove, $6@6.25; byproduct, nut, $6@6.25; gas house, $6.

OGDEN, UTAH

The holidays found the mines in Wyoming and Utah shipping all the coal they were able to mine. The shortage of box cars that has been general, for the past three weeks, developed into a shortage of all kinds, and the mines in Wyoming lost a few days on this account. The shortage on the Rio Grande Railroad that has affected the mines in Utah for the past three weeks, was accompanied by a severe congestion on the road at several points and the tonnage the last week in December fell off immensely. These blockades were so severe that the railroad was unable to move the loads away or supply the mines with empties.

Weather conditions remain about the same over the Northwest, and there is a good demand for domestic coal. The shortage of anthracite coal in eastern Nebraska has increased the demand for bituminious coals and at present the shipments east of Grande Island are good.

There seems to be no excessively low temperature in any locality, the lowest reported being about 8 deg. above zero. Reports from the territory covered by the Wyoming and Utah mines show that most dealers have disposed of a large percentage of their stocks in the last two weeks and are urging the operators to place some coal in transit, anticipating colder weather in January.

ST. LOUIS, MO.

The St. Louis coal market is very quiet for this season of the year. Everybody is well stocked up and no one is buying. It was thought that the first of the year would bring changes in both weather and prices, and although the weather has been somewhat cold, it has not been enough to warrant any material change in prices.

Cold waves and snowstorms seem to circle around St. Louis, leaving the weather here moderate. Towns to the southeast are experiencing heavy storms, and trains entering St. Louis from the east are covered with snow.

Anthracite egg, stove and grate are flooding the St. Louis market, but chestnut is not moving as fast as it should.

The prevailing prices are:

	Carterville and Franklin Co.	Trenton and Big Muddy	Mt. Olive	Standard
2-in. lump				$1 00 @ 1 10
3-in. lump			$1.40	
6-in. lump	$1 35 @ 1.50		1 60	1 25 @ 1 30
Lump and egg	1.45 @ 1 60	$2 25		
No. 1 nut	1.30 @ 1.40			
Screenings	0.75 @ 0.85			0.55 @ 0.65
Mine-run	1.10 @ 1.20			0.90 @ 1.00
No. 1 washed nut	1.50 @ 1.60			
No. 2 washed nut	1.35 @ 1.40			
No. 3 washed nut	1.35 @ 1.40			
No. 4 washed nut	1.35 @ 1.40			
No. 5 washed nut	0.85 @ 0.90			

Gas house and byproduct coke are quoted at $5.50, f.o.b. St. Louis.

PORTLAND, ORE.

Colder weather has prevailed here the week past and the demand for coal for domestic purposes showed an increase. Heretofore the winter has been mild throughout the Pacific Northwest. A large order to be placed here soon is that of the Federal Government calling for 7000 tons for use in supplying power in the construction of the Celilo Canal on the upper Columbia River. Bids have been invited and will be opened in a few days by the government engineer in charge of the project. This will be one of the largest single orders for coal placed here for some time.

COAL SECURITIES

The following table gives the range of various active coal securities and dividends paid during the week ending Jan. 4:

Company	High	Low	Last
American Coal Products	90	90	90
American Coal Products Pref.	111	111	111
Colorado Fuel & Iron	34⅛	34	34⅛
Consolidatioo Coal of Marylaad	103⅞	103⅛	103¼
Island Creek Coal Pref	87¼	87¼	87¼
Lehigh Valley Coal Sales	220	220	220
Pittsburgh Coal	24⅛	23	23⅛
Pittsburgh Coal Pref	94⅛	91¼	93
Pond Creek	28⅛	26	28
Reading	168⅛	165⅛	167¼
Reading 1st Pref	90	90	90
Reading 2nd Pref	93	92	93
Virginia Iron, Coal & Coke	58	55	55

Bonds Company	Closing Bid	Asked	Week's Range or Last Sale		Year's Range	
Colo. F. & I. gen. s f g 5s	97⅛		98	Dec. '12	79	100⅜
Colo. F. & I. gen. 6s			107¼	June '12	107¼	107¼
Col. Ind. 1st & coll. 5s. gu	82¾	84	83½	84	72½	85½
Cons. Ind. Coal Mc. 1s 5s	80	83¾	85	June '11		
Cons. Coal 1st and ref. 5s		94	93	Oct. '12	93	94
Gr. Riv. Coal & C. 1st g 6s	95		102½	Apr. '06		
K. & H. C. & C. 1st s f g 5s			98	Dec. '12	97⅛	98⅛
Pocah. Con. Coll. 1st s f 5s	87	88	87½	87⅞	81⅛	89⅛
St. L. Rky. Mt. & Pac. 1st 5s	78⅛	81	79½	80	79⅛	84¾
Tenn. Coal gen. 5s	102	102½	103	103	101¼	103¾
Birm. Div. 1st consol. 6s	102	103¾	102½	Dec. '12	102⅛	104½
Tenn. Div. 1st g 6s	101½	103⅜	101⅛	Dec. '12	101⅛	104
Cah. C. M. Co. 1st g 6s	103½	110	110	Jan. '09		
Utah Fuel 1st g 5s						
Victor Fuel 1st s f 5s	83	85½	Oct. '12	85⅛	86	
Va. I. Coal & Coke 1st g 5s	97	Sale	97	97	94⅛	98⅛

Lehigh Valley Coal Sales Co.—Dividend of $1.25, payable Jan. 20, to holders of record, Jan. 7.

Pacific Coast Co.—Regular quarterly 1½% on the common and second preferred and 1¼% on the first preferred, all payable Feb. 1.

COAL AGE

Vol. 3 NEW YORK, JANUARY 18, 1913 No. 3

"DO not look a gift horse in the mouth." Why? He usually has bad teeth.

Time was when nearly every position of responsibility carried with it certain perquisites, but with the gradual moral awakening in our business conscience, perquisites have fallen into disfavor, until now it requires an elastic conscience to accept most of them.

Every now and then, however, you'll run across some man in authority who is willing to accept without question the old adage about the "gift horse," and when you do, it is better not to suggest that his conscience is elastic. In this class must be placed those individuals who are willing to stand sponsor for any new organization, provided they see a "gift horse" in the distance.

Here are a few illustrations of what they sow:—

A fake "building and loan association" (there are plenty of them still in existence) was organized in a certain city which was centrally located in an important mining region. How were they to get the miners' money? Easy—they gave stock to a number of the more prominent mine superintendents and foremen, afterwards displaying the names of these men on all of their advertising circulars.

During the two succeeding years, a large number of thrifty miners followed the lead (as they supposed) of their bosses, and invested all of their savings in building-and-loan stock. In the meantime, the officials gradually became worried about the "teeth" displayed by their "gift horses;" however, the time to examine a horse's teeth is when the other fellow owns it. When the inevitable crash came, everything disappeared—except the "gift horses'" teeth; they will undoubtedly survive their masters.

In another mining town a fake industrial insurance company was started, and the same tactics were resorted to, with almost similar results. In still other communities, fake land companies, fake co-operative mining companies, fake orchard companies, fake banks, etc., were organized simultaneously, and after drifting on the customary two years, traveled the same road and shut up shop.

Don't think for a minute that large companies are the only ones that profit by the so-called "pull of prominent names." You'll find the book agents, picture agents and salesmen of all descriptions offering their wares free to ministers and other prominent people, just to get their list started. We have even known raffles to "hang fire" until the "super" accepted several numbers free and allowed his name to be artistically engraved on the sellers' lists.

You see, "gift horses" are grown in all sizes from ponies to draft horses, and serve all ages of humanity from children to the aged and infirm. In one respect, however, there is not much variation, and that is as regards teeth.

"But," says the pessimist, "everyone knows the proverb about 'a fool and his money.' Why try to protect him?" And we answer: There is not so much inclination on our part to guard the foolish and gullible as there is a desire to awaken the moral conscience of the near-owners of the "gift horses."

The most conspicuous example of discipleship to "gift horses" now in the public eye, is the prominent son of one of our most gifted authors. Whatever may be the outcome of his trial as affects himself, the incident is bringing home to all mining men the realization of the responsibility of guarding well one's name.

A man can no longer loan the use of his name to an unsafe business enterprise and hope to be held blameless afterwards if the venture brings disaster. Declarations of personal ignorance concerning the true character of the undertaking will not exonerate one. The only argument left to such a man is to defend his action on the basis of conviction that one of the perquisites of leadership is reward without responsibility.

The "gift horse" and the perquisite may not lay claim to the same identical pedigree, but they never refuse to eat from the same manger.

MORAL: Do look a "gift horse" in the mouth.

IDEAS AND SUGGESTIONS

The Fallacy of Seven Shifts a Week

By a Colorado Engineer

Any engineer or superintendent of machinery, for a large coal operation with several mines, can call to mind times without number when he has made hurry trips to a mine because some new piece of machinery "wouldn't work," or some newly installed drive "went backwards." Upon his arrival, he probably found that some little thing had been neglected, by the local force in the erection, or that some easily remediable defect existed, that took only a small amount of work and gray matter to cure. The same men can also recall that they swore at the apparent stupidity of the mine machinist or master

The stupidity was only apparent. The fact is that the local force had been working on that installation three or four shifts straight, and some of them, doubtless, for weeks previous, putting in eight to twelve shifts a week, until they couldn't be expected to have any ideas.

Furthermore, the local machinist, when physically fit, has almost, if not quite, as good ideas as the man who came down from the city office to set him straight. The conditions under which he works, however, are such as to absolutely benumb his brain and make original thought impossible. Such a run of extra shifts on the part of monthly men is often made a matter of loyalty to the company, but is mistaken loyalty at that. On the part of men paid by the hour it piles up the payroll without commensurate service. In either case the company loses.

Even seven shifts a week is one too many for the best work. Men get logy and give no more service than they would in six. Such conditions are more common in the West than in the older parts of the country, and the men themselves are largely responsible.

I myself worked on one construction job for fifteen months, seven days a week. I observed many of the men insisted on working on Sundays and would have quit had it not been permitted. The work would have gone slower on a six-day schedule, not because the men would work any slower, but because it would have been difficult to keep men on the job. The payroll was just one-sixth bigger than it would have been for the same work on a six-days-a-week basis. The company lost by working that seventh shift.

Where the Harm Is Done

Coal mines seldom run on Sunday, but certain men work almost every Sunday necessarily because machinery is idle and can be gone over for repairs. These same men frequently put in extra shifts during the week, and I never knew one of them to lay off a regular shift to catch up. That is where the harm is done. Physically they stand up under it, but mentally they are benumbed and in a position where they are incapable of keen intelligence and originality. The company loses rather than makes by such continual service.

Again, life in many camps has no distractions, except the saloon. Some men, ambitious and earnest, not caring for these attractions, live, eat and sleep with the job. It may be good for the job, but it is bad for the men. The man who has no outside interest, no recreation, begins to think in a circle, to lose perspective. The soft-handed office chap, who forgets his work at five o'clock, can come down to the mine and with a fresh mind, see and solve problems that have baffled the mind, naturally as strong, but clogged by unnatural living.

Would not companies be ahead by insisting that no man put in more than seven shifts a week, or if he does, making him lay off during the next to even up? In camps which the companies control, they should provide amusement places, aside from the saloon, not merely educational features, but billards and bowling, and moving-picture theaters. These things need not be given, they simply need to be permitted. They will pay for themselves as they do in independent communities not controlled by corporations.

The Danger in Efficiency Methods

By Pennsylvania Reader

In coal mining, as in all other industries, a large proportion of the companies have as their higher officials men who have not passed through every stage of the business before assuming their present position.

Thus by far the majority of presidents of coal-producing corporations are not men who have spent a considerable portion of their early life actually digging coal or driving a mule or picking slate. Very often they are the choice of the board of directors on account of their general executive and administrative ability. Sometimes they hold their position simply because they have the confidence of a majority of the stockholders and have average business ability. The same condition holds true with the general manager and superintendent. They, more often, are technically trained men; their actual experience in coal mining has probably been confined to more or less desultory chaining done on an engineer corps during summer vacations while at school.

When we get to the mine foreman we almost invariably find a so called practical man who has laboriously gone through all the various stages of mining up to his present position. He has mastered sufficient arithmetic, geometry, etc., etc., to enable him to discharge his duties intelligently. But his main "stock-in-trade" is not his book knowledge or the various theories which have been propounded to him. He is valuable to his employer on

account of his good common sense and judgment, his ability to handle men, and various other qualities which can be obtained at least as easily in the school of practice as anywhere else.

There are, of course, many presidents, managers and superintendents who have literally worked their way up from the bottom, but these are exceptional cases. The men who have thus succeeded have had unusual ability.

In the present day, when the daily papers, the so called muck-raking magazines, and reports of investigation committees are full of arguments for industrial efficiency, it is no more than natural that the directors of the coal industry should concern themselves with the improvement of the business over which they preside by introducing scientific management.

The first step in this process is to systematize the business completely. The manager requires numerous reports from his superintendents in order that he can point out to the latter where room for improvement exists. The superintendent, in turn, must have facts and figures on which to base his reports, so he calls on his subordinates to furnish him with daily statements. The most available man to turn to for these reports is the mine foreman, and it is just at this point that often more is lost than gained by trying to introduce modern efficiency systems.

It is always difficult to make a practical man see the advantages of any change in the established methods and the average mine foreman is no exception to this rule. The new reports he is required to make are considered by him as a mere waste of time, so that he does this part of his work half-heartedly and he is not so much concerned with accuracy as he is with getting the task out of the way.

But besides this apathy or even opposition on the part of the mine foreman, there is another more serious objection to this system of getting at efficiency figures. The mine foreman is the "man at the front." He is the man who personally directs and leads his men. The labor of which he has charge is of such a nature that it is necessary in most cases for the foreman not merely to give directions to his men as to how the work is to be carried out from day to day but, if he is to be successful, he must actually *see* the work done. This, of course, means that he must visit widely scattered points.

He may be called upon during the course of the day to see that a fall in a main haulageway is cleaned up and made safe, or that a roadway is repaired or that better ventilation is provided in a certain part of the mine or that hundreds of other jobs are duly performed. He may have men who are responsible to him for overseeing these various jobs, but after all a mine never was a success unless the "big boss" devoted a large proportion of his time to supervising the work in person.

It may happen that the foreman is conscientious and truly aims to give his superintendent the information the latter demands. We must remember that the mine boss is a self-educated man and cannot get down to any clerical work, such as is needed in making out formal reports, without his attention being taken from his regular duties, much to the detriment of the latter.

I do not mean to infer from the above that modern efficiency should not and cannot be applied to coal mining. But under the present existing conditions, with inferior grades of labor and strong overbearing pit committees, modern efficiency methods cannot start with the mine foreman. They must be initiated lower down the scale, with the diggers and daymen themselves. The modern mine foreman has not the ability nor leisure to train his men, especially when radical changes in the method of work are demanded in the interests of modern efficiency methods.

How Accidents May Be Reduced

By Joseph Northover*

Out of 490 persons killed in the mines of Pennsylvania during the year 1911, 308 met death from falls of coal, draw slate and roof rock. Thus 62.86 per cent. of the fatal accidents were caused by falls.

Systematic timbering and spragging at the working face will do much to reduce this type of fatalities. The question of when and where sprags or props should be set is one which should not be left entirely to the judgment of the individual miner. While he should be free to put up additional props when he thinks they are needed, he should not be permitted to set them more than a fixed distance apart. Experience shows that a large proportion of accidents occur from falls of apparently strong roof, in which no crevice or slip could previously be observed. Hence the roof, sides and working face can be made secure, only by timbering systematically.

The assistant foreman should not have any larger section than he can cover each and every day. No more than 75 men should be under his supervision. There should be a few special rules printed on cards in the various languages and hung in conspicuous places in the mine.

When the assistant mine foreman visits a working place and finds any workman violating the rules as set down by the company, such workman should be promptly suspended by the mine foreman for days, weeks or months, according to the nature of the rule violated.

The rules posted might be somewhat as follows:

Rule I. When undermining coal, set sprags not less than 7 ft. apart.

Rule II. Examine your working place at the beginning of every shift before you start to work.

Rule III. There shall be not less than 3 rows of props in all rooms. These shall be not more than 4½ ft. apart, and the foremost props must be set not more than 7 ft. from face.

Rule IV. Do not charge even a rock hole with both dynamite and powder.

Rule V. When you fire a blast in coal or rock, wait at least 3 min. before going to see what the shot has done.

It would be the duty of the assistant foreman to see that these rules were strictly enforced.

*Assistant foreman, Berwind-White Coal Mining Co., Seanor, Penn.

SNAP SHOTS IN COAL MINING

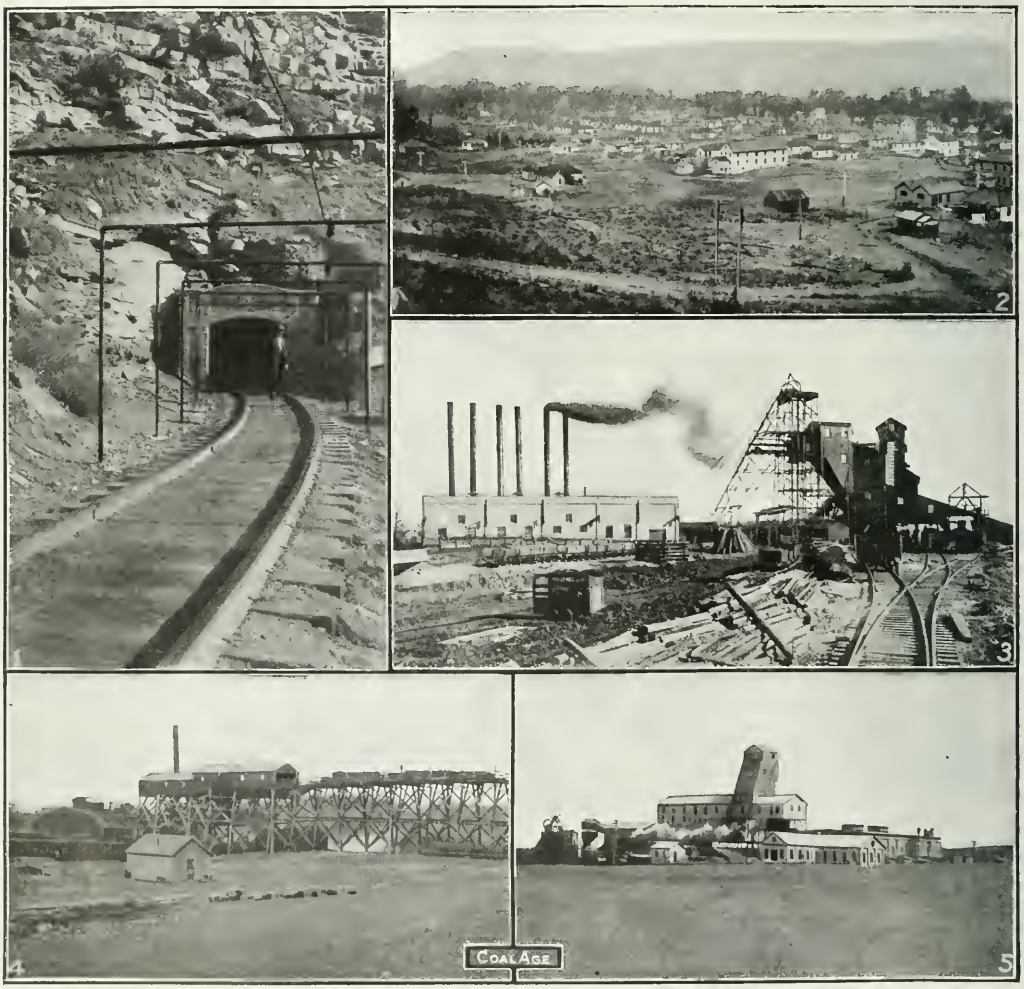
1—Concrete portal of the Willow Creek mine, Utah Fuel Co., Utah. A mine opened in 1912. Note the heavy rails for the electric locomotives.

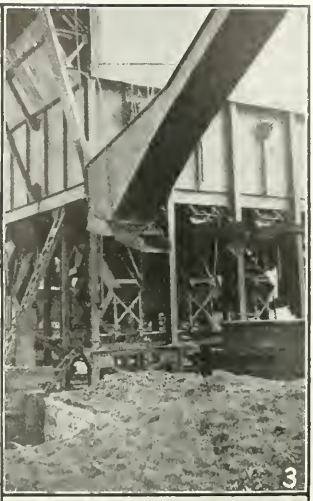
2—Village of Monarch, Wyo., where the mines of the Wyoming Coal Mining Co. are located. Most of the houses are one story high.

3—Ziegler District Colliery Co.'s Shaft North No. 1, Christopher, Ill.

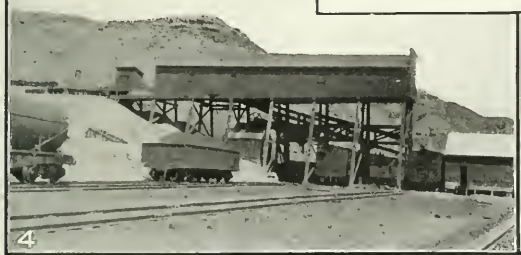
4—Roundup Coal Mining Co.'s Tipple at Roundup, Mont.

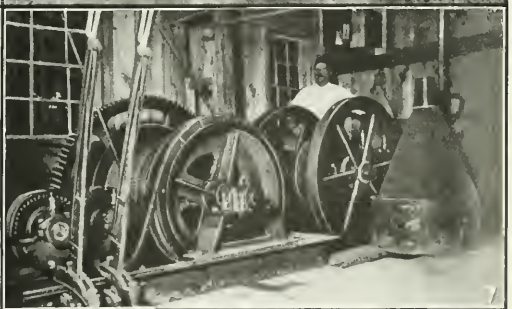
5—Headframe and Tipple at Galt Mine No. 6, Lethbridge, Alberta, Can., owned by the Canadian Pacific Ry.





1. Car-haul at the Carney Cozl Co.'s Mine at Carneyville, Wyo. Erected by Roberts & Schaefer.
2. Tipple of the Hutchinson Coal Co., at Bridgeport, O.
3. A tipple belonging to the Wyoming Coal Co.
4. Van Dyke Tipple of Central Coal & Coke Co.
5. Lorain Coal & Dock Co.'s 35-year old houses at Wheeling Creek, O.
6. Head of Short Mountain Slope, Lykens, Penn. (1) R. A. Quinn, general manager; (2) W. Auman; (3) M. Readdy; (4) C. P Kutzner; (5) C. N. Finton; (6) J. Reese.
7. Gasoline Hoist at Ratcliff Coal Co.'s Mine, Doudsleondo, Iowa.
8. Beehive Ovens of the Keystone Coal & Coke Co. at Carbon Mine, Greensburg, Penn.
9. River Tipple of Pittsburg Mining Co., Pomeroy, O.
10. Leveller at work on ovens shown in Fig. 8.





The Preparation of Bituminous Coal

By F. E. Brackett*

SYNOPSIS—This is the first of two articles on this subject. The different types of car-dumping devices are discussed, as well as the track grades, both approaching and leading from them. The slopes of bar screens and chutes for handling the various sizes of coal are also considered.

The preparation of bituminous coal for market is one of the simple problems of mining engineering. At least the process itself is simple, but it is often quite difficult to decide just what series of operations to adopt, or just how far to carry them. The present article will be confined more particularly to the engineering aspect of the business and attempt to give data of interest to those who may be called upon to lay out mine plants.

What Is Coal Preparation?

In a general sense coal preparation consists of cleaning from impurities and in sizing over screens. The first is usually carried out in the mine and in the tipple or dumphouse. The subject of washing is a specialty in itself and will not be considered here.

Such cleaning as coal otherwise receives is simply the picking out of impurities. The screening is generally done at the tipple, although coal can be "forked" in the mine.

For the present purpose we recognize two main classes —steam coals and gas coals. In physical texture the first are softer and more brittle than the latter. They produce less smoke and have a higher calorific value. On burning, the slack coal cokes quickly, forming a cover over the fire, which is easily broken with a slice bar, thus allowing a full draught through the fuel.

Slack is, therefore, nearly as good as lump coal among fuels of this class. The brittle nature and coking qualities of steam coals make sizing on screens both less effective and less important than for gas coals. We, therefore, seldom find screening carried on to any considerable extent with this class.

With gas coals, however, the conditions are quite the reverse. Their hard texture and slower coking qualities make screening advisable, and in some sections of the country where competition is strong, we find this sizing carried out with great care.

Coal is nearly always cleaned underground. Above all things the miner must be required to load a clean product. Any other policy would much increase the work at the surface and decrease the efficiency of the plant. Usually the only other attempt made at cleaning is carried out in the railroad cars. From one to several men placed there to watch the coal as it is dumped can ordinarily catch all the dirt which has passed the miner. Sometimes picking belts are installed, as in the anthracite mines, but their use has, in some cases, been found superfluous. They are not usual nor in any sense common features of bituminous plants.

The smaller grades of coal are sometimes washed for market. In coking plants the entire output is sometimes crushed and washed to remove the sulphur, and thus improve the grade of coke.

*Consulting engineer, Cumberland, Md.

It is usually thought proper to dump coal but once after it has been loaded by the miner. Thus in nearly all cases we find the mine cars brought to the surface, even though in shaft and slope mines this is sometimes quite inconvenient where large outputs are to be obtained.

It would seem that too much stress had been laid on this point. Much coal is handled eight times before it reaches the grate bars, as follows: First, from breast to mine cars; second, to railroad cars; third, to barge; fourth, to crane bucket; fifth, to storage bin; sixth, to carts; seventh, to boiler-room floor, and eighth, to grate bars. Sometimes even this schedule might be increased.

Again, the rehandling after the coal has been shipped is often much rougher than any received at the mine. For these reasons we think the colliery owner would be justified in dumping his coal from mine cars to skip, monitor or other contrivance, if he finds it convenient to do so.

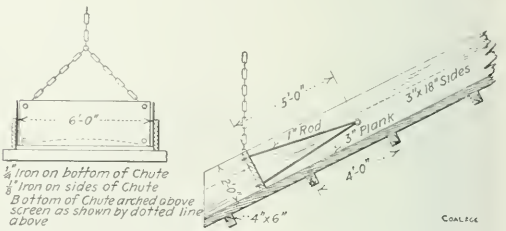


Fig. 1. A Gate Which Can Be Easily Opened or Closed

Moreover, it might be feasible by special designs to drop the coal from the skip to the railroad car more gently than it is possible to load direct from the mine car. The use of "baskets" on tipples to break the fall is a recognized advantage, but from some cause or other the use of a skip is not looked on favorably, though for reasons just given this would seem to be nothing more than a mere prejudice.

The Different Kinds of Dumps

Contrivances for dumping coal from the mine cars may be classified under three heads: bottom dumps, cradle dumps and end dumps, or tipples. These all possess their peculiar advantages, but the latter is by far the most common in ordinary use.

Gates are sometimes placed in the bottoms of mine cars, where they are to be dumped into long bins at different points. Gear equipped in this way can be discharged at any point on a track where an opening is provided, and hence for bins this is convenient. "Rope trips" can be dumped in this way without uncoupling the cable.

As bins are a necessity at coke plants and many railroad coaling stations, this method of dumping is frequently found useful. Bins can also be loaded by putting the ordinary end dump on a truck and moving same to various points, where a car is to be emptied. This, however, is tedious for a large bin and output.

Cradle dumps turn the pit wagons sideways and require no gate in the car. The form is that of a large open cylinder, in which one or more cars are placed. This cylinder slowly revolves and thus discharges the car's contents.

For loading railroad cars this arrangement has been found too slow and cumbersome for general use, but for filling bins it might prove useful, especially where several cars would be emptied at once. Like the bottom dump, it might be arranged to accommodate a rope trip without uncoupling, but for a long trip this would no doubt be too cumbersome. It is probable that the coal is deposited more gently with contrivances of this class than with any other type.

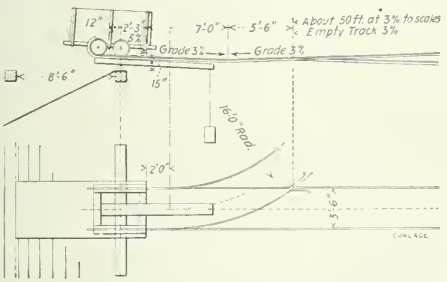


FIG. 2. A HALF TIPPLE, SHOWING TRACK GRADES

For ordinary commercial purposes—loading railroad cars—we find the end dump or tipple almost universal. This is on account of its small size, low cost and rapidity. There are a number of different types of this tipple on the market, but most of them can be classified as either "half tipples" or "through tipples."

Fig. 2 shows an efficient and cheap device of a type which since the introduction of the "through tipples" has come to be known as a "half tipple," because the car must be pulled or moves automatically backward after dumping, instead of going on through.

By arranging the grades as shown, the empty car leaves the tipple of its own accord after discharge, but sufficient momentum must exist in the car to carry it uphill to the tipple from the low point, which is 7 ft. in rear of the mechanism.

This momentum is provided by allowing about 50 ft. of a downhill run from the mine scales, as indicated. In actual practice three cars per minute have been dumped with this tipple, but delays due to non-arrival of trips, and other miscellaneous causes, much decreased this as a daily average.

Fig. 3 shows a through tipple. After being dumped, the car travels over the tipple and around the "kickback" at *B*. The "horns" which hold the car on the table while it is being dumped are opened by the action, through a special mechanism, of the next car fed to the dump. This arrangement somewhat reduces the labor requisite to the use of the half tipple and slightly increases the speed of dumping. About four cars per minute can be handled, provided there are no delays in feeding.

It is frequently claimed that this speed can be increased, though for ordinary practice it is very doubtful whether it can be materially augmented. Certainly not, if the coal is passed over a bar screen in the chute below the tipple. In fact, to screen properly this speed should be reduced a little for two-ton mine cars. There is usually far more delay in getting cars to the tipple than there is in actual dumping.

NECESSARY TRACK GRADES

The grades or slopes of the tracks below the tipple and around the "kickback" should be carefully laid out so as to prevent the empty car from attaining too great a velocity, but at the same time to make its movement prompt and certain.

To accomplish this, it would seem that the empty track grade *g* should not exceed 2 per cent., and that the total slope *b*, existing at the center of the tipple, should be between 0.0265 and 0.0320 ft., according to the amount of resistance to be encountered. For cases where there is no unusual friction, the lower value might be used, but practice usually sanctions a little higher grade. In a case where there are two extra switches, besides the one at the "kickback" to cross, and where the distance between the tracks is double width (about 16 ft.), the factor used should not be less than 0.0320.

After leaving the mine car, the coal enters the chute. If no screening is done, this is only a means of conveying the coal to the transportation car and performs no function except to break the fall and assist in trimming, so as to give the loaded car a pleasing appearance. Under these conditions the shorter the chute the better.

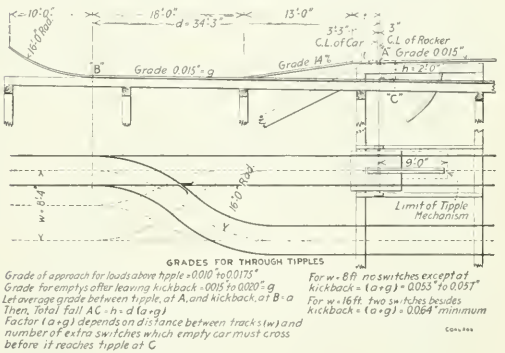

10'0"
18'0"
13'0"
d = 34'3"
3'3"
3"
C.L. of Car
C.L. of Rocker
16'0" Rad.
B
Grade 0.015" = g
Grade 14%
A
Grade 0.015" = g
h = 2'0"
C
9'0"
16'0" Rad.
Limit of Tipple Mechanism
GRADES FOR THROUGH TIPPLES
Grade of approach for loads above tipple = 0.010 to 0.0175
Grade for empties after leaving kickback = 0.015 to 0.020 = g
Let average grade between tipple, at A, and kickback, at B = a
Then, total fall AC = h = d (a + g)
Factor (a + g) depends on distance between tracks (w) and number of extra switches which empty car must cross before it reaches tipple at C
For w = 8ft. no switches except at kickback = (a + g) = 0.053 to 0.057
For w = 16ft. two switches besides kickback = (a + g) = 0.064 minimum
COAL AGE

FIG. 3. A THROUGH TIPPLE AND KICKBACK

When a screen is used in the chute, this usually consists of a number of bars placed longitudinally, over which the coal passes. That portion of the chute above the screen should be long enough to spread the coal over the entire width, but not so long as to unduly increase its velocity. Sometimes this part of the chute is arched slightly on the bottom, as shown by the dotted line in Fig. 1. This materially assists in spreading the coal.

Except for an apron to aid in trimming the cars, the part of the chute below the screen can scarcely be said to perform a function, unless the coal is stopped at its lower end.

The dimensions of coal chutes no doubt are largely fixed by the capacity of the mine cars. However, with the standardization of equipment the dimensions of chutes for lump and run-of-mine coal have been quite generally fixed at 6 ft. wide and 18 in. to 2 ft. deep where screens are used. Where there are no screens, the

chutes are often made narrower and sometimes taper slightly toward the lower end. Four feet is a common width for the extremity or lip.

The narrower end assists greatly in trimming when the length of the chute lies the long way of the railroad car. By this arrangement, the best trim on the car is accomplished. Where conveyors and revolving screens are employed, the fine-coal chutes are often from 12 in. to 18 in. wide.

From 5 to 8 ft. length of chute is usually required above the screen to spread the coal. About 10 ft. of a 6-ft. chute is enough to hold, say, 2 tons of coal, or the capacity of an ordinary mine car. This, then, is about the proper length of chute below the screen. Where chutes are made of wood, lined with sheet iron, the bottoms should be covered with ¼-in. plate, while the sides may be ⅛ in. in thickness.

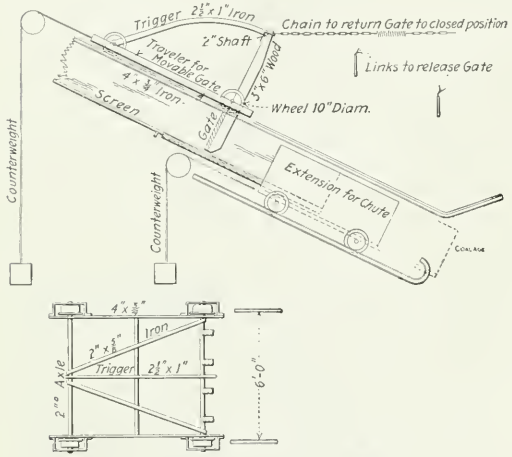


FIG. 4. A SLIDING GATE OR "MONKEY"

If the chute is a short one, the slope is not of great consequence so long as it is enough. As a rule, 25 degrees will be found sufficiently steep for steam coals. With long chutes, such as are required with screening arrangements, care should be taken to get enough slope to move the coal slowly along, but not enough to raise the velocity too high.

The following pitches have been found by trial to be about right. Some variation, however, exists between different regions. Slope or sump chutes and screens require from 5 in. to 6 in. per foot. Four and one-half inches (20°—33′) can be used for very hard, bright coals. This pitch will sometimes fail to start coal which has been stopped in the chute, even when the lining has worn bright. Nut coal will run on 6 in. per ft. or a slope of 26°—34′. The screens, however, should be pitched 8 in., or 10 in. per ft., and the chutes a little steeper than 6 in. Pea screens require about 10 in. per ft., and pea chutes at least 8 in. Slack chutes should incline 12 in. per ft., or 15 degrees.

RETARDATION NEAR END OF CHUTE

Coal is often retarded or brought to a complete standstill in the chute at the lower end, in order to permit a more thorough cleaning or for the purpose of weighing. Where the chutes are long, the coal is nearly always thus retarded, because its speed would break up the lumps too much were it allowed to enter the railroad car without check of some kind. There are various ways of stopping the coal, but the gate "monkey" and pan are the most common. A brief description will therefore not be out of place here.

Fig. 1 represents a gate of convenient form, which is easily opened and closed, and coal can be fed out at any speed necessary for a thorough inspection and cleaning. As a check on the velocity, however, it acts a little too late. The coal has already attained considerable speed, and some breakage may be expected.

The sliding gate or "monkey," Fig. 4, was designed to correct this trouble. The illustration shows an iron truck carrying the end gate for the chute. This truck is counterbalanced and controlled by a brake and a positive clutch (not shown), which holds it in its upper position. Both of these are operated through levers by the tipple man.

The weight of coal against the gate causes it to slide down the chute, until the trigger catches one of the wrought-iron loops placed for that purpose. This frees the gate, which automatically opens and releases the coal. The counterweight then returns the truck to its upper position.

The gate itself is closed by the tightening of the chain, which is fastened to the upper part of the gate frame near the point where the trigger catches it. The figure also shows an extension formed by another truck. This is a rather uncommon form of apron.

A Queer Fuel

In this country, where we have coal, wood and gas, in abundance, people hardly give the heating question a thought. But in South Africa, where there is very little fuel of any kind, they are compelled to look to other sources for their fuel. In parts of Cape Colony, it is a common sight to see little boys, ranging over the fields with a sack, picking up dried cattle dung.

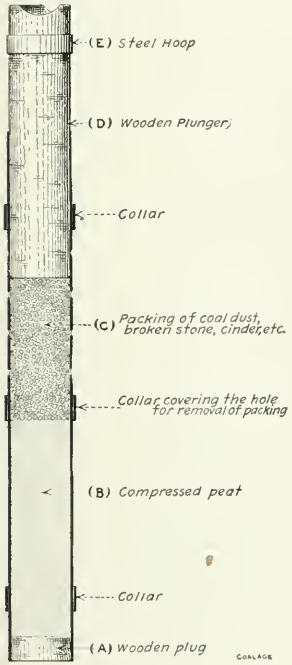
In fact this is the principal fuel supply. The farmers herd their cattle in a kraal at night, for months at a time, until their droppings have reached a thickness of several feet, and are, of course, trampled down very hard. When it is the required thickness, it is cut into square blocks and corded, very much as we cord wood in this country. When sufficiently dry it is ready for use. It lights easily and gives off considerable heat, but soon burns out, and must be replenished frequently.

Where a hillside storage of anthracite is desired, the engineer should select a slope about 300 ft. wide and 1000 ft. long, with a pitch of at least 25 deg. which ends in a level area, large enough to accommodate the desired number of tracks. If such conditions are not obtainable the expense of much digging and filling-in will have to be considered. The topography of the immediate neighborhood should be such as to permit the laying of a track, with a fair grade to the top of the storage hill and down on the other side, at a moderate cost. With this method of storage, rescreening is easy. The cost of maintenance, however, is high, as the hillside must be either concreted, paved or planked in order to insure clean coal. The cost of installing this type of plant averages $1.60 per ton of capacity, and where the hill is paved or concreted the cost is somewhat higher. The operating cost is estimated to be 10c. per ton. The percentage of breakage is high.

Metal Mine Posts

Some metal sets of the Nellen system, shown herewith, have been placed for experimental purposes at the Wérister mine, Belgium.

Each post consists of a metal sleeve of 4.8 in. diameter, split lengthwise into two parts, which are fastened together by three split collars. This sleeve is closed at the bottom with a wooden plug *A*. In it are placed one or two cylinders of compressed peat *B*, then some packing *C*, composed of coal dust, pieces of stone, cinders, etc., reaching to a point about 12 in. from the top.



When Pressure Comes on This Post it Telescopes, the Shortening Action Being Resisted by Compression of Peat

Above is inserted a wooden plunger *D* about 28 in. high, with a steel hoop *E*. The elevation of the plunger is regulated by abstracting a sufficient quantity of the packing through holes in the tube. The rail serving as a crossbar rests on the plungers of the two posts, which are held in place under it by iron shoes *F*, fastened to its base by pressure screws.

Post Gives Approximately Equal Resistance Under Unequal Subsidence

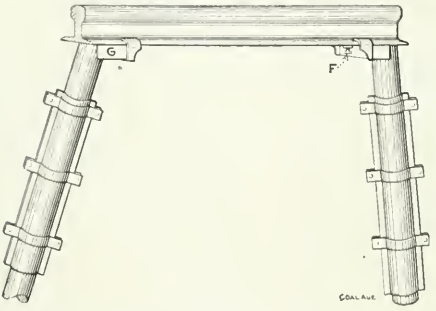
To take up the effect of the thrust, there is placed between the plunger top and the shoe, a block of compressed peat *G*. The holes in the sleeve permit the removal of packing material when the pressure is too great, thus avoiding a distortion of the frame and preserving more or less elasticity.

Unlike wooden timbers, which break, the Nellen metal posts are in this way regulated so that they give a constant support to the roof. Experiments tend to show that they resist the first pressure well. Sometimes, under its action, the sleeves tend to open, in which case more split collars are placed on them.

M. Dessard, director of the Wérister colliery, figures the cost of a metal set in place at $12.75, which compares with $1.78 for a timber set. The cost of putting up the metal set is increased by the difficulty in handling the heavy parts. Each post weighs about 103 and the crossrail about 158 lb. Furthermore, the assemblage of the parts requires some skill and takes more time than ordinary timbering.

In spite of the higher cost of the metal frame, M. Dessard thinks that its use will be economical in galleries of long life, where otherwise several successive repairs or renewals might be anticipated, due either to the pressure of the roof or deterioration of the timber.

In consequence of their being of greater size than metal supports, all-wood sets require that the galleries be made larger if an equal passage way is desired. Metal sets save about 4 or 8 in. in width and 2 in. in height. They may generally be placed farther apart than the wooden sets. Even if spaced at the same distance as wooden supports, a saving results, as, in general, intermediate timbers have to be used after the first timber sets become injured. Each replacement of the timbers in a gallery represents a cost of labor and material of about $4 per running foot.



A Three-piece Set on Nellen System, Which "Gives under Pressure" and Does Not Break

In case the galleries are abandoned, the metal post may usually be removed at little expense and used over again. It may be added that the galleries thus equipped should be easier to keep amply open. The general hygiene and safety of the workings cannot be other than improved by the use of these posts, which are likely to be adopted in all collieries where the management looks beyond first cost. The Wérister colliery proposes to use more of these sets in the future.

Note—Report of M. Beaupain in the Annales des Mines de Belgique Tome XVII, 1911. Translated by E. P. Buffet for Coal Age.

It may almost be said that good discipline in the mine will do more to reduce death rates than any discovery scientists are likely to make. The highest technical skill at the command of industry becomes inoperative where discipline is at a discount. In the same way mine rules and regulations are useless if they are not observed.

Statistics on Coal Mine Fatalities

By F. L. Hoffman*

SYNOPSIS—A brief review of coal-mine accidents during the last decade, 1902 to 1911, together with a short summary of the fatal accidents for the last thirty years, 1882-1911. It is shown that the death rate per 1000 men employed is less for 1912 than for the previous year.

The annual tabulation of coal-mine fatalities for North America is a difficult and discouraging task. It is practically impossible to obtain all returns for the several coal-equipped statistical service, and publish in the future quarterly reports on mine accidents in much the same manner as this has been done for some years by the Interstate Commerce Commission.

There are other urgent needs for reforms in the statistics of coal-mine fatalities. It requires no discussion to sustain the conclusion that trustworthy information regarding coal-mine fatalities is a matter of considerable practical importance to the coal-mining industry. The

TABLE I—NUMBER OF PERSONS KILLED IN THE COAL MINES OF NORTH AMERICA, 1902—1911.

	1902	1903	1904	1905	1906	1907	1908	1909	1910	1911	1902-1911
Alabama	50	57	84	185	96	154	108	129	238	209	1310
Colorado	73	40	89	60	88	99	61	99	319	85	1013
Illinois	99	156	157	199	155	165	183	213	406	157	1890
Indiana	24	55	34	47	31	53	45	50	51	35	425
Iowa	55	21	31	24	37	35	38	28	39	36	344
Kansas	30	36	16(a)	36	30	52	31	35	25	42	333
Kentucky	19	25	19	31	40	32	40	33	84	41	364
Maryland	11	16	12	16	13	5	12	19	17	13	134
Michigan	6	8	7	8	6	7	6	9	6	7	70
Missouri	10	17	11	11	16(b)	8(a)	10	21	16	8	128
Montana	12	5	9	8	13	14	21	12	13	7	114
New Mexico	17	17	15	5	9	31	34	18	14	15	175
Ohio	81	124	118	114	126	153	112	115	162	109	1214
Oklahoma	60	33	30	44	39	32	44	23(b)	46	29	380
Pennsylvania Anthracite	300	518	595	644	557	708	678	567	601	699	5867
Pennsylvania Bituminous	456	402	536	479	477	806	572	506	539	515	5288
Tennessee	226	26	28	29	33	31	34	31	38	111	587
Utah	8	7	9	7	7	8	8	16	15	16	101
Washington	34	25	31	13	21	37	25	39	43	37	305
West Virginia	120	159	140	194	269	356	625	364	320	332	2879
British Columbia	139	42	37	12	15	31	18	57	28	16	395
Nova Scotia	19	31	19	20	28	35	39	33	31	36	291
Total	1849	1820	2027	2186	2106	2852	2744	2417	3051	2555	23607

(a) Six months only. (b) Eight months only.

TABLE II. FATAL ACCIDENTS IN THE COAL MINES OF NORTH AMERICA, 1902—1911.

Rate of Persons Killed per 1000 Employed.

	1902	1903	1904	1905	1906	1907	1908	1909	1910	1911	1902—1911
Alabama	2.79	2.94	4.77	10.75	5.23	7.61	5.75	6.40	10.81	9.20	6.74
Colorado	8.11	3.89	8.26	5.05	7.32	7.67	4.25	7.53	21.60	5.94	8.20
Illinois	2.15	3.13	2.87	3.36	2.49	2.47	2.58	2.93	5.44	2.03	2.98
Indiana	1.83	3.64	1.91	2.63	1.58	2.79	2.36	2.64	2.41	1.68	2.33
Iowa	4.23	1.59	1.90	1.36	2.20	2.03	2.20	1.56	2.17	2.13	2.09
Kansas	3.22	3.61	3.09(a)	2.97	2.95	4.35	2.74	2.83	2.26	3.56	3.16
Kentucky	1.58	1.85	1.37	2.06	2.39	1.82	2.15	1.76	3.97	1.78	2.14
Maryland	1.89	2.82	2.11	2.57	2.10	0.85	2.00	3.34	2.93	2.17	2.27
Michigan	4.24	2.54	2.58	2.16	2.83	2.43	1.94	3.04	2.43	2.74	2.59
Missouri	1.09	1.85	1.09	1.06	1.65(b)	1.70(a)	1.06	2.31	1.55	0.80	1.39
Montana	6.19	2.32	3.59	3.67	5.43	5.12	6.68	3.11	3.16	1.81	3.94
New Mexico	10.11	7.26	7.07	2.35	3.82	10.13	9.26	5.57	4.89	4.21	6.51
Ohio	2.16	3.00	2.57	2.58	2.71	3.20	2.23	2.45	3.32	2.25	2.65
Oklahoma	9.62	5.42	3.63	5.76	4.81	4.15	3.02	2.78(b)	5.43	3.54	4.55
Pennsylvania Anthracite	2.03	3.41	3.69	3.83	3.35	4.19	3.89	3.31	3.57	4.03	3.55
Pennsylvania Bituminous	3.36	2.65	3.44	2.90	2.76	4.40	3.15	2.72	2.79	2.82	3.10
Tennessee	25.80	2.69	2.81	2.76	3.07	2.79	3.06	2.62	3.40	10.37	5.56
Utah	3.24	3.21	4.06	3.57	3.69	3.07	2.99	5.36	4.38	4.21	3.85
Washington	7.83	5.13	6.69	2.61	4.68	6.05	4.68	6.81	7.15	6.18	5.74
West Virginia	2.41	4.03	3.08	3.88	5.20	6.33	10.35	5.85	5.00	4.90	5.46
British Columbia	34.65	9.85	8.31	2.72	3.12	5.12	2.95	8.88	3.61	2.33	7.16
Nova Scotia	2.36	2.79	1.63	1.86	2.31	2.89	3.02	2.73	2.82	2.87	2.54
Average	3.48	3.16	3.33	3.40	3.20	4.15	3.84	3.39	4.18	3.48	3.58

(a) Six months only. (b) Eight months only.

mining states within a reasonable period of time after the close of the year for which the information is required. As an inevitable result, the data are deprived of the highest attainable degree of practical utility.

I first commenced the tabulation of coal-mine fatalities in 1897, at the request of the late editor of the *Engineering and Mining Journal*, Richard P. Rothwell. Since the field was new, many difficulties were met with, and these have not passed away during the intervening years. Apparently some of the coal-mine inspectors are indifferent to the requests made to them for information, and in other states the law prevents the publicity of the required facts previous to the publication of the official report.

The establishment of the Federal Bureau of Mines has done something to improve matters and it is to be hoped that the bureau will succeed in establishing a well value of the returns is in proportion to their inherent trustworthiness and comparability.

It may be seriously questioned whether, under present methods, the average number of men employed is always determined by precisely the same method, and it may be suggested that an understanding should be arrived at by all of the coal-mining states to make use of standardized methods, not only as regards the calculation of fatality rates, but also as regards many important statistical details, which at present are not available. This suggestion applies to the causes of accidents, the time of their occurrence, the age, race, nationality and precise occupation of the employed, and the killed or injured, as the case may be.

Many accidents also occur in which there is no loss of life or serious injury. The reports for the several states do not at present show the number of accidents as distinct from the number of persons killed or injured. A

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further defect is the absence of a precise definition as to what constitutes a fatal, a serious, or a minor injury. Some time limitation must be agreed upon to make the fatalities strictly comparable for the several states. It occasionally occurs that death follows a serious injury many months after its occurrence.

For practical statistical purposes it would probably be advisable to consider all serious injuries fatal which are terminated by death within seven days of their occurrence.

All these matters require careful consideration, and no

TABLE III.—FATAL ACCIDENTS IN THE COAL MINES OF NORTH AMERICA

Comparison of 1911 with 1906-1910.

	Number of persons killed Yearly average. 1906—1910	1911	Rate per 1000 employed 1906—1910	1911	Increase or decrease of Rate
Alabama	145	209	7 28	9 20	+1 92
Colorado	134	85	9 91	5 94	—3 97
Illinois	225	157	3 23	2 03	—1 20
Indiana	46	35	2 35	1 68	—0 67
Iowa	36	36	2 03	2 13	+0 10
Kansas	35	42	3 04	3 56	+0 52
Kentucky	46	41	2 47	1 78	—0 69
Maryland	13	13	2 23	2 17	—0 06
Michigan	7	7	2 51	2 74	+0 23
Missouri	14	8	1 64	0 80	—0 84
Montana	15	7	4 49	1 81	—2 68
New Mexico	21	15	6 99	4 21	—2 78
Ohio	134	109	2 78	2 25	—0 53
Oklahoma	37	29	3 91	3 54	—0 37
Penn. Anthracite	622	699	3 67	4 03	+0 36
Penn. Bituminous	580	515	3 16	2 82	—0 34
Tennessee	33	111	2 99	10 37	+7 38
Utah	11	16	3 97	4 21	+0 24
Washington	33	37	5 82	6 18	+0 36
West Virginia	387	332	6 56	4 90	—1 66
British Columbia	30	16	4 79	2 33	—2 46
Nova Scotia	33	36	2 76	2 87	+0 11
Average	2634	2555	3 76	3 48	—0 28

authority is in a better position to bring about the required reforms than the Federal Bureau of Mines. Its preliminary tabulation of accidents marks a promising beginning, and it is to be hoped that, in course of time, the statistical aspects of the accident problem will receive more extended consideration.

Granting a considerable degree of inherent trustworthiness to the valuable data regarding fatal accidents in coal mines, it must be admitted that the returns regarding serious and nonserious injuries are often worthless. From the point of view of employers' liability and workmen's compensation, however, the nonfatal injuries are of much greater importance than those which are terminated by death.

According to the statistics of compensation, and of proceedings under the Workmen's Compensation Act of 1906, for the year 1910, the financial consequences of mine accidents in the United Kingdom were as follows: There were 1347 fatal cases, costing companies £222,973 ($1,085,098) in compensation; the number of nonfatal cases was 166,709, for which £818,302 ($3,982,267) was paid. In addition, compensation was required to be paid to persons employed in mines on account of 3783 cases of industrial disease, to the amount of £42,507 ($206,860).

In the course of time, when the doctrine of liability for industrial diseases shall become more firmly established and enlarged, it is practically certain that compensation on this account will reach a much more impressive figure. The data are merely referred to as an illustration of the practical utility of trustworthy accident statistics, including nonfatal injuries, precisely defined, according to the nature of the injury, the part of the body injured, and the consequent duration of disablement as measured by incapacity for work.

After delaying the present discussion for several months on account of the difficulties briefly referred to at the outset, I have found it necessary to include the returns for three states as furnished by the preliminary report of the Federal Bureau of Mines. I have done so with reluctance, since the returns may be subject to future correction, but I have not been able to secure the required information from the state inspectors of mines of the three states. I only refer to these difficulties to make it clear that the long delay in publication is not my own fault or due to indifference on the part of the large majority of state inspectors of mines, who have been most courteous and prompt in furnishing the desired information.

According to the present tabulation, the number of fatal accidents in the coal mines of North America during 1911 was 2555, or 496 less than the number of fatalities during the previous year. Since the number of persons employed in mining was slightly higher, the fatality rate decreased to 3.48 per 1000 during 1911, against 4.18 in 1910. Table I gives in detail the number of fatal accidents in the principal coal-mining states of North America for each year since 1902, and a similar statement for the decade ending with 1911. Much to my regret, the returns for some of the smaller coal-mining states could not be included, particularly Alaska, Arkansas, North Dakota, Texas and Virginia.

This table shows that the largest number of fatalities (699) during 1911 occurred in the anthracite mines of Pennsylvania, followed by 515 deaths in the bituminous mines of that state, and 332 deaths in the coal mines of West Virginia.

TABLE IV.—THIRTY-YEAR RECORD OF THE FATAL ACCIDENTS IN THE COAL MINES OF NORTH AMERICA, 1882—1911.

	Number of Employees	Number Killed	Rate per 1000 Employed
1882	151,737	412	2 72
1883	188,519	585	3 10
1884	203,504	594	2 92
1885	214,184	576	2 69
1886	222,029	514	2 32
1887	230,834	514	2 23
1888	278,175	659	2 37
1889	278,361	681	2 45
1890	301,295	853	2 83
1891	326,684	959	2 94
1892	343,564	883	2 57
1893	384,249	970	2 52
1894	394,146	962	2 44
1895	401,553	1061	2 62
1896	409,320	1123	2 74
1897	409,830	956	2 33
1898	407,536	1056	2 59
1899	421,489	1250	2 97
1900	464,237	1507	3 25
1901	494,287	1586	3 21
1902	530,624	1849	3 48
1903	576,365	1820	3 16
1904	609,001	2027	3 33
1905	643,225	2186	3 40
1906	658,880	2106	3 20
1907	686,460	2852	4 15
1908	715,355	2744	3 84
1909	712,550	2417	3 39
1910	730,707	3051	4 18
1911	733,144	2555	3 48
1882—86	979,973	2681	2 74
1887—91	1,415,349	3666	2 59
1892—96	1,935,832	4909	2 58
1897—01	2,197,377	6355	2 89
1902—06	3,018,695	9988	3 31
1907—11	3,578,216	13619	3 81
1882—1911	13,124,842	11308	3 15

The highest fatality rate during 1911 was 10.37 per 1000 employed, and this rate was for the state of Tennessee. This excess in the fatality rate was due largely to an explosion at Briceville, which involved a loss of 81 lives. Second to Tennessee in this respect is the state of Alabama, where the figures reached 9.20 per 1000, due largely to an explosion at the Banner mine, which caused a loss of 128 lives. The rates in detail for each state, and for each year of the decade ending with 1911, as well as for the North American coal field as a whole, are given in Table II.

According to this table the average fatality rate in coal mining in North America during the decade ending with 1911 was 3.48 per 1000 men employed. The rate attained its maximum during 1910, when it was 4.18 per 1000, and its minimum in 1903, when it was 3.16. Comparing the rate for 1911 with the rate for 1910, it is shown that there was a decrease of 0.70 per cent.

If the 1910 rate had prevailed in 1911 there would have been 510 more lives lost than was actually the case The reduction in the rate may safely be considered a gratifying evidence that improved methods of mining, the introduction of safety devices, rescue work, etc., are beginning to show results, but this cannot be entirely credited to the causes stated.

Comparing the fatality rates for 1911 with the average for the preceding five years, it appears that the rates increased in Alabama, Iowa, Kansas, Michigan, Pennsylvania (anthracite), Tennessee, Utah, Washington and Nova Scotia. This evidence of an increase in the rates of representative mining states is in itself conclusive proof that as yet the effect of improved methods of mining, the introduction of safety devices, rescue work, etc., is considerably below what might reasonably be expected. Only those who are thoroughly familiar with the underlying causes of mine accidents can fully appreciate the practical difficulties which will have to be overcome so as to bring about a material reduction in the fatality rate.

The problem will only be solved by radical improvements in mining methods, and most of all by the gradual development of a strict sense of discipline on the part of all mine employees, including the supervising officials themselves. Model mine conditions cannot be of much value as long as mine workers and mine officials continue to disregard rules and regulations, or wilfully incur risks which involve the safety of others as well as of those who are foolhardy enough to imperil themselves.

The details of changes in the fatality rates for the several states are given in Table III.

In continuation of the fatality record for previous years, I include Table IV, for a 30-year period, with a convenient summary of the returns by five-year periods. It will be noted that the decrease in the rate for 1911 did not materially change the average for the last five years, which exceeds considerably the average for the preceding 25 years of coal-mining operations in North America. The average fatality rate during this long period has been 3.15 per 1000 men employed. This rate, without question, is at least 50 per cent. in excess of that obtainable under safer mining methods with a mining population more obedient to rational rules and regulations making for safety in mine work.

Considering that the rate includes both inside and outside employees, it requires no argument to emphasize the conclusion that the rate, without doubt, represents conditions much better than they actually are. If only underground workers had been considered, the rate would probably have been not far from 5 per 1000 during the last decade.

Since the average age of coal miners in North America is probably not much over 33 years, when the normal death rate is about 9.5 per 1000, it is obvious that on account of the risk in coal-mining operations the mortality of this class of wage earners is probably increased about 50 per cent. It would, therefore, seem that much more public attention should be given to the question of accident prevention than to the subject of employers' liability and workmen's compensation.

TABLE V.—LIST OF MINING ACCIDENTS IN GERMANY DURING THE LAST 46 YEARS, 1867—1912.

Year.	Name of the Mine.	Number of Deaths.
1867.	Fundgrube Sachsen	101
1869.	Iserlohn, Ruhrrevier	101
1869.	Burgker-Schaechte, Sachsen	268
1876.	Neu-Iserlohn, Ruhrrevier	33
1876.	Karlingen, Lothringen	147
1876.	Borussia, Ruhrrevier	15
1879.	Brueckenberg-Schaechte, Sachsen	89
1881.	Luisen-Tiefbau, Ruhrrevier	17
1882.	Pluto, Ruhrrevier	62
1883.	Massener-Tiefbau, Ruhrrevier	16
1884.	Shamrock, Ruhrrevier	16
1884.	Viktor, Ruhrrevier	12
1885.	Osterfeld, Ruhrrevier	12
1886.	Konsolidation II, Ruhrrevier	56
1887.	Hibernia, Ruhrrevier	52
1887.	Gneisenau, Ruhrrevier	15
1889.	Konstantin, Ruhrrevier	14
1889.	Erin, Ruhrrevier	12
1891.	Hibernia, Ruhrrevier	54
1893.	Kaiserstuhl, Ruhrrevier	63
1893.	General Blumenthal, Ruhrrevier	20
1893.	Koenig Ludwig, Ruhrrevier	10
1894.	Camphausen, Saarrevier	181
1895.	Prinz von Preussen, Ruhrrevier	37
1896	General Blumenthal, Ruhrrevier	36
1896.	Kleophas-Grube, Oberschlesien	30
1897.	Oberhausen I and II, Ruhrrevier	10
1897.	Kaiserstuhl II, Ruhrrevier	20
1897.	Frankenholz, Pfalz	44
1898.	Zollern, Ruhrrevier	45
1898.	Karolinengluecck, Ruhrrevier	119
1901.	Koenig Ludwig, Ruhrrevier	10
1901.	Konsolidation, Ruhrrevier	18
1902.	Carolinengluecck, Westfalen	119
1903.	Konenigin-Luisen-Grube, Oberschlesien	30
1905.	Borussia, Ruhrrevier	39
1907.	Reden, Saarrevier	148
1907.	Klein-Rosseln, Saarrevier	73
1907.	Mathildenschacht, Saarrevier	22
1908.	Radbold, Ruhrrevier	360
1908.	Didweiler, Saarrevier	15
1910.	Siegfried, Mitteldeutschland	17
1912.	Osterfeld, Ruhrrevier	16
1912.	Lothringen, Ruhrrevier	110

The following is a brief list of the accidents in the United States, involving the loss of five or more lives during 1911, arranged in the order of their occurrence:

1911		No. killed
Jan. 20	Gayton Mines, Richmond, Va.	5
Jan. 25	Hughestown No. 10, Pittston, Pa., Penna. Coal Co.	6
Feb. 9	Cokedale Mine, Trinidad, Colo., American Smelting and Refining Company	9
March 18	Mine No. 16, West Mineral, Kan., M., K. & T. Ry.	6
April 7	Panceast Mine, Tbroop, Pa.	73
April 8	Banner Mine, Birmingham, Ala.	128
April 24	Ott Mine No. 20, Elk Garden, W. Va., Davis Coal & Coke Co.	10
July 15	Sykesville, Pa., Cascade Coal & Coke Co.	21
Oct. 25	O'Gara Mine No. 9, Harrisburg, Ill.	8
Nov. 9	Adrian Mine, Punxsutawney, Pa., Rochester & Pittsburg C. I. Co.	8
Nov. 18	Vivian, W. Va., Bottom Creek Coal & Coke Co.	18
Dec. 9	Cross Mountain Mine, Briceville, Tenn., Knoxville Iron Co.	84

Table V is derived from German sources, and shows the more serious mine accidents throughout Germany since 1867.

During 1911 the number of deaths in disasters causing a loss of 10 lives or more was 334. It is self-evident, therefore, that the chief consideration is not the disaster which attracts national or even international attention, but the daily loss of life, due to falls of roof, mine cars and other causes more or less preventable, provided mine workers and supervising officials coöperate and work persistently toward this desired end.

Danger from shotfiring may be greatly reduced by observing the following points: (1) If possible use an electric battery for shotfiring. The handles should be detachable and the cable at least 20 yd. long. (2) Examine all working places carefully before firing. If possible remove gas and dust if present. (3) Keep all detonators in a locked can. After removing one, relock the can. (4) Never shoot from the solid. All under cutting should be at least 66 in. deeper than the shot hole. (5) Use only just enough powder to do the work where the coal is full of slips and breaks. (6) Never tamp with coal dust. (7) Remove all powder before firing. (8) Use a copper scraper and a wooden rammer. (9) Only fire one shot at a time.

Development of Coal Cutting Machinery

By Thomas W. Fry*

SYNOPSIS—This article describes briefly the inception and development of the continuous undercutting machine from the first type employing a revolving cutter-bar and cleaner-chain to the modern design, which will operate either right or left handed and is driven by a motor entirely inclosed in a flame-proof case.

For the purpose of undercutting coal, two types of machines had been developed in this country up to about 1885. These were the reciprocating or pick machine, driven by compressed air, and the breast machine, driven either by compressed air or electricity. As compared with hand work, the advent of these types mark a decided advance in the art or process of mining coal.

The reciprocating machine, or puncher, as it is commonly called, is practically the power operated equivalent of the miner's hand pick—virtually a pick engine mounted on wheels. Naturally it is much more powerful and cuts faster than by hand. It is built in various sizes, which are well designed, durable and efficient.

This type of machine will work in coal, which, owing to impurities such as sulphur and rock, cannot be economically cut by some of the other types. It is small and inexpensive in first cost, but owing to its relatively less cutting capacity compared with the larger and more powerful machines of other types, the expense of operation in labor and power per ton of coal produced is higher.

Its principal limitation is that its successful operation depends upon the skill, strength and continuous effort of the runner since it must be guided and controlled by the hands and feet, and each blow which is delivered must be placed effectively.

The Breast Machine

The breast machine substitutes for the reciprocating pick a gang of teeth or cutters, which are moved against the face of the coal, scraping or raking it from the solid. In the earlier types the cutters were inserted in a rotating bar, mounted at the front end of the machine, and as this bar was forced under the coal at right angles to the face, the bits cut a kurf equal in height to the diameter of the circle in which they rotated.

In the later machines, however, the rotating cutter-bar was dispensed with and the bits inserted in the links of an endless chain, which traveled in a horizontal plane. In this type the cutters operate only while crossing the machine at its forward end, being pushed ahead meanwhile under the coal.

Generally speaking, breast machines are more continuous in their operation than punchers, since they make an undercut, say, 3 ft. wide and 6 ft. deep, ordinarily without stopping. They are held to their work by jacks and fed forward by power instead of being guided and controlled by the strength and skill of the operator.

Both pick and breast machines make undercuts about 3 ft. and 5 ft. wide, respectively, and from 5 ft. to 7 ft. in depth. On the completion of these cuts, the machine must be moved with more or less difficulty and loss of cutting time to a position adjacent to the incision already made. This frequently involves the removal and replacement of posts for supporting the roof close to the face of the coal.

It is evident from the above that there is great advantage in a machine which, after its first undercut at one side of the room is made, will cut continuously without interruption clear across the face. Such a machine is not only more efficient in cutting capacity, but also leaves a cleaner bottom.

Continuous Coal Cutters

Development work on cutters of the continuously operating type was begun in the early Eighties and they were placed upon the market a few years later. Fig. 1 shows a top view of such a machine as built by the Diamond Prospecting Co., of Chicago, now the Sullivan Machinery Co. It will be noted that like all of the

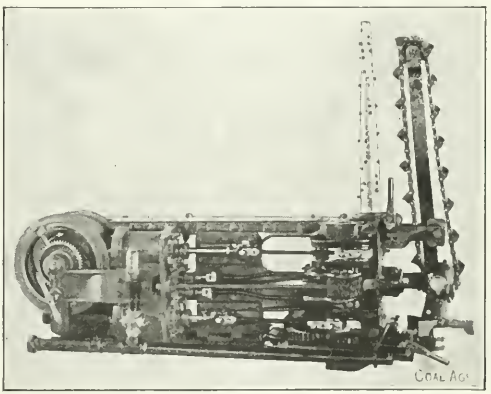


Fig. 1. Top View of First Continuous Coal Cutter

machines of that period, the cutter-bar was of the rotating type with inserted bits.

The machine was operated by compressed-air engines geared to the cutter-bar and to a drum furnished with a wire rope, the free end of which was attached to a jack set close to the face of the coal in advance of the machine. The entire mechanism could, therefore, be pulled along by means of this rope and drum.

To keep the machine close to the face, it was either mounted on rails or attached to a heavily weighted car, which was supported on sharp, edged disks or wheels which sunk into the bottom and resisted the outward thrust of the cutter-bar, which tended to force the machine away from its work. The illustration also shows the cleaner chain following the cutter-bar and provided with scrapers to clean the cuttings out of the kurf.

This machine was also provided with jacks for raising it on one side or the other, thus keeping the cutter bar down close to the bottom or raising it to pass over rocks or other impurities.

*Claremont, N. H.

The Improvements Made

Various improvements in this type of machine have been made from time to time. The first and most important of which was doubtless the substitution of the endless chain for the revolving cutter-bar. Another was the employment of a cable chain instead of the wire feed rope. The chain is not only more convenient to handle than the rope, but embodies a principle which was a pioneer invention in the method of guiding or steering the machine while at work.

The feed chain is fastened to a jack at the side of the room, extends along the face to a sprocket on the forward end of the machine body, thence to sprockets at the rear of the machine, and then to a jack at the opposite side of the room.

By tightening or loosening the chain between the machine and the rear jack, the angle of the bar supporting the cutter-chain can be varied with relation to the face of the coal, thus permitting the machine to follow irregularities therein.

Then, too, by advancing the end of the bar in the direction in which the machine is moving at the completion of its travel, the cut can be finished to the full width of the room.

By raising or depressing the feed chain in advance of the machine, the latter is made to cut higher or lower in the coal. This chain is also used in making the entering of sumping cut, and also in removing the machine from the face and loading it upon its truck for transfer to another room. All of these operations are performed by power from the electric motor or compressed-air engine.

The latest type of these machines is arranged to make its face cut either right- or left-handed. The motor is also totally inclosed in a flame-proof case, adapting it admirably for use in gaseous mines.

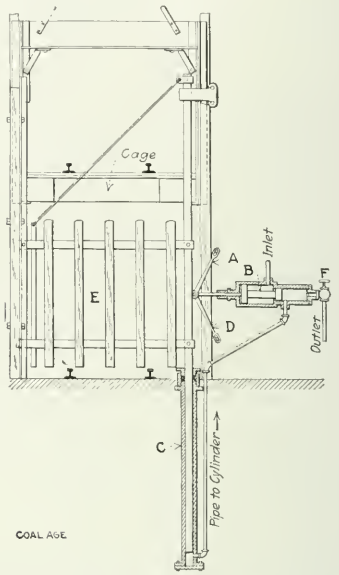
Where the local conditions will warrant the use of any chain-cutting machine, those performing a continuous cut are the most advanced and best perfected of all coal undercutters. Being far more powerful than the puncher or breast machine, their cutting capacity is proportionally greater, their expense of operation per ton of coal mined is correspondingly less and an increased output may be secured at a lower cost. Their development has extended the use of machine mining in drawing pillars and in work on steep-pitching beds, which heretofore has usually been done by hand.

An Automatic Safety Mine Gate

An automatic safety mine gate has recently been invented and patented by M. W. Harvey, of Sykesville, Penn., which, due to its simplicity and ease of manufacture, requires more than a casual notice. It consists of a cylinder approximately 6½ ft. long made of 4½ in. pipe and provided with a stuffing box at the top, inside of which works a plunger made of 4-in. pipe which has been turned down and polished to a diameter of 4⅜ in. outside.

The cylinder is placed vertically in the ground, which renders it frostproof. It may be set at either side of the gate to be operated as convenience may dictate. The gate itself may be made by bending two pieces of strap iron and bolting wood palings vertically between them.

A controlling valve, somewhat similar in principle to a piston valve on a steam engine, is provided. This is equipped with a contact for the cage in its proper position for loading. The outlet, or exhaust, is provided with a throttle valve to control the downward movement of the gate. The general arrangement can be clearly seen in the accompanying drawing.



The Gate and Operating Mechanism

The operation is as follows: When the cage is brought to position for loading from the ground, it makes contact with the lever *A*, which operates the piston valve *B*. This admits air or steam to the vertical cylinder *C*, forcing up the plunger *D* and with it the gate *E*. When the cage is moved from this position, the piston valve *B* is forced back to its original place by the pressure of the air. This releases the exhaust and allows the plunger and gate to descend. The rapidity of this descent may be controlled by the valve *F* to any desired speed.

In the ordinary operation of hoisting, the contact between the cage and the lever *A* is only momentary while the cage is passing that point. Consequently, the amount of air admitted to the main cylinder is not enough to start the plunger from its initial position, and the gate therefore remains stationary.

This gate can be easily arranged so that temporary removal of one of the guides on the opposite side from the plunger will allow it to be swung open for the loading of long rails or other material upon the cage.

One of these gates is in successful operation at a Pennsylvania coal mine, and we understand that four more are to be installed soon.

The annual loss due to the run-of-mine law of the state of Arkansas to operators and consumers is estimated to be $1,670,500; the loss to the miners is placed at $100,000, the market loss equals $1,600,000, while the loss through waste reaches $850,000. All of which gives the appalling total yearly loss of $1,220,000, due to hasty class legislation.

The New York Market in 1912

SYNOPSIS—Market conditions at New York, on the average, were satisfactory during the year. The trade in both anthracite and bituminous branches was active and profitable previous to the suspension in the mining regions. Succeeding this, however, the usual summer dullness developed in bituminous, but the fall trade was heavy and characterized by an unusually high price-level. Rather panicky conditions prevailed in the anthracite market over the last half of the year, due to the shortage as a result of the suspension, but the year closed with conditions approximately normal.

The importance of New York as a coal distributing point is probably not generally appreciated. Unfortunately no statistics covering the fuel handled there are available, but it is conservatively estimated that this runs approximately 32,000,000 tons per annum, about equally divided between anthracite and bituminous. Because of the smoke restrictions in effect, the consumption of the latter locally, amounts to less than 5,000,000 tons per annum, the remainder being shipped to New England ports or used in the bunker trade locally. It is estimated that about 12,250,000 tons of anthracite are consumed here, which is about 14 per cent. of the total production.

The First Quarter

The year opened with business fairly active. There was only a limited spot demand, but the movement was large, although not in excess of the contracts which absorbed all the arrivals without much delay. Transportation had been much better than during previous seasons at this time, and shippers were able to meet their obligations more readily than heretofore.

A demand for prompt shipment began to develop during the first month, due to the stormy weather which caused more than the usual inquiries for cargoes. However, a large number of barges had been loaded and waiting power to move them for some time, so that prices were not affected. Loading at the piers was considerably hampered by the freezing of the coal.

Congestion and accumulation of freight along the railroads retarded delivery of coal to line consumers, causing them much uneasiness over the supply and resulted in a sharp increase in the demand for rail coal. Marine transportation in the harbor and sound was quite hazardous in February, due to the ice conditions. The heavy demand and poor car supply was keeping the arrivals down with the result that local stocks were considerably below normal.

The near approach of the expiration of the agreement with the miners together with the short supply, stimulated the New York market early in March and prices advanced rapidly until even the poorer grades were being held at $2.90 to $3 f.o.b. with only small tonnages available even at these figures. The supply at the piers was extremely limited and shippers were only able to take care of their contracts.

Prices continued to advance rapidly through the month reaching the maximum about the middle, when spot bituminous was quoted as high as $4 to $5 f.o.b. It was believed at this time that the supplies were only about 50 per cent. normal and the market was apparently bordering on a panic.

The Second Quarter

The demand for bituminous became a little less urgent toward the close of the month and the market appeared to be steadying up. Prices, however, did not ease off and the change in the situation was due more probably to the hesitancy on the part of the consumers to purchase at the prevailing high prices, believing that there must shortly be a break in the market. That they were justified in this belief, is shown by the sharp decline which occurred early in April when quotations eased off to between $2.90 to $3.65 along side. The suspension in the mining regions was now in effect but there was not much anxiety apparent locally, as yet. This did not apply to anthracite, however, as the arrivals of this grade were entirely cut off and the consumers were becoming urgent in their requests for coal.

Arrivals of bituminous throughout the month were much below normal, but there was scarcely any demand due, no doubt, to the excessive storing in anticipation of a more protracted suspension at the mines. This had a decidedly depressing effect on the trade, and the market continued dull and heavy for a time.

The bituminous market gathered some strength at the same time in sympathy with the changed conditions in hard coal. This was however, more in the way of holding its own rather than making any advance. When the agreement was finally reached between the anthracite miners and operators about the middle of the month, there was a sharp flurry in the local markets.

The month of June saw little of interest in either the hard- or soft-coal markets. The larger anthracite companies reported an active business but consumers were not showing much interest in the markets due to the increased prices which the companies put in effect. The demand centered about stove coal, which was practically out of the market.

Third Quarter

The third quarter opened with the bituminous trade down at the customary low level at this period of the year. There were few transactions, but on the other hand there was no evidence of any appreciable tonnages on demurrage. The movement was confined almost entirely to contracts, any coal being sent in on consignment usually selling at prices even less than the cost of production.

Anthracite continued quite active throughout the month, with shipments considerably behind requirements. Stocks were far below normal and there was no doubt but what a decided shortage would be experienced during the coming winter. Stove was particularly short, with none of the grades easy and prices were firm with the exception of the steam sizes which were selling off in some instances.

The month of August opened with the soft-coal market about normal for that period of the year. The car shortage was quite apparent the first part of the month and there was a fair amount of contracting at average prices. Little or no coal was coming in on speculation with the

result that demurrage consignments were quite rare; it was evident that the companies were making a concerted effort to maintain better market conditions, by adopting a vigorous curtailment policy.

The strong heavy demand for anthracite continued unabated throughout the month. No stocks were being accumulated except in the steam sizes, on which a few companies were able to get ahead. The movement into New York continued slow, with little or no indication of any improvement. The shortage was most pronounced in the stove size which was practically out of the market, and by the middle of the month was bringing a premium of 25c. per ton above the circular.

The beginning of September saw a gradual but perceptible hardening in the soft-coal market. The visible supplies on hand were rather low for this period of the year and quotations began the steady advance which they were to continue for the remainder of the year. Inquiries were becoming more frequent but consumers were hesitating to enter the market because of the new high prices.

The Fourth Quarter

That there was a decidedly tense feeling in the New York bituminous market at the beginning of October was no longer to be questioned. The heavy demand at this period of the year was almost unprecedented and it appeared at this time, that the situation would be serious when the real winter trade set in. By the middle of the month nothing could be obtained under $2.85 and this only on the lower grades, Georges Creek and the better qualities being entirely out of the market.

The first of October saw little change in the anthracite trade; the prepared sizes were still short and the steam grades in rather long supply. The mines were being pushed to the limit, but production was curtailed slightly although not seriously by the lack of sufficient labor and the inadequate car supply. The large companies expressed the belief at this time that the present acute situation was brought about by the consumer attempting to acquire his entire winter supply at once.

The first of November found the bituminous market in as probably a hard a position as it had been for some years. The movement was confined almost entirely to contracts and producers were being hard pressed to meet their obligations. The trade was quite spotty at times and showed some indications of becoming softer occasionally, but supplies were short and all arrivals going into immediate consumption. The situation was relieved about the middle of the month, by the appearance of mild weather which caused the demand to lessen somewhat.

The first of December brought with it an abrupt and decisive break in the anthracite market. This was ascribed to the allotment of larger tonnages by the companies and partly to the mild weather conditions which had been prevailing. This continued well into the middle of the month, the water tonnages received by the large companies steadily reducing the premiums on the domestic grades.

Chicago Coal Trade in 1912

SYNOPSIS—The past year was fraught with many uncertainties and anxieties, but on the whole was good so far as profits were concerned. Throughout the last few months particularly, the demand for all grades of fuel, including coke, was strong and insistent, with prices ranging exceedingly high.

With the close of the year 1912, coal producers and distributors have much to be thankful for and comparatively little to complain about. It was a year fraught with many anxieties and, at intervals, gloomy predictions, but with the balancing of the books for the twelve months those in the coal trade find that it was a period of profitable dealing.

For the purpose of considering the varied features of the Chicago market, the year may be divided into four quarters as follows:

First Quarter

January—At the beginning of the year the market was technically strong, but sales were not particularly brisk. Smokeless lump and egg were selling at various figures with efforts being made to hold prices firm at $1.90 @ 2.

There was a period of severely cold weather during the week ending Jan. 13 and wholesale prices for all kinds of coal were forced to a level higher than any attained during the preceding six years. The average mine-run price was one-third higher than two weeks before. Low grade screenings doubled in value and a rise of 50c. in other sizes was not uncommon.

February—Expectation of a shut-down of the mines April 1 agitated the Chicago coal trade in the early part of February. As an outcome, a bullish influence was exerted on the market and railroads, public utility corporations, and others began acquiring surplus stocks of steam coal.

Storage buying continued to be the chief feature of the market in the latter part of the month with a break in some prices and advances in others.

March—When March arrived there was a slight recession in prices for domestic coal, but steam prices remained firm. Anthracite was a trifle weak, as a good deal of this fuel held in transit had reached the market. There was a 10 per cent. advance in coke during the first week of the month.

Second Quarter

April—Early in April what coal buyers there were bargained shrewdly with a view of beating down prices. There practically was no anthracite to be had and for some weeks the market was halting and uncertain.

May—Buying in the early days of May was done chiefly by the railroads which had supplied themselves with only enough storage coal to tide over the suspension of the mines. The coke market was active. Toward the middle of the month there was some demand from small steam users. Screenings, mine-run and steam lump all sold around $2.10 @ 2.25, f.o.b., Chicago.

June—At the beginning of this month announcement was made by the trade of an advance of 25c. a ton

in the price of anthracite. Other important events occurring about this time included the agreement reached between the Indianapolis operators and miners, the appearance of a number of contracts from the railroads and the resumption of work in Iowa.

THIRD QUARTER

July—During the first part of the month screenings remained firm, but domestic lump prices were exceptionally low. In a number of instances, this grade sold below $1 a ton, but smokeless lump and egg continued to be scarce.

August—Smokeless mine-run advanced 15c. Aug. 3, while smokeless lump and egg jumped from $1.90 to $2. There was much discussion among the trade concerning the influence on business of big crops and a car shortage. August 8 there was an advance of 10c. a ton on Franklin County coal. There was an advance of an equal amount on splint coal, while screenings fell off sharply 5c. a ton.

September—A rise in the price of Hocking Valley coal to $1.65 a ton was noted Sept. 7. Coke prices were strong and in many instances dealers were handling twice as much of this fuel as during the corresponding period in 1911.

A premium ranging from 10c. to 50c. was paid Sept. 21 for smokeless coal. The circular prices on Franklin County and Carterville coals were advanced 25c. a ton, while there was an increase of 15c. a ton in the price of Hocking. Splint was strong and 5c. a ton was added to the price of screenings.

FOURTH QUARTER

October—At the beginning of this month the Chicago coal market was on a rampage. Nearly everything that went by the name of coal could be sold at a fancy price. Some kinds of domestic lump commanded $2 while good grades brought from $2.25 to $2.75. In a number of instances prices were raised to such a level as to prevent buying. Many producers were off the market and called in their salesmen. There was an upward shoot in the price of smokeless. Mine-run, with a circular price of $1.25, sold at $1.50 in 100 carload lots and at $1.60 in lots of ten cars or less.

November—Throughout the first week orders for coal in Chicago exceeded the supply. Anthracite was exceptionally scarce and consumers bought other coals from necessity rather than from choice.

A break of from 25c. to 40c. a ton in the market for domestic coal was reported during the week ended Nov. 23. This drop was attributed to warmer weather prevailing at that time.

December—The beginning of December came with the market still strong and the demand for steam coal the greatest it had been in years. During the latter part of the first week in this month, however, there was a drop of about 25c. a ton in the price for domestic sizes of coal, due to the warm weather. The steam market continued strong. There was little change in coke quotations.

When the holiday season arrived, retail dealers and steam users did not buy coal except to satisfy immediate needs. The market was unusually quiet, but prices remained firm.

The Talking Cocoanut

"While in the government employ in the Philippines," says Sanford Jones, manager at North Yakima, "I was stationed on the Island of Basilan, which is a small island in the Sulu Archipelago. The natives of this island were so uncivilized that they did not even know the value of money, and of course had never heard of a telephone. Frequently they entertained us with their native dances, and in turn we would fill them with wonder and awe by a phonograph which we had in our outfit.

"Once we found it necessary to put up a telephone line between two buildings that were a little distance apart, using two 'Western Electric' magneto sets. I found a rather large cocoanut under a tree near the bamboo hut we were living in, and conceived the idea of making a cocoanut talk. So I emptied its contents and hung it on the outside of the house opposite the phone, and arranged it so that we could put the receiver through the grass wall and drop it into the cocoanut.

"We then invited some of the natives to see the wonderful cocoanut that we could make talk. With the aid of an interpreter at the other phone who understood their language, we had a lot of fun. Some of the natives were so frightened they left the village.

"One day a delegation of natives came and asked us to burn it, as they did not like to have so uncanny a thing around. So with great ceremony and much rejoicing we consigned it to the flames, and to this day I suppose they are telling their children about the cocoanut that could talk."

Small Tonnages in the West

By BENEDICT SHUBERT*

In the Rocky Mountain district, a large daily tonnage is rarely obtained over one dump. In comparison with the results at some of the Eastern mines, it might be inferred that the Western operator does not concentrate his work and is losing the advantages to be gained from handling a large daily tonnage at one point.

The demands of the coal trade in the West, places a handicap upon the producer not found in Eastern districts. It is true that a large tonnage can be economically taken from one opening and as economically screened, but the fact that it is necessary to load all lump and nut coal into box-cars, introduces a serious obstacle in the handling of large tonnages at one point.

For a daily tonnage of over 1800, the loading of practically all this coal into box-cars is a serious problem. The delays attendant to placing the cars and running the box-car loader in and out seriously cuts down the actual working time. The introduction of two or three box-car loaders, two extra loading tracks, the necessary storage bins and elevating machinery for handling the nut coal, together with the extra labor involved, complicates matters further and has prevented the development of large-tonnage tipples.

In a word, it is necessary to balance the economics of concentrated operation against the extra expense of loading this tonnage into box-cars so that the smaller operation is usually a better paying proposition.

*Boston Building, Denver, Colo.

Notes on Mine Gas Problems—I

By G. A. Burrell*

SYNOPSIS—The lower "explosive" limit of methane is nearer 5.5 than 6 per cent. and varies somewhat with the size and shape of the explosion vessel, kind of igniting body, degree of temperature, intensity of pressure, percentage of moisture and point of ignition. The upper limit is 12.4 per cent. But partial inflammations could be obtained below and above the limits mentioned. The presence of 10 per cent. of carbon dioxide raises the lower limit to 6.6 per cent. An explosion of 9.40 per cent. of methane was obtained, when the oxygen percentage was reduced to 14. With 12 per cent. oxygen and 6 per cent. methane a complete inflammation was obtained. Hence, J. Harger's plan of reducing the oxygen and adding to the carbon dioxide of mine air, will not entirely prevent explosions.

The limits of explosibility of fire-damp have been worked out by different investigators, and results, which in the main are in accord with each other, have been determined in their laboratories. Some discordant conclusions have been published, but these have resulted mainly from the fact that different experimenters have performed their work under different conditions. Sufficient emphasis has not always been placed upon the decided effect experimental conditions exert on the results.

The Variants on Which Explosibility Depends

The size and shape of the vessel employed, the nature of the source of ignition, i.e., whether a flame, a small electric spark, a large electric flash, the ignition of the mixture from above or below, the moisture in the sample and the temperature and pressure, all may have influence in determining the limits of explosibility of mixtures of combustible gases with air.

A partial burning takes place when the ignition temperature is reached, whether an explosive proportion of combustible gas is present or not. The extent of this burning will depend upon some of the conditions to which I have just referred.

But an explosion in the true sense of the word means a self-propagation of flame to all parts of a mixture without help from the source of combustion other than the ignition of the mixture at one point. The smallest quantity of any combustible gas which when mixed with air will enable this self-propagation of flame to take place is termed the lower limit of explosibility of the gas.

Low Explosive Limit of Methane with Air Mixtures

The low explosive limit for methane is about 5.50 per cent. methane and not 6 per cent., as is sometimes stated. Coquillon ignited methane-air mixtures in a closed vessel by means of an electric spark, and placed the lower limit of explosibility at 5.8 per cent. gas. Le Chatelier and Mallard and Boudouard have placed the limit at 6.0 per cent.

Eitner determined the lower limit of explosibility of methane to be 6.1 per cent. Clowes obtained 5.0 per cent. as the low limit of explosibility when the gas was fired from below with a flame and 6.0 per cent. as the limit when the gas was fired from above. Teclu found the lower limit of explosibility to be between 3.20 and 3.67 per cent.

The most recent values are those obtained by Burgess and Wheeler of England, who place the lower limit of explosibility between 5.50 and 5.70 per cent. No discussion of the different methods of experimentation will be given here, the idea I desire to convey being that an exact duplication of results by different experimenters has not always resulted.

In the laboratory of the bureau, an explosion could not be obtained when a mixture of methane and air containing less than 5.50 per cent. was subjected to the action of a small ⅛-in. spark from an induction coil. The latter was fed by four dry cells. The mixture was placed in a 100 c.c. spherical vessel over mercury.

An explosion could not be obtained with 0.10 per cent. less methane even when the pressure was increased from one to two atmospheres. A pronounced explosion occured when 5.50 per cent. methane was present, but the combustion was not quite complete. Analysis of the products of combustion showed, however, that only a trace of combustible gas remained unburnt. The experiment was made with a pure methane prepared by the action of alcohol and methyl iodide on a zinc-copper couple.

A Mere Flame Extension Is Not an Explosion

A number of experiments have been performed in the laboratory of the bureau in which a flame has been used as the source of ignition. In some of these experiments, a spherical flask having a capacity of one liter (61 cu. in.) has been used. Some burning followed under these conditions when as little as 4.75 per cent. methane was present and when iguition was effected from below. The burning extended as a cone about halfway to the top of the flask. Inflammation in the mixture increased with increasing percentage of methane. Of course, all mining men have noticed this behavior in mixtures of combustible gases and air.

With a very small percentage the inflammation starts as a cap on the flame. The inflammation spreads from the source of ignition as the percentage of combustible gas is increased. Finally, conditions are right for a violent projection of flame throughout the mixture. At about 5.50 per cent., the low limit of explosibility, the flame extends to all parts of the vessel, but travels with comparative slowness and can be followed by the eye. With increasing proportion of methane, the explosion becomes more violent.

A Mixture Which Propagates Flame Throughout Its Volume Should Be Said to Explode

It was observed that the partial burning in a mixture containing less than 5.50 per cent. methane depended up the several factors, such as nature of ignition, shape of container, etc., but that complete explosion could not be obtained, no matter what the experimental condition, when less than 5.50 per cent. of methane was present.

In determining the low explosive limit of methane-air

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Note—Part of an article read at the winter meeting of the West Virginia Coal Mining Institute, Parkersburg, W. Va., Dec. 11, 1912.

mixtures, the products of combustion were examined to ascertain to what extent the gases had been burned. In experiments to follow, this was not done, unless otherwise stated. The term explosion will be retained to mean that the flame filled the container as far as could be seen by the eye. Inflammation will mean only a partial filling of the container by the flash. All experiments were made at atmospheric pressure.

High Explosive Limit of Methane-Air Mixtures

When the small spark from an ordinary induction coil was used as the source of ignition, no explosion in methane-air mixtures could be obtained after the methane was raised above 12.40 per cent. In these tests, a vessel having a capacity of 100 c.c. was used. When we used an electric flash, produced by breaking copper wire terminals through which a current of 220 volts and 7¾ amperes were flowing, different effects were observed. The mixtures were confined in a glass cylinder 4.5 in. wide and 12 in. high. The flash was produced in the center of the jar.

When a mixture containing 20 per cent. methane and 80 per cent. air was ignited, some inflammation occurred, extending a distance of 3 in. above the electric flash, but none was observed below it. In the presence of 15 per cent. methane, inflammation extended to the top of the jar and somewhat to the sides, but not downward. In the presence of 13.5 per cent. methane, the inflammation filled the upper part of the jar and spread downwards to within an inch of the bottom. In the presence of 13 per cent. methane, the flame seemed to fill the entire jar. Effects, about similar, were observed when a gas flame was applied from below to mixtures of methane and air.

Effect of Carbon Dioxide on the Explosibility of Methane

In explosions, as well as in flame extinction and physiological effects, the influence of carbon dioxide in mine air has usually been overestimated. Carbon dioxide always occurs in mine-gas mixtures in which explosive amounts of methane are present and there is always a greater oxygen deficiency than exists when the same amount of methane is added to air for sample laboratory experiments. The following tests show something about the explosibility of methane both in the presence of excessive proportions of carbon dioxide and when the oxygen is considerably reduced.

In the laboratory of the bureau, when 2.5 per cent. of carbon dioxide was present in a mixture, an explosion followed on the methane being raised to 5.83 per cent. With 5.0 per cent. carbon dioxide, an explosion occurred when the methane was raised to 6.25 per cent. With 10.0 per cent. of carbon dioxide present, an explosion was obtained when the methane constituted 6.60 per cent. of the total. A small spark from an induction coil was the source of ignition. The experimental conditions were the the same as those under which the 5.50 per cent. low explosive limit for methane and air was determined.

The presence of carbon dioxide narrows the explosive limits, but it will be observed that even 10 per cent. only raised the low limit to 6.60 per cent.

Effects of Reduced Oxygen on the Explosibility of Methane

A spherical flask having a capacity of one liter (61 cu. in.) was filled with a mixture containing the following gases:

AN EXPLOSIVE MIXTURE OF GASES

Gas	Percentage	Gas	Percentage
CO_2	0 03	CH_4	9 40
O_2	14 00	N_2	76.57
			100 00

When exposed to a flame from above, inflammation occurred. The flame spread downward to the middle of the flask, and out to the sides. The eye could easily follow the course of the wave. When the mixture was ignited from below with a flame, it exploded with considerable force. As far as the eye could see, the flame filled the entire flask.

Further experiments were made in which the oxygen had been reduced to 13 per cent. This mixture had the following composition.

AN INFLAMMABLE MIXTURE OF GASES

Gas	Percentage	Gas	Percentage
CO_2	0 03	CH_4	9 40
O_2	13 00	N_2	77 57
			100 00

This mixture was placed in a cylindrical vessel 4.5 in. long and 12 in. high. Two copper terminals were quickly broken to produce the flash, which took place in the center of the vessel. A current of 220 volts and 7.5 amperes was used. A flash about ½ in. long was obtained. On the breaking of the contact, the inflammation spread upward almost to the top of the jar.

With the same percentage of methane, but with 12 per cent. of oxygen, and under the same conditions of experiment, only a slight inflammation extending about 3 in. upward was obtained. But with 12 per cent. oxygen and 6 per cent. methane, the flame filled the entire top of the jar. With 15.1 per cent. oxygen and 9.4 per cent. methane, a quite violent explosion was obtained under the same conditions of experimentation.

Experiments were also performed in which a small ⅛-in. spark from an induction coil was used as the source of ignition. A mixture having the following composition exploded.

A MIXTURE WHICH EXPLODED

Gas	Percentage	Gas	Percentage
CO_2	3 92	CH_4	9 43
O_2	16.25	N_2	70.39
			99 99

Under the same conditions, a mixture in which the oxygen was slightly diminished from the foregoing, and having the following composition, did not inflame at all.

A MIXTURE WHICH WAS NON-INFLAMMABLE

Gas	Percentage	Gas	Percentage
CO_2	3.99	CH_4	9 25
O_2	15.90	N_2	70 86
			100 00

In all of these explosibility experiments, both the large electric flash and flame (flame applied from below) produced decided inflammation under more severe conditions than the small ⅛-in spark. In each case, when used, the small spark was applied near the top of the mixture. The analyses are accurate to about 0.10 per cent.

These are only a few of many experiments which have been made on explosibility of gaseous mixtures at the laboratory of the bureau. They are given as showing something about the limiting proportions at which methane ceases to be inflammable under the conditions in which it occurs in mines. Such knowledge has been es-

pecially useful to the bureau in that frequently it has been desirable to know something, before explorations have been made, about the explosive character of the atmosphere in sealed areas and in other workings in the mines where ventilation has been interrupted.

From the foregoing and from experiments to follow, we can also conclude that oxygen in mine air at one place may be diminished to such an extent that a miner's lamp will not burn, but at some point beyond, a flicker of a flame made in an attempt to relight a lamp, or the flashing of an electric spark, might precipitate an explosion if enough methane was present.

The Harger Cure for Explosions

Much interest has followed the proposal of John Harger of England[a] that the oxygen be decreased and carbon dioxide increased in mines to prevent explosions. Briefly, Dr. Harger's proposition is this: A small reduction in the oxygen percentage and a small increase in the carbon-dioxide percentage in mine air will suffice to produce an atmosphere incapable of supporting combustion and consequently one in which explosions and gob fires cannot occur.

For average mines, it is suggested that in order to start the experimental work on a large scale, the oxygen should be reduced to 20 per cent., i.e., one per cent. below normal, and a half per cent. carbon dioxide added to it. Where the conditions are more dangerous the oxygen should be further reduced, say, to 19 per cent., and the carbon dioxide increased to three-quarters of 1 per cent.

Experiments which have been performed by the bureau, some of which are here presented, indicate that the oxygen percentage will have to be reduced much below the figures mentioned by Dr. Harger to prevent all explosions. However, if all conditions are identical, the mixture will explode less violently and less completely in proportion to the decrease of oxygen percentage. As regards carbon dioxide, it appears that so much would have to be added to prevent firedamp explosions that its use for this purpose of treating normal mine air would be precluded.

Mine Gas Mixtures Containing Explosive and Other Proportions of Methane

Below are given analyses of mine-gas samples, some of which contain explosive proportions of methane. The accompanying carbon-dioxide and oxygen content are of interest in connection with foregoing experiments.

The samples were collected in the rooms of mines wherein ventilation had been interrupted for some time. Explosions have occurred in these mines.

SOME SAMPLES OF MINE AIR

Sample No.	CO_2	O_2	CH_4	N_2
1	8 28	10 50	4 49	76 73
2	0 48	17 49	9 20	72 83
3	5 81	12 95	5 67	75 17
4	1 75	17 63	7 60	73 02
5	0 34	19 46	5 79	74 41
6	0 35	18 81	7 25	73 59
7	2 00	15 64	7 37	74 99

Samples No. 2, 4, 5 and 6 are explosive. It is not believed that even an inflammation could be obtained in mixtures represented by samples No. 1 and 3.

(To be concluded in an early issue)

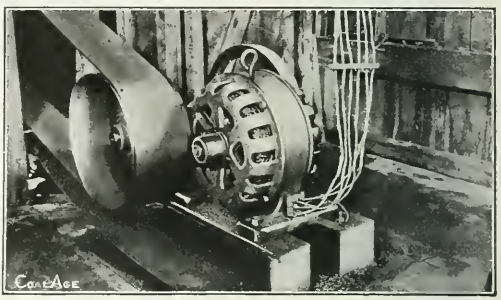
Experiments made in England have shown that ashes or common salt properly spread will destroy the larvae and eggs of hookworm at 77 deg. F. This is an economical method of disinfecting chambers used in place of the portable conveniences which are sadly lacking in most American mines.

[a] The Prevention of Explosions in Mines. Transactions of the Institute of Mining Engineers. Vol. XLIII, Part 2, pages 132-166.

Two Speed A. C. Motor for Mine Fan Drive

An excellent example of the efficient adaptation of electricity to mine service is illustrated in the accompanying picture, which shows a two-speed, alternating current, three-phase, 60-cycle, 440-volt motor belted to a Guibal 12-ft. fan installed in the Greensburg No. 1 mine of the Keystone Coal Co., near Greensburg, Westmoreland County, Penn.

The force of miners is considerably less at night than during the daytime, and consequently it is desired to run this fan at only about one-half the speed at night that is required during the day. For this service there was selected a Westinghouse squirrel-cage type induction motor with a rating of 7½ hp. at 600 r.p.m., and 15 hp. at 1200 r.p.m.



Two-speed A. C. Motor Driving Mine Fan

The change in speed is accomplished by altering the number of poles. The stator of the motor is provided with two windings; one of which gives 6 poles, resulting in a speed of 1200 r.p.m., and the other gives 12 poles, with a speed of 600 r.p.m. The connections are changed from one set of windings to the other by the controller. This is a most efficient form of control for an installation of this kind, as the motor can be operated at low speeds and high efficiency; there being no losses in the control resistance. The motor itself is particularly well adapted to this class of service on account of its rugged characteristics, which insure great reliability of service.

Current for the operation of this machine is furnished by the West Penn. Electric Co. In order to determine the results obtained from the installation, tests were made by C. V. Elliott, electrical engineer of the lighting company, which showed the following excellent results:

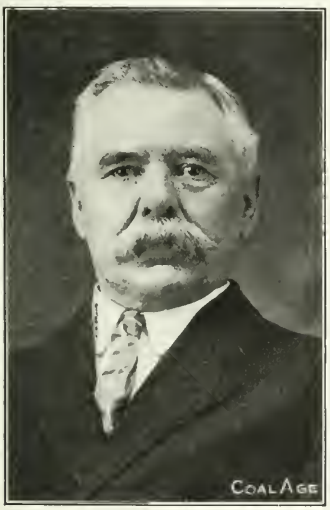
The fan is 5 ft., 6 in. wide, and the depth of blades 3 ft. 6 in. When running at 120 r.p.m., with 1.5-in water gage, or an equivalent pressure of 0.87 oz. per sq.in., 46,200 cu.ft. of air per minute were delivered. The motor in performing this work took 9.6 kw., giving an efficiency of 63.03 per cent. for the outfit. When running at half speed, or 60 r.p.m., with 0.6-in. water gage, or 0.29-oz. pressure per sq.in., 14,850 cu.ft. per minute were delivered, and an efficiency of 58.33 per cent. was obtained.

These results are particularly important as they show economy in the use of purchased power, which is becoming standard practice where alternating current is available.

WHO'S WHO—IN COAL MINING

An old myth tells how a giant, Antæus, could vanquish his adversary Hercules whenever he could touch Mother Earth and gain strength from the contact. And the theorist is never at his best in the world of practical and material things unless he has had some years at actual toil.

This is the real upbringing. This is the real royal road to achievement of which we hear so much. Yet it is one we all might travel if we would, were we not so desperately afraid of the cold, hard contact with Mother Earth and of what we are pleased to call the drudgery of toil.



THOMAS THOMAS

Thomas Thomas was born in Wales in 1860, the son of Shadrach Thomas, a Welsh miner. When the young boy was three years old, the family embarked for America. Shortly after landing, Shadrach Thomas took up his abode in Pittston and later placed the boy in the public schools.

Still later he was sent to the "pay" schools which were then so general in the anthracite region. But at nine years of age, he entered the mines as a trapper and thence he went to the breaker. At 14, he was a full-fledged driver boy. At the present time, he could not be even a trapper at that early age but different views were held in the seventies.

His first work was in the Twin shaft, the scene of a disaster caused by the heavy load of glacial drift in the Wyoming "buried valley." This crushed in the roadways and killed several men. Such an accident has never been duplicated in the anthracite region. This colliery was then owned by the Pittston & Elmira Coal Company.

Later, young Thomas became a runner and let cars down from the working faces to the levels. Then he commenced to load coal as a laborer and finally he became a miner. There were thus few places in the mine which he did not fill before he was 20 years of age. In those days there was not the multiplicity of occupations which can be found in modern mines.

In 1880, Thomas Thomas was working in the Exeter mine and having saved a little money by frugality he decided that he needed mental development and took up a course of study at the Lewisburg Academy. An education, paid for from the savings of the student, earned by some ten years of steady toil was not sought in the half-hearted way pursued by the young man who goes to school at the parental admonition, and Thomas Thomas burned the midnight oil, endeavoring to make up the deficiencies in the education of his earlier years. In 1885, he entered Lehigh University and after five years of study he graduated.

During each vacation period he went back to the mines, part of the time working on the engineering squads of the Lehigh Valley Coal Co. In 1891 he was made outside mine foreman at the old Enterprise colliery of that company. Shortly after he was transferred to the Exeter colliery, serving as general inside foreman.

In 1901, he became superintendent of the William-A and Seneca collieries. Four years elapsed before his next promotion and in November, 1905, he became division superintendent of the Lehigh division and established his headquarters at Hazelton. So well did he handle the work of this responsible position that in 1907 he was transferred to the Wyoming division, the largest under the company; there he became superintendent.

Following the promotion of F. M. Chase to the position of vice-president and general manager of the Lehigh Valley Coal Co., to succeed S. D. Warriner, it was decided to create the position of mining superintendent, and abolish the office of assistant to the general manager.

According to this plan, announcement was made Oct. 1, 1912, that Thomas Thomas was the new mining superintendent. He was given complete control of all the mining operations of the company, both inside and out. Under his charge are thirty-two collieries and several washeries scattered throughout the anthracite fields. In all, an army of 25,000 workmen is directly responsible to him.

Both educated and experienced is Thomas Thomas, but somehow neither of these qualifications, important as they are, overshadow in him that other characteristic, just as vital to success—the quality of personality. A man who has been through the mine, filled every place, worked at every job and yet has had a college experience, bridges the gap between the office desk and the mine face, the unfathomable abyss, as it seems, between the man who works and the man who, as the foolish phrase goes, "only thinks for a living."

Thomas Thomas has not forgotten the humble little cottage at Pittston, the dinner-pail days, the early walks

to the breaker, the dangers of the coal face. His interest in the miner is not the sympathy of an outsider but the clear full-faced vision of one who has but to look back in his own life to find similar experiences. The miners like to deal with men of that kind and it is to be hoped that the future may see the mines officered by more of such democratic talent, not only well trained but well experienced. It will prevent that segregation of class interests, of which the worst is to be feared.

Mr. Thomas is a pleasant, affable man who desires only to impose what he would himself be prepared to accept. And he realizes what is fair because he knows the mine from the shaft mouth to the face and the outside works from the headframe to the main railroad switch. There are not many young men who, after 11 years on the firing line, will return to their studies to put a final finish on their education.

Before such men, there opens up a large future. With bodies developed by early toil, with the mind matured by contact with men of action, made independent by the thought that they can take their place at any time in the ranks of labor, such men have a strength not usually to be found among those who have not mixed the practical with the theoretical, but have seen and probably thereafter always will see life through the spectacles of their academic education.

But above all, the feeling of the Lehigh men for Thomas Thomas is one of pride in an old friend who has "made good." Those who have known him from boyhood and knew his father before him, recognize his solid purpose and real worth. The younger men realize in him a promise that work well performed will not be forgotten and that the high places of corporational control are not beyond those, who, beginning at the bottom of the ladder, keep their eyes fixedly on the topmost rungs and their feet pressing steadily upward.

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Protection of Trolley Wires

By U. U. Carr *

To safeguard employes about the mine against contact with trolley wires, as is required by the mining laws of some states, boards placed parallel to and on both sides of the conductor are claimed by many to afford an efficient and inexpensive means of protection.

*Engineer, Monongahela River Consolidated Coal & Coke Co., Pittsburgh, Penn.

Many different methods have been employed to suspend protection boards placed in this manner, and where a permanent installation is desired, the hangers shown in the accompanying cuts have proven satisfactory.

Where the usual type of trolley hanger, carried on an expansion bolt in the roof is used, Fig. 1 illustrates the method of supporting the protection boards. The iron strap is provided with a hole in the horizontal portion, into which the boss on the base of the trolley hanger fits. This strap is thus clamped between the roof and the hanger base when the latter is screwed onto the expansion bolt.

Preferably this hole should be drilled or punched the same diameter as the bolt holes and drifted to its proper size. All the perforations can be made in the strap before bending.

The boards may be joined at the hanger by making a half-notch in each, as shown in the side view of Fig. 1, or they can be spliced between hangers by butting them end to end and nailing on a batten.

They should be of sufficient width and placed low enough to extend below the point of greatest sag in the wire.

Where the trolley hangers are secured to over-head timbers, by means of lag screws, the protection boards may be carried by a similar strap, as shown in Fig. 2. In this case, holes are drilled in the strap to match the holes in trolley hanger base and the former clamped between the timber and the hanger.

These methods of supporting the protection boards have the advantage of utilizing the necessary trolley wire supports and making them perform the double duty of carrying the wire and also the boards.

If the trolley hangers are spaced more than 15 ft. apart, an intermediate strap should be provided for the boards. In cases where it is desirable to carry these protections, independently of the trolley wire supports, a hanger of round iron, shaped as shown in Fig. 3, and driven into the roof will answer the purpose. No bolts are required with this arrangement, as the boards are allowed to lap at the hangers and the thickness of two boards should fill the space in the bent portion of the hanger.

Where the roof will not permit the boards to be placed or removed from the top, this is accomplished by sliding them endwise to clear the hangers.

Each board should extend beyond or lap over the round hanger at least 3 in.

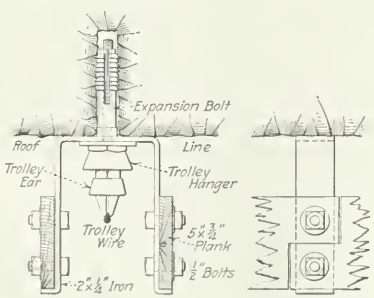

Fig. 1. Double Hanger Suspended from Roof

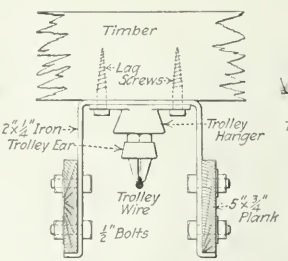

Fig. 2. Double Hanger Suspended from Timbers

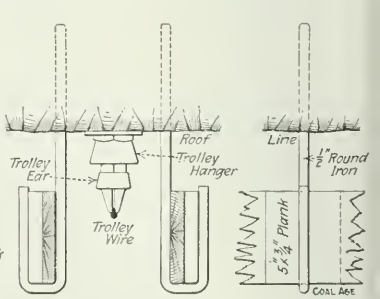

Fig. 3. Single Independent Hangers Driven into Roof

EDITORIALS

A Bituminous Trust

The people of the United States are not unalterably opposed either to trusts or to reason. Their theory of government, viewed along broad generic lines, does condemn, it is true, all amalgamations which are in restraint of trade. But they do not condemn labor unions, which are, in a real sense, trusts, and there has been a tendency to favor combinations of farmers and tobacco raisers, who seek to obtain higher prices for their produce and reduced rates for the storage of their goods.

The right to a fair compensation for services rendered to the community is thus generally recognized. Unfortunately in some cases the compensation taken by monopolists has not been fair, and in other instances, the public has set itself up as a judge when it did not understand the conditions it was endeavoring to adjudicate.

The recent increase on the price of anthracite was a case in point. This boosting of the circular rates was condemned by almost all the papers alike without careful inquiry as to what the increases actually were. Some of the reputable papers doubtless soon realized their error, but they did not care to retract their mis-statements; the others doubtless never sought the truth and would have published their diatribes in any event.

It is not now our intention to discuss the anthracite trust, but rather the prospect of creating a successful control of the bituminous-coal market after a needed change has been made in the sentiment of the electorate and in the laws on the statute books. It is useless to endeavor to harrow the mind of the average man with the misfortunes of the producer. The consumer is not disposed to be sympathetic and indeed he cannot afford to be.

An increase in the cost of coal is not a desirable end for legislation, yet this is usually the sole and declared end of those who would create a trust. The monopolist must present the public with some more logical basis for coöperation. In fact it does not appear impossible to forecast and promise that a unification of bituminous interests might lower costs of fuel.

It seems a violence to reason to declare that the cost of fuel is too high everywhere in face of the fact that many of the largest producers are in the hands of receivers. However, not only the cost of mining, but the cost of transportation as well, enter into the question, and only a large combination can hope to compel reductions in this item.

When the Standard Oil Co. found the costs of transportation on its oil were too high, it threatened to build pipe lines, and immediately obtained rebates on its own oil and even on that shipped by others. Small companies would have pleaded in vain, no, rather they would have failed to plead at all. They would have spent their time trying to reduce the pay of their pumpers and refiners or in endeavoring to harass and underbid one another.

The question of transportation, except competitively, would have been wholly overlooked, because a general reduction of all oil-transport rates with unlimited competition would not have been divided between operator and consumer. The latter would have received it all and the change would have left the producer subject to more competition by reason of the reduced expense necessary to enter the business with only the lowered freight rates to meet.

It is a fact that small profits almost invariably make narrow-minded operators, just as low wages make wooden-headed employees. The lower price of oil owes not a little to the power of the Standard Oil Co. to lower the railroad rate and of the Interstate Commerce Commission to give all the competitors of that oil company an equal transportation charge.

Just as the Standard Oil Co. threatened to build pipe lines, so could a big coal corporation compel the railroads to make needed concessions by the building of a canal or of a rival railroad. Or it could bring pressure to bear by converting all the coal into gas or electricity and transporting the product by pipes or wires to the market.

But such minatory attacks on the railroad corporations cannot be made effective by companies having small purses, though carbo-electric conversion on a small scale does not necessarily involve a large investment. To unamalgamated companies the railroad rate is fixed as by a divine fiat. The average operator would not attempt to argue with the nod of the Wall Street office.

This ability to reduce railroad rates in the hope of sharing with the consumer in the benefits of the reduction is but one of the advantages which a combination would afford. Many developments could be expected from a unified interest, which a number of jarring elements cannot hope to effect.

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A Word with Our Readers

We are desirous that every subscriber to COAL AGE take an active part in discussions that occur in these pages. It is also our wish that many more of our readers would contribute articles on some phase of coal-mining and coke manufacture. Not every article received by us will be published, for it often occurs that a contributor will submit a paper of considerable merit, but which deals with a problem of only local interest or discusses a subject already covered in some recent issue.

It is certain that many more articles will be received than we can use, so there is little or no occasion for a subscriber to feel discouraged if his first attempt at authorship proves unavailing. Furthermore, articles are not judged according to the reputation or personal popularity of the contributor, but solely on the character and original value of the information contained.

One statement may be made in this connection, however, and that is concerning neatness and legibility. It is just as easy to use a little more paper and double space

all the lines, as it is to crowd the writing so that the editor must turn the manuscript over to an assistant to decipher and copy before it can be intelligently read. There is no denying the fact that a carefully written article, properly paragraphed and neatly laid out, will make a better initial impression and receive earlier editorial attention than a slovenly prepared manuscript of equal technical value.

We wish to call attention again to the fact that we will pay $20 for any five- or six-hundred-word article, suitable for publication as a "Foreword" on our first page. The subject may be ethical, technical or general—just so the meat is there.

Then there are the pages of "Ideas and Suggestions," which in a general way are sub-forewords. These little talks by our readers have proved both interesting and popular and are paid for at an unusually liberal rate.

We are sure all our subscribers have appreciated the pages of "Snap Shots" recently published, and we intend to continue this feature of our paper. Every photo which we print is paid for, and the best picture each week is awarded a prize of $5. No view shown is valued at less than $1.

On Feb. 1, the entire issue of COAL AGE will be devoted to the subject of "Power" at mines. There are dozens of modern colliery equipments deserving the attention of the industry. Send us a description of some unique power installation or efficient arrangement which has come to your notice. Help us make this "Power" number the best of its kind ever issued. Copy must reach us not later than Jan. 25.

Self Propagating Inflammation

It would be disingenuous for us to attempt to hide from ourselves, or to deny to our readers, the fact that G. A. Burrell, in making his address before the West Virginia Coal Mining Institute, purposed to make a "retort courteous" to COAL AGE and the technical press.

This purpose does him much credit, for we conceive that, with us, the Bureau of Mines is engaged in the informing of the industry. It would be negligent in the performance of its duties did it not take due exception to anything we might publish which appeared incorrect or misleading. Similarly, we have felt such a duty impending on us, which we hope we have not been disposed to shirk.

As Mr. Burrell did not fail to test the button on his foil before entering the conflict, we propose to thrust, guard and parry with equally invulnerable weapons. We desire that this reply may be taken, not as shrouded sarcasm, but in the most solemn literalness.

The section of Mr. Burrell's paper, which we reproduce today, details the percentage volumes of methane which are explosive, determining the higher and lower limits of explosibility. Made as carefully as his tests are, we shall be disinclined to cavil at his results, and shall be content merely to object to his manner of expression, which we have not hitherto followed and do not desire to adopt.

The use he makes of the word "explosion" follows neither the popular practice, the preferences of advanced scientists, nor the definitions of the dictionaries. Nor does it agree with the philology of the word. Soundless plaudits, like noiseless explosions, are alike unthinkable. Derived from the Latin root signifying "clap," the word explosion has, from the time of its first use, involved the sense of an action producing sound. In earlier years the word was used to express among other things the clamorous clappings and vociferous bellowings with which the unpopular Roman actor was driven crestfallen from the stage.

The dictionaries add to this root-meaning the idea of expansion, and term an explosion "a violent bursting expansion with noise." The public, whose unexpressed opinion constrains reluctant lexicographers, declares that "explosion" is not a synonym for "inflammation." On the other hand, the British writers, Doctor Thornton in particular, agreeing neither with Doctor Burrell nor with the vulgar herd, term "explosions" all those kinds of methane inflammations which are not mere caps on a flame.

As we have pointed out, Mr. Burrell is not so radical, and we congratulate him on his stand. Even if it is not as logical as the British view, it is more practical and gives results which are more closely consonant with the definition of an explosion as approved by popular judgments, lexicographic preferences and philologic precedents.

All inflammations probably produce sound. Helmholtz has shown that air vibrations of lower frequency than 16 per sec. fall without effect on the insensitive human ear, and we all know that sound waves of slight intensity fail to cause perceptible vibrations of the auditory nerve.

Hence, in an extremely modified sense, all inflammations are probably explosions. Even the burning of a gas jet may be made to produce musical sounds. But the judgment of most of us is that an explosion must make at least an audible sound, and not merely one which is too infrequent in vibration and too feeble in intensity to be detected by the human ear.

We have seen how widely modern writers differ from the best everyday usage in their definition of the word "explosion." Mr. Burrel takes a medium viewpoint and is sure that "an explosion, in the true sense of the word, means a self-propagation of flame to all parts of a mixture, without help from the source of combustion other than the ignition of the mixture at one point."

Why not use another term for this low limit? Does it seem desirable to use a popular word like "explosion" in such an extremely technical way? Where a body of powder or dynamite burns away quietly without detonation, we do not say it explodes; we say it burns or deflagrates. Why make a new meaning for explosion, to be applied solely to methane and similar gaseous bodies?

There were other expressions available, such as, complete, self-propagating or progressive inflammation. The English language has not broken down, nor has it been found inadequate that we should suffer ourselves to limp along with a poor philologic substitute like the word "explosion."

After all, it is a question of words and their definitions. We believe it was Lord Bacon, in his Novum Organum, who declared that disputations are as frequent over definitions as over facts. We hope that Mr. Burrell will modify his statements so that they will accord more closely with popular parlance, and declare that, on applying a light to a 5.5 per cent. mixture of methane and air, a complete inflammation or a self-propagating conflagration, and not an explosion, will result. Thus he will avoid confounding the violence of the latter with the gentle action of the former.

DISCUSSION BY READERS

Reducing Ventilation at Firing Time

Letter No. 1.—I have been much interested and startled at times in reading the phenomenal experiences of Alexander McAllister, Croweburg, Kan., as narrated in his letter, COAL AGE, Jan. 4, 1913, pp. 24 and 25. The statements set forth seem very convincing. Although such an experience is forbidden the majority of mining men, I am sure all would welcome the chance to be allowed to witness such a demonstration as Mr. McAllister cites in his letter.

The old proverb, "An honest confession is good for the soul," gives me consolation, when I say candidly, I would be afraid to perform such operations as he has described, in a gassy mine. It may be said with candor that his experience and convictions are contrary to or directly the reverse of those of practically all mining men and theorists alike, to whom we have looked and on whom we rely to furnish us facts, figures and experiences, for our guidance.

I have had nearly thirty years' experience, in all sorts of mines, having served in every capacity, but have never heard of such a scheme as that suggested. My opinion is that it would be a costly experiment to perform in a well equipped mine. I do not think the property and equipment of any mine should be jeopardized by such an experiment.

Personally, from my own experience and from that of tutors and the best authorities—men who have spent almost half a century studying mining conditions—I would condemn the practice of reducing the ventilation in a mine at firing time. I firmly believe such a method of procedure is extremely dangerous. To reduce the ventilation would increase the danger in the same proportion as to increase the quantity of explosive gas in the mine.

By reducing the ventilation, we increase the percentage of firedamp in the air, as the same quantity of gas is given off and a less quantity of air circulated. The percentage of dust is also increased and likewise the percentage of carbon monoxide produced by the explosion of powder in blasting. From these conditions it follows:

1. Percentages of gas that are not previously explosive become explosive in proportion as the volume of air is decreased.

2. Percentages of gas that are not previously explosive become explosive under the pressure of heavy blasting in a confined space where the air is dead.

3. The reduced air current will carry a large per cent. of dust, which will greatly help to propagate the flame of an initial explosion, and the danger point in respect to dust will be in proportion to the reduced ventilation.

If we knew the exact amount of gas given off in the mine, we might, with some security of feeling, estimate the quantity of air that should travel, but this is not possible. Nor can any exact estimate be made of the amount of carbon dioxide (CO_2) that would render the firedamp inexplosive. Authorities state that 1 volume of carbon dioxide (CO_2) when mixed with 7 volumes of firedamp at its most explosive point renders the latter inexplosive.

I shall watch this discussion with interest. It is an important subject, and until I was firmly convinced that I was wrong, if I were a shotfirer on my rounds and discovered a weakness in the air I would cease firing and ascertain the cause and would not commence again until conditions were normal.

R. Z. VIRGIN.

Johnstown, Penn.

The Hastings Explosion

A great deal of prominence is given in COAL AGE, Nov. 30, 1912, p. 756, to the explosion at Hastings, Colo., June 18, 1912; and it would appear from that article and the one by Mr. Verner, Nov. 16, p. 677, that the theory that damp dust or wet zones will stop an explosion is at fault.

It is difficult for me to conceive how anyone can arrive at such a conclusion, in view of the dust experiments made at Pittsburgh, Penn. In those experiments, the propagation of flame by coal dust ceased when the moisture content in the air reached 30 per cent. The coal dust, in the Hastings explosion was damp but not wet; still the writers of these articles refer to that explosion as proof that moisture cannot be depended on to stop an explosion. In reply to this statement, these writers may claim that, in the experiments at Pittsburgh, the explosion was not sufficiently under way when it reached the coal dust zone in the entry. If that line of argument is followed, then it is possible to suppose a case in which the initial force generated by an explosion of gas, or both gas and dust, would pass the flame through a zone of either stone dust or moisture, or both combined. I do not mean to say that either of these writers would dispense with moisture entirely, as a means of preventing explosions, but I think they are in error when they say that it cannot be depended on to do this.

I have worked in the Hastings mine, and know something of the conditions existing there. When there was only the upper seam working, the mine was naturally wet throughout, and small explosions that occurred failed to go further than the point of ignition. I held the opinion and expressed it to others that it was the naturally wet state of the mine that had localized these explosions. These considerations and the fact that the explosion in June, last, did not enter the main-intake airway where there was a running stream of water and where the props and everything else were saturated with moisture, leads me to the conclusion that the theory that the presence of moisture in coal dust will effectually stop the propagation of an explosion is correct.

I pointed out to Mr. Dean that there was not the least sign of an explosion on the intake; to which he replied that there was no dust being thrown into the intake from the cars, as there was on the main-haulage road. While that is true, by cars is not the only way that dust is

spread through mines. The crushing and grinding action of the overlying strata on the pillars produces a great deal of very fine dust, which is likely to be deposited all over the mine irrespective of the haulage roads; and besides, at Hastings there was one haulage road, at least, that crossed the intake, and there was also a side track from which the dust had access to the intake. I was much impressed with the amount of fine dust there was in the crosscuts and which was much disturbed when putting in new stoppings. I am of the opinion that had it not been for the running water in the intake there would have been enough of dry dust there to have carried the explosion to the surface.

The new-slope south entries do not show the same amount of moisture or standing water on the roadways that the entries of the old upper seam did, and therefore the new workings, in the lower seam, could not be expected to be immune from dust explosions to the same extent as the old mine in the seam above.

It seems probable that the greatest force of the explosion was exerted at the upper end of the main-slope side track. It was here that the cars were so badly broken up. A trip of cars standing about halfway up the slope and in the path of the explosion did not seem to be much damaged, although they were surrounded and covered with rock and loose timber. From what has been said it seems likely that the explosive force was generated from a little pocket of gas in the third south entry, and augmented, later, by dust picked up on that entry and the large side track at the end of it. From here the explosive force decreased, as is clearly shown by the fact that a man working near the top of the slope was found still alive. It is well known that a dust explosion will always travel the intake road if it can get any thing to feed on and avoid a wet road. The point of expansion referred to by Mr. Dean unfortunately is above where the man was found alive, showing that the blast had lost a great deal of its power before it reached that point.

The greater area of the road would reduce both the velocity and energy of the explosive wave, but the flame could easily have jumped across this space had conditions been favorable. Immediately beyond this point, where the area of cross-section of roadway expanded, is the last evidence of the force of the explosion, on the outby end; and here begins the naturally damp and sloppy condition characteristic of the old mine. It is here, I believe, the explosion was stopped from entering the upper seam; and I ascribe the credit for this to the very wet condition existing there. For hundreds of feet on the outby end of this point the damp conditions are very much in evidence. In some places, pools of water, from four to six inches deep, are found in the manway. When these things are considered I think it would have been a surprise to any of us had the flame of the explosion traveled beyond this point. Cases have been known where the mine was dry and dusty and the explosion traveled through the shaft from one seam to another without losing its explosive force; although there would be more room for expansion, at the shaft bottom and in the shaft, than there was in the Hastings slope.

An important factor, in connection with dust explostons, which should not be forgotten, is that, owing to the difference in the amount of energy and heat developed by different explosions, in different mines, a zone of moisture and stone dust that would stop the propagation of an explosive flame in one mine, might not stop it in another; because of the greater heat and explosive force. It is reasonable to suppose that if it required a zone of 100 yd. of moisture and stone dust to stop the propagation of flame in one mine, then it would require a zone of perhaps 200 yd. to stop the flame in another mine where the explosion had developed twice the amount of heat and energy. In the latter case, the greater velocity of the blast would carry it further into the zone, before the moisture and stone dust could cool the gases sufficiently to extinguish the flame, and the greater amount of heat in the flame would be able to convert some of the moist dust into gas, which would help to extend the explosion.

From this it is clear that a mine in which the analysis of the coal shows a high percentage of volatile combustible matter would require more attention and the stone dust and moisture have to be kept closer to the working places, than a mine in which there was less volatile matter in the coal. Referring again to the intake airway, I would like to ask: If the moisture did not stop the explosion from traversing it, what did? The flame had to cross the intake to enter the third north, and the pumper was found in the intake just below this point badly burned, which shows that the flame was there and had plenty of power behind it; but the naturally wet condition of the airway stopped it there, although it traveled up the parallel entry about a quarter of a mile further. It may be well to explain that the third-south entry is driven at right angles to the intake and main slope, so that it received little benefit from the water that was in them. This explosion was a particularly unfortunate occurrence, because the officials of the Victor American Fuel Co. had been paying a great deal of attention to the safety of their mines, by the application of adobe dust, water and other means, some of which were pointed out to me by the superintendent when he took me through the mine shortly after the explosion.

ROBERT MCCUNE.

Delagua, Colo.

Timber for Framing

I have been asked which is the stronger, a square solid piece of timber 12 by 12 in., 20 ft. long, or six pieces of 2 by 12 in., 20 ft. long, spiked or bolted together. These six pieces make a post or stringer of the same size as the single piece first mentioned.

There is no difference in the strength of the two pieces, except what little strength may be lost by the penetration of the spikes or bolts into the wood. This slight loss in strength, however, is generally compensated by the ability to choose good clear-grained pieces of the smaller sizes. The timber is less expensive than the larger size, and the latter may contain hidden knots or imperfections in the grain that are not observed on the surface, which weaken the stick.

The combination of smaller sizes of timber is often preferred not only on account of the saving in the cost of the timber, but the pieces are more readily handled.

When a stringer is formed of several small pieces of timber bolted together, they should always be set on edge, or with the greater dimension corresponding to the depth of the beam.

MINING ENGINEER.

Clermont, Penna.

INQUIRIES OF GENERAL INTEREST

Surveying Methods

Please explain an approximate method of measuring the distance across a stream, by the use of a transit and tape or chain; but without reference to any book of tables.

MINE SURVEYOR.

Stotesbury, W. Va.

First Method—Where it is possible to cross over the stream, the following method may be used, which will give approximate results: Referring to Fig. 1, set up the instrument at *A* and sight to a point *B*. Then, by means of the 3, 4, 5 method, often called the 3, 7, 12 method, set off the right angle *OBT*. To do this, first line in the point *O*, on the line *AB*, with the instrument, making the distance *OB* 3 ft. or any multiple thereof, and place a surveying pin at *O*. With *B* as a center and a radius of

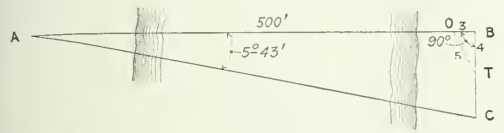


FIG. 1. METHOD OF MEASURING DISTANCE ACROSS A RIVER

4 ft., describe an arc; and with *O* as a center and a radius of 5 ft., describe another arc intersecting the first at *T*. The angle *OBT* will then be a right angle.

By the 3, 7, 12 method, the end of the tape is fastened at *O*, and the tape is then carried around the triangle *OBT* and back to *O*. The distance around the triangle *OBTO* is 12 ft. Now, holding the end and the 12-ft. mark at *O*, with the 3-ft. mark at *B*, pull out the tape with a pin at the 7-ft. mark, which will establish the point *T*, making the angle *OBT* a right angle.

With the instrument at *A*, turn off the angle *BAC* equal to 5 deg. 43 min., and line in the point *C* on the line *BC*. Now, since the tangent of 5 deg. 43 min. is 0.1, the distance *AB* will be ten times the distance *BC*. Thus, if the distance *BC* equals 50 ft., *AC* will be $10 \times 50 = 500$ ft.

Second Method—When it is not possible to cross to the opposite side of the stream, the following method can be used: Referring to Fig. 2, establish the line *CD* more

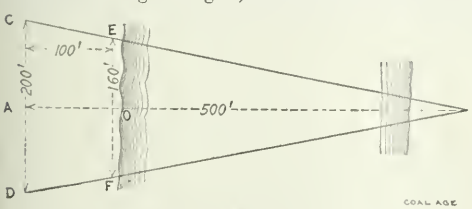


FIG. 2. ANOTHER METHOD OF SURVEYING

or less parallel to the stream, and another line *EF* parallel to the first, and at any distance *AO* from it. Now, select a well defined point or object *B*, on the opposite bank and line in the point *E* on the line *CB*, and likewise the point *F* on the line *DB*. Measure *CD* and *EF* carefully. The distance *AB* is then calculated as follows:

$$AB = \frac{CD}{CD - EF} \times AO$$

If the several distances are as indicated in Fig. 2, the calculation is as follows:

$$AB = \frac{200}{200 - 160} \times 100 = \frac{200}{40} \times 100 = 500 \text{ ft.}$$

Discharge of a Mine Siphon

A siphon pipe 4 in. in diameter and 1000 ft. long has a rise of 15 ft. and a fall of 40 feet. How many gallons of water will this siphon discharge in 24 hours?

HENRY HENNESSEY.

Stauffer, Penn.

In ordinary mining practice, the coefficient of friction of water flowing through a siphon pipe may be taken as 0.01. On this basis, the flow of water in a 4-in. siphon pipe, 1000 ft. long, rising 15 ft. and falling 40 ft., may be calculated by the following formula:

$$G = 4^2 \sqrt{\frac{800 \times 4\,(40 - 15)}{1000 + 2.08 \times 4}} = 142.4 + \text{gal. per min}$$

The quantity of water this siphon will discharge in 24 hr. is, then, $24 \times 60 \times 142.4 =$ say 205,000 gal.

In siphon work it is never safe to calculate the discharge of a siphon, by any formula, unless it is positively known that the flow of water, under atmospheric pressure, in the suction end, is equal to or greater than the discharge, under gravity, in the other end of the pipe. If the flow in the discharge end due to gravity is greater than that in the suction end due to the pressure of the atmosphere, the pipe will tend to empty itself; and sooner or later the siphon will cease to work or, in other words, will "run dry." Since it is the atmospheric pressure that causes the flow in the suction end of the siphon, and this decreases with the elevation above sea level, it is evident that a siphon that will work at sea level will often fail to work at an elevation above sea level where the atmospheric pressure is less. In order that a siphon shall work continuously, the value of the following approximate expression must be greater than zero:

$$\frac{\text{Atmos. head} - \text{suc. head}}{\text{Length of suc. end}} - \frac{\text{dischg. head} - \text{atmos. head}}{\text{Length of dischg. end}}$$

The normal atmospheric pressure, at sea level, expressed in water column, is 34 ft. Assuming the siphon, in this case, is located at sea level, the suction head being 15 ft. and the discharge head 40 ft., gives

$$\frac{34 - 15}{400} - \frac{40 - 34}{600} = \frac{19}{400} - \frac{6}{600} = 0.0375$$

This value being greater than zero, shows that the siphon will operate continuously without emptying itself, provided, of course, that both ends are submerged and other necessary conditions fulfilled.

EXAMINATION QUESTIONS

Mine Foremen's Questions

(Answered by Request)

Ques.—Two pumps are working together, the one 14x36 in., and the other 15x30 in. If both of these pumps are running at a speed of 90 ft. per min., which will throw the greater amount of water per hour; and how much will the discharge of the one exceed that of the other?

Ans.—For a piston speed of 90 ft. per min., the piston displacement of each pump is as follows:

Pump, 14x36 in.

$$\frac{90\ (0.7854 \times 36^2)}{144} = 636.17 \text{ cu.ft. per min.}$$

Pump, 15x30 in.

$$\frac{90\ (0.7854 \times 30^2)}{144} = 441.78 \text{ cu.ft. per min.}$$

Since 1 cu.ft. of water equals 7.48 gal., and assuming the water-end of each pump has an efficiency of 85 per cent., the quantity of water discharged per hour by each of these pumps is as follows:

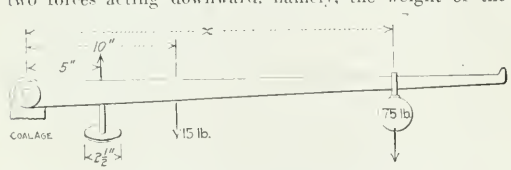
$0.85\ (636.17 \times 7.48 \times 60) = 242{,}686$ gal. per hr.
$0.85\ (441.78 \times 7.48 \times 60) = 168{,}530$ gal. per hr.

Difference ..... 74,156 gal. per hr.

At a speed of 90 ft. per min., the 14x36-in. pump will, therefore, throw 74,156 gal. per hour more than the 15x30-in. pump will discharge, at the same speed.

Ques.—In a ball-and-lever safety valve, the distance from the fulcrum to the valve stem is 5 in.; the diameter of the valve, 2.5 in.; the weight of the lever, including that of the valve and stem, 15 lb. and its center of gravity, 10 in. from the fulcrum. If the ball weighs 75 lb., how far should it be set from the fulcrum in order that the valve will blow off at 90 lb. per sq.in., boiler pressure.

Ans.—Referring to the accompanying figure, there are two forces acting downward, namely, the weight of the



Ball-and-Lever Safety Valve

lever and valve and the weight of the ball. The weight of the lever and valve acts through the center of gravity, which is 10 in. from the fulcrum; while the weight of the ball acts through a distance x from the fulcrum, which distance is to be determined.

These forces acting downward are balanced by a single force acting upward; namely, the total steam pressure on the valve. This force acts through the valve stem, at a distance of 5 in. from the fulcrum. The steam pressure on the valve is first found as follows:

Area of valve $= 0.7854 \times 2.5^2 = 4.9087$ *sq.in.*

Then, for a steam pressure of 90 lb. per sq.in., the total pressure on the valve is:

$$4.9087 \times 90 = 441.78 \text{ lb.}$$

At the moment when the valve blows off, there is equilibrium between the forces acting downward and that acting upward. Since the fulcrum is the center of moments about which these forces act, the sum of the moments of the downward forces must equal the moment of the upward force. Therefore, calling the distance from the fulcrum to the ball, x

$$75x + 15 \times 10 = 441.78 \times 5$$

$$x = \frac{2208.9 - 150}{75} = 27.45 \text{ in.}$$

In order that this valve shall blow off at a steam pressure of 90 lb. per sq.in., the ball must be set 27.45 in. from the fulcrum.

Ques.—If the separation doors at the bottom of a mine shaft are set open, so that the air current short-circuits at this point, passing down one shaft and up the other without circulating through the mine; will the fan run faster or slower as a result?

Ans.—The opening of the separation doors at the shaft bottom and the consequent short-circuiting of the air current, cuts out the mine resistance. As a result, a larger quantity of air is circulated by the same power applied to the fan. This means a larger volume of air is passing through the fan and the two shafts per minute. The resistance of the fan and the work lost in the fan is increased. The effective power or the power available to turn the fan will therefore be decreased, and the fan will naturally run slower. How much the speed of the fan will be decreased will depend upon the relative resisting power of the mine and that of the fan, in connection with that, also, of the two shafts and the airways connecting them.

Ques.—Does dynamite exert a greater force downward, or does it exert the same force equally in all directions?

Ans.—In the explosion of dynamite the cartridge is the center of a radiating force, which is exerted equally in all directions. The reason for the statement so often heard that dynamite exerts its greatest power in a downward direction is probably due to the fact that the cartridge or stick of dynamite is supported from below, and the force of the explosion is more in evidence in this direction, owing to the destruction of the support.

The explosion of dynamite is so sudden and violent, that it is only necessary to lay a stick of this explosive on the upper surface of a rock or boulder, and its explosion will generally break the boulder. Sometimes a handful of sand or earth is placed over the cartridge to keep it from rolling away before the explosion takes place. However, if the dynamite could be held against the under surface of the boulder or any other obstruction, its explosive force would be manifested as strongly in an upward direction as it was previously manifested in a downward direction.

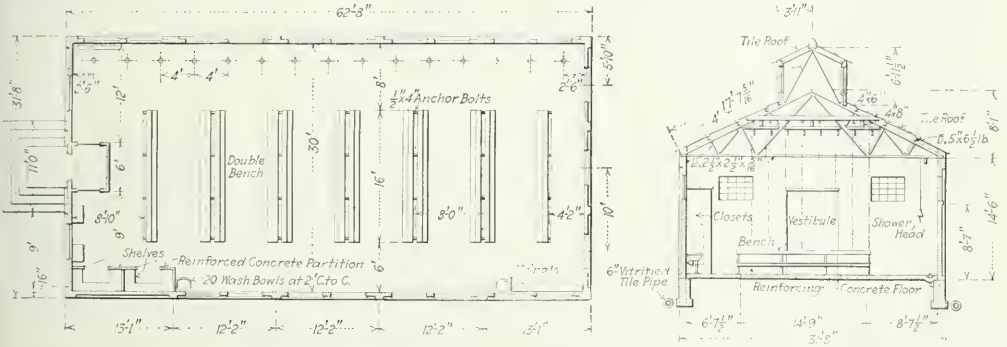
SOCIOLOGICAL DEPARTMENT

Bunsen Miners' Change and Bath House

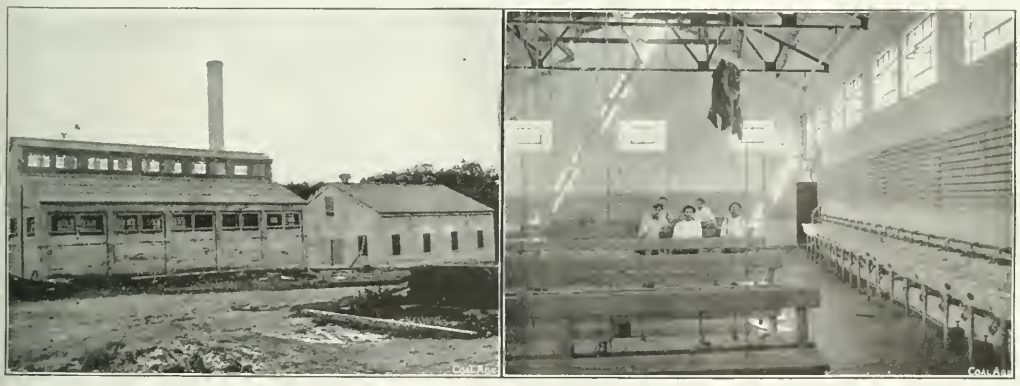
By A. F. Allard*

The miners' change and bath house provided by the Bunsen Coal Co., at its Universal Mines, situate near Clinton, Ind., is in close proximity to the shafts, and of pivoted windows placed on each side of the monitor, running throughout the length of the building. These windows are opened and shut from the floor by a hand-operating device.

The entrance to the building is provided with an outer and inside vestibule, the men passing from the latter through swinging doorways on either side. This feature prevents cold drafts from entering the building



Plan and Sectional Elevation of Bath House of Bunsen Coal Co., Universal Mines, Clinton, Ind.



Exterior and Interior Views of Bath House at Universal Mines, Constructed of Reinforced Concrete with Steel Window Frames and Cement Tile Roof

measures 31 ft. 8 in. in width by 62 ft. 8 in. in length The floor and walls are of reinforced concrete; the roof covering is of cement tile, supported on steel trusses, and the window frames are of steel, making the building absolutely fireproof. It was designed by the Roberts & Schaefer Co., of Chicago.

At the present time, there are about 200 miners employed, out of which number about 75 per cent. make use of the bath house. Ventilation is provided by means and chilling the stripped men. A row of shower heads is located on the side opposite the washbowls, but it is not shown in the illustration of the interior. Near the entrance, two concrete closets are fitted up with shelves and hooks for the personal use of the mine managers.

The heating system consists of steam-heat coils made up of 1¼-in. pipe, in ranges of 11, supported along the side walls and the end of the building. The pipes are supplied from a high-pressure steam line and a comfortable temperature is maintained at all times. The hot-

*Chief engineer, Bunsen Coal Co., Westville, Ill.

water supply is drawn direct from a hot-water heater located in the boiler house, insuring a sufficient supply.

Along the bath side 15 shower heads are placed at 4-ft. centers and 7½ ft. above the floor. They are supplied with hot and cold water, the temperature being regulated by means of hot- and cold-water valves within easy reach of each man.

On the lavatory side there are 20 individual enameled washbowls, each supplied with a hot- and cold-water spigot. The urinal is on the same side and located at the extreme end of the house, but screened from general view by a slate partition. It is 8 ft. long and is fitted with a tank and pipes for flushing and sprinkling.

The concrete floor slopes 5 in. from the center to the gutter, permitting the water to drain off quickly. Brass bee-hive strainers placed at intervals along each gutter carry off the waste, which leads through pipes and traps to the drainage sewer. After each shift of men has used the bath house, a caretaker, paid by the company, washes down the floor, cleans the benches and wash bowls, keeping the house clean and sanitary.

Wooden benches fastened to the floor are placed in pairs back to back. They are 16 ft. long and spaced 8 ft. apart, allowing ample room for the men to walk between and around the seats. The men's clothes are suspended between the roof trusses by means of a 12-in. diameter brass ring with chain attached, operating on a pulley fastened overhead. When the clothes are hoisted into position, they are held in place by securing the chain to a padlock fastened to the back of the bench. The locks are in combination, each man carrying his own key.

Clothing thus suspended is well ventilated, and quickly becomes dry. The arrangement has an advantage over lockers placed on the floor, because no additional floor space is required. The method adopted for handling the clothing proves satisfactory to the men, enabling them to wash and change their clothing in a short time. In the view of the exterior of the bath house, another building is included on the left; the bath house can easily be distinguished by the monitor or clerestory in the roof.

Sociological Development in 1912

By R. Dawson Hall

SYNOPSIS—The work of the subsidiaries of the United States Steel Corporation has attracted much attention and will doubtless result in a great development of sociological work of all kinds. The South leads in the consideration of health, the anthracite region in the matter of institute work and first aid. The Steel Corporation leads the country in almost all forms of welfare work except in the organization of institutes.

The sociological development of 1912 is perhaps one of its most remarkable features. The work of the United States Steel Corporation at its many plants seems one of the dominant facts of the year but, as a matter of fact, the public announcement and the development of its work are about all which can be credited to the year just passed. The year before last it let an account of its plans to promote safety appear in the public press and last year it permitted the public to learn how much had been done to make its villages sanitary and picturesque.

But the greater part of the work is older than these records as the companies have been anxious to test the issue of the work before giving the public an account of it. The paper of Thomas W. Dawson at the winter meeting of the Coal Mining Institute of America best describes the work of the H. C. Frick Coke Co. Many, but by no means all, the pictures which illustrated that lecture have appeared in Coal Age. What is true of the Frick company is no less true of the United States Coal & Coke Co., another branch of the Steel Corporation.

Profits and Ethics

Suffice it to say that the Steel Trust is proving the statement of an Ohio coal operator published as a foreword that so long as we have a cut-throat competition in the coal business we cannot expect to have a truly ethical vision of the duties of operators to working men. The companies which lead today in sociologic work are the large steel corporations and the anthracite coal companies.

In relation to the first it will be recalled that at the summer meeting of the Coal Mining Institute of America, two of the officials of the Cambria Steel Co., M. J. Moore and H. S. Endsley, advocated reforms in the mining industry. The first urged the necessity for bathhouses and the second spoke in favor of making accident compensation free from the defence of contributory negligence.

Playgrounds in Colorado

But while all eyes are directed to the H. C. Frick Coke Co., due credit should be given to the Rocky Mountain Fuel Co., which is showing a commendable spirit in constructing playgrounds. We show an illustration of their mines at Superior, Colo. Careful inspection will show in the foreground a playground with a large swing and some sliding boards. Such places of recreation can be found at all the operations of the company, of which there are nine in northern Colorado and about the same number in the southern part of the state.

Only one of two houses can be seen in the picture, but this Superior camp is considered to be one of the best looking and cleanest villages in the state. There are 30 houses; some have four rooms and some five or six. There is a good boarding house with 75 rooms. All the dwellings are lighted by electricity and supplied with artesian water.

A good bathhouse supplied with hot water is provided. Fortunately, Superior has good connections, being on the main line of the Colorado and Southern railroad. The Denver and Interurban R.R. runs electric cars to Denver and Boulder every two hours. With such provisions for comfort, the Rocky Mountain Fuel Co. should have no shortage of men.

The Southern Operators Fighting Disease

In the South, a large interest has centered around sociological work. Disease which makes little headway in the colder climate of the North is rife in Southern camps,

and the Alabama Coal Operators' Association determined to cope with it and employed two experts to advise the operators as to prophylaxis and printed several pithy pamphlets on disease prevention. At the Kentucky Mining Institute, a paper was read on the hookworm.

Little on these lines has been done in the North, but it is not unlikely that the lead of the South will ultimately be followed. The H. C. Frick company has done good work by constructing concrete cesspools under their privies. In fact, the Frick company has paid as much attention to sanitary needs as to mere comforts and aesthetics.

First Aid Occupies New Territory and Intrenches Itself in Old

First-aid work has had a large development. The work of the Red Cross Society was spread so thin over so large a field of industrial work that the addition of Dr. R. N. Mackey as an assistant to Dr. M. J. Shields was

An Alley in an H. C. Frick Coke Co. Town, Showing Privy Vault

imperative. He has been doing a good work in the Southern States.

Kentucky has hitherto not been active in first-aid work but under the influence of W. L. Moss, the general manager of the Continental Coal Corporation, much is hoped from the coming year. The doctors are now at one in aiding the movement, their hostility being replaced by skillful direction since first-aid work has proved its value.

First-aid meets have been held from one end of the country to the other and have been most successful, especially in the anthracite region where there is a clear understanding as to the marking of the judges. In the bituminous region, the umpires are biassed by their private preferences as to methods. As the contestants coming from a distance have no knowledge of these preferences, a slight injustice is sometimes done in giving demerits with considerable disadvantage to a team near the lead when the final count is made.

The Debate on Methods

The time element in first-aid work is not as popular as before. Where it is still maintained, the time is made so ample that it really does not have any importance in judging the results. In some cases no limit at all is provided.

There is marked difference in view as to the relative value of elaborate and rough dressings. The Philadelphia & Reading Coal & Iron Co. is an advocate of the most careful and elaborate dressing of patients. But it must be remembered that the success of the Reading teams is due to the fact that they are well trained. It would be worse than useless to advocate such work where the men were not likely to get such continuous training or were not disposed to assimilate it.

The Coal Mining Institute of America and the Tennessee Association of Mine Foremen have each promoted first aid by holding a meet at their summer sessions and the Kentucky Mining Institute proposes to follow with one next year. The work is, however, alien to the purposes of these institutes and will probably be dropped by them after the work is well on its way. The time devoted to the reading of papers and discussion is all too short for work of any other kind to be attempted.

Doctors Differ, Yet All Are Right

The Bureau of Mines has developed a Mine Rescue and First-aid Conference which is expected to hold frequent meetings. The movement has been favorably received by the mining fraternity, but the doctors who met seem to have been obsessed with the idea that they ought not to have been there and did not become actively interested in the work at hand. This feeling is doubtless because first aid is a layman's movement.

It will take some time to overcome the unwillingness of the medical profession to assimilate it. But that acceptance will eventually take place and then the doctors will be prepared to meet and to discuss the issues as readily as they have hitherto considered other technical subjects in their medical societies. The very fact that all are not agreed is a reason for discussion. If all the practitioners of medicine and surgery had like views there would be no need for a conference. The remarkable stand is taken, however, that as no one agrees, it is well to avoid discussing the issues.

During the past year, some local hospitals have been built. One at Cle Elum, Wash., was started by the labor union. One at Pineville was built by the Continental Coal Corporation. That one has been in operation at Penn-Mary Mines for two or three years has already been noted. Evidence seems to point to a further development wherever a dense industrial population is planted in sparsely settled agricultural country where such institutions have not been provided.

Secularization of Institute Work

During the last year, the anthracite coal corporations have been taking over the institute work of the Young Men's Christian Association. This work, while conducted on a purely nonreligious basis, was not regarded by many as wholly unsectarian. For this reason, the companies believed it best before giving the movement their full support to separate the work from the association.

Whether because of the new *status quo* or from the renewed efforts of the operators, the institutes have been doing extremely valuable work. C. K. Gloman, of the Susquehanna Coal Co., has published an exceptionally useful booklet on methods to be adopted in the formation of institutes. The Panther Valley Coal Mining Institute, while perhaps not among the largest, is developing an exceptional amount of high-class literature.

All are doing a great deal to educate the younger men. Many of the classes are supplied with the textbooks of the American School of Correspondence, of Chicago, Ill., and the scholars are making remarkable progress. The Carbondale Mining School has, however, broken up, the attendance having fallen off.

The Bituminous Region Lags in Institute Work

It is to be regretted that the bituminous regions are far behind the anthracite in aggressive institute work. It should be noted here that C. L. Fay has resigned from the position he has filled most acceptably for so many years as organizer of the mining work of the Y. M. C. A. in the anthracite regions. He assures his friends that the work will not fail of success as it is now firmly supported by the coal companies and has borne enough fruit to assure the public of its value and practicability.

The school code of Pennsylvania permitting occupational schools is doing good work at Ellsworth and Nanticoke and probably in other places. E. E. Bach, of the first mentioned place, is the pioneer in such work

washhouses at the mines. Farmers in villages where roads are bad, and sidewalks unknown drift into careless ways of living and attire, which low standard is immediately raised as soon as clothing is not exposed to so much unnecessary wear and tear.

The Bureau of Mines is securing a sociologist. Consequently, we may expect, in the year to come, that the bureau will spread the good work in other states which has been started in Pennsylvania. As its good offices have taken first aid from a restricted area and made it national, so perhaps we may in a year or two find that, owing to the bureau's work, institutes will be found in almost every large camp in the Union.

A Fatal Mine Cave

The photo in a recent issue of Coal Age, showing the old Court-Wright House, at Courtdale, hanging over a cave hole, which swallowed up the heater in the cellar, sending it down out of sight into the workings of the old No. 1 slope of the Kingston Coal Co., reminds the writer

The Playground and Plant at the Industrial Mine of the Rocky Mountain Fuel Co., Superior, Colo.

of a similar but more disastrous cave in the mines at Stockton, about three miles east of Hazelton, on the night of Dec. 18, 1869. It occurred after midnight, when all were asleep, burying the house, a large double block, occupants and all; and to add to the horror of the occasion, the stoves overturned with the wreck, burning the bodies, which were never recovered. A marble slab was placed over the spot, bearing the names of the victims and dates of their births, as follows:

Elizabeth Rough,	1796
Margaret Rough,	1837
Isaac Rough,	1839
Elizabeth Rough,	1869
George Swank,	1819
William Swank,	1850

Later a neat iron fence was built about the inclosure, and within it stands several weeping willows, the mountain winds whistling in common sympathy with their drooping leaves.

In Pennsylvania a miners' compensation bill has been written by a commission appointed for that purpose and it is expected that in the coming year something will be done to enact it into law. The corporations having a firm footing are a unit in favor of some such legislation. The smaller are doubtless not so favorable, but the act will pass nevertheless and the provision will make for safety, if not for efficiency. Unless the act is carefully worded and honestly applied it will result in increased malingering.

Relation of Industry to Well Being

There has been some complaint that the miners of today do not desire to earn more than a minimum wage, that an increase of pay is always offset by a decrease of effort. If the mining villages of the country are improved so that the inhabitants of these backwoods towns can enjoy a sort of semi-urban life, it is probable that the standard of living will rise continuously with the rate of wages. Sidewalks, places of public entertainment and churches will tend in that direction and some further stimulus to pride of appearance will be derived from the building of

A "self-rescue" apparatus has been recently placed on the English markets. It is intended to be kept below ground ready for use by miners threatened by fire or bad air. Incased in this apparatus the miner could live for at least one-half hour, which would allow him to make his escape to some ventilated part of the mine.

COAL AND COKE NEWS

WILKES-BARRE, PENN.

Trouble is expected at many collieries in the anthracite field after Feb. 1. On and after this date, miners in District No. 1 are supposed to refuse to be lowered into the mines if the engineer at the colliery is not a member of the miners' union.

The decision to enforce a rule of this sort was reached at a meeting of the grievance committee of the district, which was held at Plymouth. President John T. Dempsey was not present at the meeting, and he has made a statement in which he says that such action cannot be taken because it would be in direct violation of the working agreement between miners and operators.

Despite this the miners declare they will refuse to ride on any carriage which is operated by an engineer who is not a member of the miners union. Such a decree is virtually a strike order, for the refusal to ride on a mine carriage not operated by a member of the miners' union would mean that the operation would be forced into idleness.

Mine leaders are putting forth their best efforts to prevent the men from carrying out such a threat, but the spirit of the miners just now is that every man about the colliery must be forced into their union, and this desire for a closed shop is backed by an agitation that is hard to control.

Hoisting engineers in the anthracite region have other troubles aside from those relating to the union. The proposed mine code of the state, which has been drafted and is now receiving the consideration of the mine code commission, provides that an eight-hour day be given to only those engineers at collieries where more than 200 men are employed.

The engineers have taken up the battle against proposed legislation of this sort, and are advocating that instead of placing restrictive amendments on the state law, it should be altered so as to extend to all hoisting engineers, for there are many who, besides hoisting men, rock, or coal from one vein to another, have pumps and a fan to attend.

Appeals have been made to the members of the Mine Code Commission not to wipe out the eight-hour law for all engineers, which the last legislature placed on the statutes.

A Clean Place to Eat In

Officials of the Lehigh Valley Coal Co. have erected a mess house at the Prospect Colliery for the use of all outside men. Its value will be put to a thorough test, and if it is found to be of real benefit to the men, the system will be extended to every one of the Lehigh Valley collieries. Vice-President and General Manager F. M. Chase is deeply interested in the scheme, and is watching it carefully, believing that the mess house will fill a long-felt need of the men who are employed outside at the collieries.

The mess room provides a clean place for the men to eat their meals. Sufficient room is given for all men employed on the outside. It keeps them away from the dirt and dust of the breaker, gives them comfort from bad weather, and provides the means for a pleasant chat while the meal is being enjoyed.

The rooms will be so arranged that during their noon hour the men may read and smoke, discuss any topics they desire, and get a period of rest that will be beneficial to them for the afternoon's work.

Hot and cold running water is provided, and there are benches and tables for the use of all employees.

PENNSYLVANIA

Anthracite

Pottsville—An accident at the McTurk colliery at Girardville resulted in a mine car being hoisted over the sheave. It fell and landed in the engine house. It was several days before work was resumed.

Incendiaries set fire to the barn of the Reading company at the Otto colliery, Branchdale, Jan. 3. It is believed that the object was to handicap the operation of the mine.

Scranton—T. Ellsworth Davies, the mining engineer engaged by the county commissioners to ascertain and report to them the quantity of coal in Lackawanna County that should be subject to assessment, will make his report this week. Mr. Davies, among other things, has been asked to enlighten the commissioners as to the total squeezed area in the county that is now exempt from taxation. In his report, Mr. Davies will set forth that there is between $2,000,000 and $3,000,000 of coal in the county that is being freed from taxation under the name of squeezed and unminable coal. He contends that all of this coal is not only minable, but being mined; and that coal companies are now working in places that are reported as being squeeded and worthless. In his report he will explain his reasons for declaring this coal accessible, and further will advise that the assessment value be increased from $150 to $300 per foot-acre. At the last triennial assessment the county commissioners increased the assessed valuation of coal from $67.50 to $150 per foot-acre. Appeals were filed from this valuation, but later the coal companies accepted it.

Wilkes-Barre—The strike of Lehigh Valley Coal Co. employees at Yorktown has been amicably settled and work resumed. The strike was caused on account of the miners' claim that not enough cars were furnished them under existing conditions to allow them to make a living wage. Superintendent Davies held a conference with the men and decided to abandon the hoisting of coal in No. 1 slope at Yorktown, and hereafter all coal mined in this district will be run underground to the Jeanesville operations and prepared at the Jeanesville breaker. By this plan the men can get more cars, and No. 1 Yorktown slope will be used only for the lowering of timber and hoisting of rock.

The North End Coal Co., of Scranton, proposes to take an appeal from the decree in favor of the Delaware, Lackawanna & Western Coal Co., to the Supreme Court. By the decree of the local court, the North End company was directed to forfeit leases and contracts to two tracts in North Scranton, and to pay the plaintiff $46,528.59 damages for alleged mining of coal not conveyed in the lease.

Bituminous

Washington—Martin Williams, a fireman, lost his life Jan. 9 when a flywheel on a generator engine at the mines of the Clyde Coal Co., near Fredericktown, burst. The generator is a wreck and the engine room badly damaged.

Uniontown—While drawing coke from an oven at Orient Jan. 3 workmen were horrified to find the skeleton of a man. It is thought that the man may have been murdered and thrown into the oven.

WEST VIRGINIA

Charleston—Five hundred miners of the Four States Coal Co., at Dorothy, have struck. Several mines are tied up, and among them is one which has a contract to furnish 1000 tons of coal a day to the C. & O. R.R.

Rioting has again been resumed in the Paint Creek district. A coal train was shot up and the tipple of the Standard mine of the Supplint Coal Co. was set on fire.

ALABAMA

Birmingham—The semiannual examination will be held by the State Mining Board in the auditorium of the Chamber of Commerce, Jan. 21-24, according to a statement made recently by Chief Mine Inspector Nesbitt.

Newcastle, Ala.—The Pratt Consolidated Coal Co. will fire up the Milner Iron & R.R. Co.'s coke ovens at once, for the purpose of filling a 40,000-ton coke contract, which is to be delivered within the next six months. About 250 ovens will be placed in service, after a three years' idleness. This property has been recently acquired by the Pratt company. The contract is said to involve a sum of $250,000.

KENTUCKY

Louisville—The organization of the Du Pont Coal Co. with a capitalization of $6,000,000 is expected to take place not later than Feb. 1, when the Central Coal & Iron Co. interests will be merged, it is said, with 30 smaller coal-mining companies in western Kentucky. About 20 of these smaller companies already have signed articles binding them to participate in the merger, according to reports. They will receive besides bonds securing the entire value of their property turned over, 40 per cent. of this value, as agreed upon by both sides in new stock the proposed company will issue.

The new company is said to be planning to issue $3,000,000 of stock, of which it will own 60 per cent., and $3,000,000 of bonds. This merger is supposed to be only the preliminary to the forming of a larger merger later on.

Whiteside—A new variety of smokeless bituminous coal has recently been uncovered, according to a report from Whiteside, Ky., which is said to have been used in a test at Atlanta with entire satisfaction to the smoke inspectors, no smoke consumers having been used. The coal is mined by the New Etna Coal Co., and will be placed on the market as St. Anthony coal. The supply in sight is said to be abundant.

Madisonville—With Mine Foreman H. D. Mason and a crew of expert miners in charge, United States Bureau of Mines Safety Car No. 3 is at Madisonville, Ky., for a week's stay, demonstrating the most approved methods of handling coal and of preventing accidents in mines. From Madisonville the car will proceed to Earlington and other western Kentucky points.

OHIO

Pomeroy—The floods which raged on the Ohio River recently caused practically all of the mines in the Pomeroy Bend district in Ohio to close down. One mine was operated and that was a mine belonging to the Maynard Coal Co., which was a considerable distance back from the river. Considerable damage was done to property in that mining district.

East Liverpool—There is a well defined rumor circulating in Wellsville to the effect that the Pennsylvania R.R. Co. will soon extend the Powhatan branch of the C. & P. division to a point near Martinsville, W. Va., bridge the Ohio River and extend the line through undeveloped coal fields in West Virginia.

Columbus—The United States circuit court has decided that the merger of the Hocking Valley with the Toledo & Ohio Central and the Kanawha & Michigan R.R. and other coal companies is illegal and must be dissolved.

It is expected that the Ohio state legislature will pass a bill compelling operators of coal mines to pay their men on the run-of-mine basis. The operators of the state will oppose the law with every obstacle they can invent.

INDIANA

Terre Haute—The leaders of the Mine Workers of Indiana are canvassing the vote for district officials this week. The term of office will be for two years for the first time and will begin April 1. It is generally conceded that William Houston will be elected president and that Charles Fox will be reëlected secretary.

Evansville—A fire has been raging in the Elberfield coal mine since Dec. 27. The opening of the shaft has been covered with timber and dirt to smother the fire. It is feared that the loss will be heavy. The mine employs 85 men.

ILLINOIS

Greenfield—The large coaling station buildings of the Chicago & Alton R.R. were burned Jan. 3. The origin of the fire is not known. Loss $15,000.

Streator—On Dec. 31 B. E. Parcher filed an injunction in the circuit court of LaSalle County against the Harrison Coal Co., restraining them from obstructing the flow of a small creek which runs through his land, and thence to the Vermillion River, Parcher claims that the obstruction of this creek deprives him of his right of drainage.

MISSOURI

Joplin—Six hundred and fifty miners, employed in the five mines of the Wear Coal Co., went on strike, Jan. 4, because the officials of the company refused to discharge the superintendent and the pit boss of No. 19 mine, as the men demanded. Officials of the company refuse to make any statement, except that they expect the men to return to work in a few days.

WISCONSIN

Superior—Fire, starting in the operator's cage of unloading rig No. 1, at the Carnegie coal dock, caused a damage to the apparatus estimated at $75,000.

WASHINGTON

Spokane—An extensive deposit of commercial coal has been discovered within ten miles of the heart of Spokane. The discovery has been made on a number of farms while digging wells, the workmen having cut through beds running from 10 to 20 ft. in thickness. Local and eastern capitalists have placed $250,000 on deposit in the Spokane banks to develop the find, should the pending negotiations with the owners of the land prove successful.

PERSONALS

Dr. de Holl will be succeeded by Mr. Harry M. Urban, new chief civil engineer of the Tennessee Coal, Iron & R.R. Co.

P. J. Friel, of Mahanoy City, has been appointed state mine inspector in the Shamokin district, to fill the vacancy caused by the death of Martin McLaughlin.

Henry R. de Holl, of Birmingham, Ala., assistant superintendent of the byproduct coke-oven department of the Tennessee Coal, Iron & R.R. Co., has resigned his position, effective Jan. 10, 1913, to accept the position of superintendent of the byproduct coke-oven department of the Inland Steel Co., at Chicago, Ill.

Arthur L. Ware, well known in the Kentucky and Tennessee coal fields as an engineer and machinery agent, has accepted a position with the Roberts & Schaefer Co., Chicago, and will represent them in this territory. The Roberts & Schaefer Co., through Mr. Ware, solicit the patronage of any coal companies contemplating building new plants or remodeling existing equipment.

John J. McNulty, who has been inside foreman at the Barnum Colliery of the Erie, has been transferred to the Butler Slope section of the Butler Colliery, and George V. O'Hara, who has been inside foreman on the Butler Slope workings, will have charge of the Barnum. Mr. McNulty is just recovering from injuries received in a cave in the robbing section of the Barnum Colliery.

OBITUARY

William R. Brasher, aged 33, assistant state mine inspector of Kentucky, died recently at the Norton Infirmary, in Louisville, following a surgical operation for a tumor. Mr. Brasher was brought to Louisville from Earlington, Ky., for the operation. He was unmarried, and is survived by two sisters.

CONSTRUCTION NEWS

Duluth, Minn.—The Pittsburgh Coal Co. has let contracts for two structures at its Dock No. 5, which is being rebuilt at Allouez Bay. The cost will be about $300,000.

Oak Creek, Colo.—The Yampa Valley Coal Co. is installing a plant for the manufacture of eggettes or briquettes. The machinery is valued at $50,000 and has been imported from France. It is now being erected in Denver.

Millsboro, Penn.—W. H. Flint, of Pittsburgh, has purchased a tract of 49 acres facing Black Dog Hollow and ground has been broken for a new coal plant. A modern tipple and plant will be erected, and the mine equipped with electricity.

Birmingham, Ala.—The Tennessee Coal, Iron & R.R. Co. is repairing and overhauling its Oxmoor Furnace, and will put it into blast about Feb. 1, after being idle since the fall of 1907. With this one in blast, every available furnace of this company will be at work.

Morgantown, W. Va.—The new mines of the Crucible Coal Co., near Rice's Landing, will soon be completed and it is believed that many miners will be put to work within a short time. Robert Holliday has been appointed superintendent of the Crucible company's works.

Nelson, Ky.—The Nelson Creek Coal Co., at Nelson, Ky., announces that it will rebuild its coal tipple, which was recently destroyed by fire, this time avoiding the possibility of any such mischance by making the construction fireproof. The mine has a daily output of 600 tons.

Centralia, Penn.—The Estey Coal & Mining Co., capitalized at $750,000, has been organized with the intention of starting, as soon as possible, actual development work on 500 acres of coal land recently transferred to them. The new company is an organization of Portland and Los Angeles capital.

Connellsville, Penn.—The Bellevernon Coal & Coke Co. has bought the Somers No. 1 mine, and proposes to erect 40 coke ovens. Twenty are almost completed and the others will soon be ready. The company intends to dig pillar coal for the present, as most of the solid coal has already been mined

Birmingham, Ala.—With temporary tipples and top houses in place, where the structure was burned a few weeks ago by a fire that did considerable damage, work has been resumed at the Banner mines, in the western part of the county. Something like 600 tons of coal daily will be attempted at the start.

Martin's Ferry, Ohio—The work of setting poles for the new high-tension electric power lines from the plant at Brilliant to this city is progressing rapidly. Mines between these two points will be the first to be supplied with current. A 2200-volt generator is being installed in the plant and it is expected to be in operation in a short time.

Pittsburgh, Penn.—The Cheat Haven & Bruceton Ry. has begun the construction of 8 miles of track along the bank of the Cheat River, from a junction with the Baltimore & Ohio's line in Fayette County, to Ice's Ferry, W. Va. The new railroad is backed by the Kendall Lumber Co., which has 25,000 acres of coal and timber land in the Cheat River tract. Frank Cunningham is president and chief engineer of the new road.

Bellaire, Ohio—The George M. Jones Co. is planning to develop its recently acquired territory along the Ohio & Western R.R., west of Bellaire, on an extensive scale. It has been learned that the company is planning to open at least 3 additional shafts on their property within the next year. The Pennsylvania R.R. Co. is running broad-gage cars on a siding from Wegee to the first opening, which has already been started.

Birmingham, Ala.—The Pratt Consolidated Coal Co. has leased the Montgomery County, Ala., convicts for the year 1913, paying $17 per month each in addition to maintaining and caring for them. The company will work them in their Flat Top Mine, where they will replace the Jefferson County convicts, who will be worked on the county roads after April 1, 1913. The Montgomery County convicts have for the past few years been worked on the roads and in lumber and turpentine camps.

Nashville, Tenn.—It is announced at Nashville, Tenn., that the Tennessee, Kentucky & Northern R.R., formerly known as the Overton County R.R., extending a distance of 16 miles from Algood to Livingston, Tenn., is to build south about 20 miles to connect at Sparta, Tenn., with the Nashville, Chattanooga & St. Louis Ry., and northward about 40 miles to connect with the Kentucky & Tennessee Ry. at Rock Creek, Ky., giving a short through route between Cincinnati, Nashville and Birmingham, and rendering accessible an immensely rich coal and timber section now untouched by railroads.

Knoxville, Iowa—More than $500,000 has been spent on the plant of the Indiana Consolidated Coal Co., in Dallas Township. It is estimated that the completed plant will cost little short of three-quarters of a million dollars. The shaft at the Indiana works is 200 ft. deep and has a concrete lining built around a framework of structural steel from top to bottom.

The Indiana company has 1500 acres of coal land surrounding the shaft and controls 5000 additional acres. The output of the mine will be 2000 tons a day. It is expected that everything will be ready to commence operation by Jan. 20.

NEW INCORPORATIONS

Henryetta, Okla.—The Deep Fork Coal Co.; capital stock, $10,000.

Great Falls, Mont.—The Tiger Butte Coal Co.; capital stock, $50,000.

Bonanza, Ark.—The Woodson Strickland Coal Co.; capital stock, $5000; to deal in coal.

Mount Vernon, Ill.—The King City Coal & Mining Co.; capital stock, $35,000; general mining business.

Charleston, W. Va.—The Hughes Creek Coal Co.; to increase its capital stock from $75,000 to $125,000.

Montgomery, Ala.—The Red Eagle Coal Co.; capital stock, $50,000. Home offices at Blockton, Bibb County.

Dawson, N. M.—The Vermeo Coal & Coke Co.; to change its name to the Dawson Fuel Sales Co.

Williamsburg, Ky.—The Mammoth Blue Gem Coal Co.; to increase its capital stock from $10,000 to $25,000.

Dover, Del.—The Electric Coal Co.; capital stock, $100,000; to buy, sell and deal in coal and all like products.

Toledo, Ohio—The France Coal Co.; capital stock, $10,000, to mine and deal in coal and other mineral products.

Buckhannon, W. Va.—The Welsh Colony R.R. Co.; capital stock, $5000; to own, improve and operate a railroad.

Charleston, W. Va.—The Cheat River Hydro-Electric Co. has changed its name to the Great River Hydro-Electric Co.

Wheeling, W. Va.—The California Erie Co.; capital stock, $5000; to acquire mines and mining rights, develop lands, etc.

St. Louis, Mo.—The Briquette Coal Mfg. Co.; capital stock, $100,000; to manufacture briquettes, to own and operate coal mines.

Connellsville, Penn.—The West Penn & Shenango Coal Co.; capital stock, $1,000,000; to develop western Pennsylvania tracts.

Albia, Iowa—The Monarch Coal Mining Co.; capital stock, $100,000. Incorporators, J. W. Gilschrist, B. A. Harris, H. A. Harris.

Toledo, Ohio—The France Coal Co.; $10,000. Charles L. France, H. E. Fayne, Lee J. Bronneman, G. H. France, Walter H. Jeffery.

Altoona, Penn.—Application will be made Jan. 28, 1913, by Anthony W. Smith, Alfred C. Steward and Luther E. Lewis, Richland Coal & Mining Co.

Connellsville, Penn.—Application will be made, Jan. 24, for a charter for the Connellsville Coal Co.; to mine coal, manufacture coke and sell both.

Columbus, Ohio—The Taylor-Williams Coal Co.; capital stock, $25,000. Incorporators, . W. Moore, S. E. Ranney, J. M. Taylor, E. E. Learned, W. B. Runyan.

New York, N. Y.—Buffalo Creek Coal & Brick Co.; capital stock, $250,000. Incorporators: C. A. Smith, R. D. McDonald, Pittsburgh, Penn.; C. E. Meyer, Ingram, Penn.

Connellsville, Penn.—The Consolidated Coal Co., of Baltimore, the Somerset Coal Co. and the Fairmont Coal Co. consolidate; capital stock, $31,750,000. Combined output, 10,000,000 tons a year.

Viola, Ill.—The McCraney Coal Mining Co.; to change its name to the McCraney Sand & Gravel Co., and to increase its capital stock from $10,000 to $25,000; principal office changed from Viola to Milan.

Roanoke, Va.—Hazard Coal Land Co.; capital stock, $100,000; minimum, $10,000. W. L. Brown, president, Bristol; J. B. Fishburn, vice-president, Roanoke; D. D. Hill, Jr., secretary and treasurer, Roanoke, Va.

Belington, W. Va.—The National Consolidated Coal Co.; capital stock, $2,000,000; to operate several new mines in West Virginia. A plan has also been announced to consolidate the leading southern coal companies under the name of the Consolidated Coal Co.; capital stock, $12,000,000.

Johnson City, Tenn.—A company, to be known as the Carter Coal Corporation, with a capital stock of $10,000,000, and with general offices at Johnson City, Tenn., has been organized by George L. Carter, of that place, for the purpose of developing his extensive coal holdings in Tennessee, Kentucky, Virginia and West Virginia. Mr. Carter is president of the company, J. C. Stone is vice-president, and T. F. Davis, secretary and treasurer. Most of the properties to be developed are along the Carolina, Clinchfield & Ohio and its proposed extensions to Elkhorn, Ky. The company proposes the immediate opening of mines in nine counties, with the most modern equipment. The aim of the promoters is to produce coal for the Panama Canal trade.

INDUSTRIAL NEWS

Brownsville, Tenn.—F. S. Chalfant and F. P. Stewart have bought 475 acres of coal in Luzerne Township at $55 an acre. Works will be built to employ 300 men.

Connellsville, Penn.—The Enterprise Realty Co. has sold 604 acres of coal land in Deep Valley, Springhill Township, to Fayette County parties at $100 an acre.

Frankfort, Ky.—According to the report of State Geologist J. B. Hoenig, a practically virgin coal field of fine proportions is on the eve of development along the upper Licking River.

Springfield, Ill.—The proposed merger of the coal interests of the Springfield district has been dropped for the present. Prices are considered too high for the earning powers of the plants.

Connellsville, Penn.—The outflow of Connellsville coke has awakened the upper Connellsville region into unwonted ac-

tivity. The region, in its complete collective sense, is now running full blast.

Washington, Penn.—A deal for the sale of 2500 acres of coal has just been negotiated by a syndicate of Pittsburgh men, for immediate development. The consideration exceeds one-half million dollars.

Massillon, Ohio—Valley Camp Coal Co. has purchased from the Akron Coal Co. the Columbia mine at this place. The mine will be operated as heretofore, but will be known as Valley Camp Coal Co., Columbia mine.

McDonald, Penn.—McDonald Coal Co. has bought a farm of 100 acres near Thomas Station on the Baltimore & Ohio R.R., which is underlaid with a 6-ft. bed of Pittsburgh coal. It is likely that mining operations will be begun in the spring.

Uniontown, Penn.—It is reported that J. O. Clark sold 400 acres of coal land in Braxton County, W. Va., Jan. 2, to Edward Prickell, of Pittsburgh. The consideration was $40 an acre. Clark purchased the acreage 6 years ago for $10 an acre.

Altoona, Penn.—The Bland-Cambria Coal Co., a newly organized concern, has taken over the Black coal field at Dougherty's Mines, at the terminal of the Altoona-Northern R.R., for the purpose of developing it. William H. Byers, of New York, is at the head.

Elkins, W. Va.—The Elkins mines are running as full as the scarcity of cars and men will permit. It has been officially stated that 200 men could be used up the creek, and that, while the car shortage is not so serious as during the past few weeks there is still a scarcity.

Ogden, Utah—The Lion Coal Co. has completed the connecting line between its mines and the Union Pacific R.R. The mines are located within 4 miles of Rock Springs, Wyo., and are said to embrace 600 acres of the best coal land in the district. The company has begun to ship its product.

Springfield, Ill.—It is stated that the New York Central road has purchased a tract of 30,000 acres of coal land in Montgomery County. This land will not be developed at once, but will be held in reserve for future locomotive necessities. The land is located along the line of the Big Four.

Connellsville, Penn.—L. F. Ruth is recently reported to have closed a deal for 800 acres of Greene County Coal land, which gives him nearly 2000 acres of coking coal along Dunkard Creek. The tendency toward developing Greene County coking coal is becoming more and more pronounced.

Harlan, Ky.—The Harlan Coal Mining Co. is reported to have sold to the Clover Fork Coal Co. a tract of 500 acres of land immediately adjoining the latter's tract at Kitt's. The entire consideration is said to be between $40,000 and $50,000, and to represent a good advance in the value of the land.

Wheeling, W. Va.—The miners at the Virginia Hill mine, at Lafferty, resumed work, Jan. 6, after an idleness of two weeks. It is stated that the operators notified the men that they would have to return to work or vacate the company houses. Upon the advice of their officials they returned to work.

Edmonton, Alta.—Official announcement has been made that Dr. R. Hoppe, of San Francisco, has acquired 28,160 acres of coal land in western Alberta, between Grand Prairie and the main line of the Grand Trunk Pacific R.R. Steps will be taken shortly to open the property for commercial purposes.

Fairmont, W. Va.—It is understood that a coal deal between M. A. Jolliffe and the Little Kanawha Syndicate was completed Jan. 4. As a result the holdings, recently secured by Mr. Joliffe, underlying some 1300 acres of land near Downs Station, have been transferred to the syndicate. It is understood also that the sum involved was close to $125,000.

Sharon, Penn.—The first consignment of coke arrived at the Fannie Furnace, Dec. 27, and the plant will be ready to resume operations in a short time. Officials stated that the furnace was to have been blown in Jan. 4. All the machinery has been overhauled and the plant is in first-class condition, of the Steel Corporation.

Fernie, B. C.—A snowslide has placed a damper upon operations in the Fernie, B. C., coal district. Such an occurrence is very unusual, the weather ordinarily being cold enough to prevent such a catastrophe. However, six lives were lost and seven others were fatally injured while working in the Coal Creek mines of the Crows Nest Coal Co.

Uniontown, Penn.—The Whyel Coal Co., which operates in the Yukon district, Westmoreland County, has added over 100 acres to its holdings. The latest purchase includes 3 tracts and involves a sum of $35,000.

The mines in the Sewickley field are running full time and the extensive development has given the section the title of the "million-dollar coalfield."

Martins Ferry, Ohio—Deputy Mine Inspector L. D. Devore has closed the Rush Run mine No. 3, of the Glenn's Run Mining Co., at Rush Run. Mr. Devore says he has discovered that the mining law was being violated in a number of places. The mine will remain closed until the company has complied with the law in regard to timbering and refuge holes on the main passageway.

Buffalo, N. Y.—The Sterling Coal Co., of Toronto, Ont., has bought out the Conger Coal Co., of that city, and will reorganize under the name of the Conger-Lehigh Coal Co., with R. E. Gibson, of the Conger company, president, and A. R. Gibson, acting manager. The agency of the Lehigh Valley Coal Co. will be continued and a large amount of bituminous will also be handled as before.

St. Louis, Mo.—The Santa Fé R.R. has purchased extensive coal-mining properties at Lehigh, Okla., from the Missouri Pacific R.R. Co. The property consists of more than 10,000 acres of the most productive coal land in Oklahoma. Mines now being worked are producing over 2000 tons a day. The Santa Fé management intends to open two additional shafts and increase the output to about 4000 tons a day.

Clarksburg, W. Va.—It is understood that the Righter Coal Co. has bought 136 acres of Pittsburgh coal and 86 acres of Red Stone coal along the West Virginia & Pittsburgh division of the Baltimore & Ohio R.R., 1½ miles south of Lost Creek. Grading for the sidetrack and switch is about completed, and the company expects to be shipping coal within a short time. The property will be operated on the royalty plan.

Charleston, W. Va.—The Kanawha Coal Operators' Association has addressed a letter to the Interstate Commerce Commission complaining about the treatment accorded the Kanawha coal operators by the New York Central, the Chesapeake & Ohio and the Hocking Valley Rys. It is complained that the independent operators along the Kanawha & Michigan cannot fill half their orders because they are not given cars.

Missoula, Mont.—Butler Creek Coal Co., of Missoula, Mont., has discovered a large deposit of lignite coal on their property. County Clerk F. W. Kuphal, head of the company, states that the find was made after a tunnel of 30 ft. had been dug, and the discovery leads the stockholders of the company to believe there is coal on every acre of the 1920 which they hold under lease. They expect to have the product on the market before spring.

Weleetka, Okla.—The Monitor Oil Co. is reported to have struck a 4-ft. seam of fine coal while drilling for oil at a point 3 miles northeast of here. The coal was struck at a depth of 419 ft. and is of superior quality, with a good roof and no water to contend with.

Probabilities are that arrangements will be made to mine it at once. The new find was made on the Lake Moore property, close to the railroad track.

Grand Forks, N. D.—A big effort is being made to put lignite coal on the market in such a form that it will be convenient for handling. The Northern Briquetting Co., of Minot, will at once erect a large factory for pressing lignite coal into small briquettes.

Heretofore companies have been organized with too little capital, but it is expected that the new company will be able to make an exhaustive test of the marketable qualities of the coal.

Cape Breton, N. S.—The Dominion Coal Co. has commenced to pump out the workings of the Old Victoria mine, which was closed down in 1897. The colliery produced 100,000 tons in that year, and it is expected to obtain an output as soon as the workings are unwatered. The unworked area of this colliery is chiefly submarine. The coal seam is 7 ft. thick, inclined at an angle varying from 20 to 30 degrees.

The same company also intends to open up the Emery seam at their No. 3 Colliery. The upper seam is exhausted, and the existing plant will be utilized to mine the lower seam, which is between 4½ ft. and 5 ft. in thickness. The long-wall method will be used.

Wheeling, W. Va.—It has recently become known that the Number Eight Coal Co. has purchased the old Wabash Coal Co.'s mine, north of Dillonvale. The mine has changed hands 3 or 4 times during the past 5 or 6 years, and it is stated that it has never been profitably operated. The deal includes several hundred acres of good coal, miners' homes and other physical property. The price paid has not been made public.

For several years past the Number Eight Coal Co. has been buying up coal properties in eastern Ohio. During the past year it has acquired a number of good mines and valuable coal lands in Belmont County.

COAL TRADE REVIEWS

GENERAL REVIEW

The hard-coal situation is becoming steadily easier, due to the slightly better receipts and to a lessened demand from consumers. Because of the absence of more seasonable weather, all householders have saved from one to two tons so far this season, and the combined aggregate of these small lots makes an enormous tonnage.

The future of the anthracite trade holds out excellent possibilities; in fact, it never looked better. There is just a sufficient shortness in supply to stimulate the market to a normal, or possibly a little more than normal, activity. This also keeps the buyers a little anxious and on the lookout for tonnages, which is an essential feature of a good market.

Detention in the Eastern coastwise bituminous trade is less severe, and shippers are able to promise fairly prompt loading; as a consequence, there are more sales and for larger tonnages. The demand is somewhat stronger for spot shipments on the better grades, as a result of which quotations are up slightly; consumers of these are still being compelled to fill out their requirements with the off grades. The milder weather has also relieved the car situation, and there are few complaints about slow movement.

Nearly all the river mines in the Pittsburgh district have been closed by the high water, which has also interfered with railroad operations and caused a local shortage of equipment for loading. Minimum contract prices are being well maintained and quotations on slack are firmly established at a level well over contract figures. The holidays and floods have both interfered with production to such an extent that it is difficult to form a reliable opinion on the soft-coal situation, but it seems reasonable to believe that stocks are rather low and the market consequently on a firm basis.

In spite of the unfavorable weather conditions in Ohio the trade has been fairly strong and the movement good, the unseasonable weather has had a tendency to soften the domestic grades, but the steam sizes are in heavy demand, and the consumers are attempting to obtain surpluses. The same condition as regards domestic sizes applies also to the Southern markets, where some claims are being advanced that the winter is already over. The steam market, however, is strong in every department with the railroads taking their maximum tonnage on contracts and even confiscating consignments.

The Middlewestern market is uncertain and spotty. Some appearance of real winter weather had a tendency to tighten the situation up, but increased shipments has prevented a rise in prices. The best feature in the market is the steam grades, which are relatively firm and in big demand. A heavy snowstorm in the Rocky Mountain region, with accompanying landslides and delays in transportation, has created an active demand, but prices are unchanged.

BOSTON, MASS

Pocahontas and New River, for spot shipment, are up in price from a week ago; the demand is stronger in all directions, and loading conditions at Baltimore are rather worse than heretofore. There are also more sales and for larger tonnages, as a few of the agencies are working out of the vessel detention at Hampton Roads and are in position to promise fairly prompt loading. By far the most of the clearances are still on contract, however, and it will be a long time before all the shippers have caught up on season obligations. Prices for distribution inland are on about the level that ruled last month and there is only a scattering market at the higher quotations. The shortage of Georges Creek is the most notable feature of late and several of the large corporations that ordinarily depend on that source of supply are still being compelled to buy Pennsylvania grades to keep them going, supplemented by what spot shipments can be had from Hampton roads.

The market for ordinary grades at New York has sagged a little in response to the renewed offering of Pocahontas and New River, but there are only small quantities available and the speculative business is largely confined to shippers who have sizeable contracts on which coal can be used before charges accrue.

All-rail movement has been seriously affected, not only by an increasing shortage of cars but lately by floods in southern Pennsylvania and in West Virginia. Several important groups of operations have been put out of commission and that, together with the two or three days of cold weather served to give impetus to the demand for spot coal at the transfer points; $1.75@1.95 is the market for this delivery. There is more inquiry for transportation and several charters have been made at 80c., Norfolk to Boston.

Anthracite conditions here are somewhat easier. Dealers are in better shape in the larger cities, due partly to slightly better receipts but chiefly to a slackened demand from the consumer. The New York companies are sending a better volume of coal, but all the difficulties and restrictions as to sizes and kinds still prevail. Pea has joined stove as a size that is very hard to get. The call for premium anthracite fluctuates with the weather. With the absence of any prolonged cold this market would probably squeeze by without any great distress.

Current wholesale quotations are as follows:

Pocahontas, New River, f.o.b. Hampton Roads	$3 50@$3.60
Pocahontas, New River, on cars, Providence	4.50@ 4.75
Pocahontas, New River, on cars Boston	4 53@ 4.75
Clearfields, f.o.b. mine	1 65@ 1.90
Clearfields, en route, f.o.b. mine basis	1 75@ 2.00
Clearfields, f.o.b. Philadelphia	2.95@ 3.25
Clearfields, f.o.b. New York	3.25@ 3.50
Anthracite, delivered alongside Boston	7.25@ 7.40

NEW YORK

Bituminous—The soft-coal market is practically unchanged and still continues at the relatively high level of last week. There was a slight appearance of a tendency to ease off early in the week, but this was only temporary and was immediately succeeded by a resumption of the previous hard conditions. Now that the operations in the mining regions have once again got under way, after the holiday suspension, there appears to be a little more coal offering at the mines. This is not, however, having any effect on the local situation, as the demand remains strong, and there has been considerable pressure for coal at South Amboy.

As most of the fuel contracts expire Apr. 1, there is some activity in contracting at the present time. Operators are showing a determination to procure higher prices for the next year, and are holding firmly for advances of from 10c. to 25c. over the prevailing figures. In this connection it might be stated that the selling agencies are to be complimented in the fair and equitable manner by which they have dealt with their contract customers during the past year. In spite of the relative high price level prevailing through the last few months of the year, by which the companies might have added materially to their profits by disregarding their contract obligations and entering the spot market, they have in most instances adhered rigidly to these obligations.

Both the anthracite and bituminous prices continue firm at the following relatively high level:

	Anthracite		Bitiminous	
	Circular	Individual		
Broken*	$5 00	$5.00@5 10	West Virginia, steam	$3 25@3.35
Chestnut†	5 50	6 00@6 15	Fair grades, Penna.	3 25@3 35
Pea*	2 75	3 75@4 35	Good grade, Penna...	3 35@3 50
Buckwheat**	2 75	2 75@2 80	Best miller, Penna...	3 40@3 50
Buckwheat†	2 50	2 40@2 50	Georges Creek	3.50
Rice**	2 25	2 25@2 30		
Rice†	1 95	1 85@1 95		
Barley†	1 75	1 25@1 50		

* Scranton and Lehigh. ** Scranton. † Lehigh and Schuylkill.

Anthracite—Mining operations in the anthracite fields were seriously curtailed over the holiday period, and since that time by celebrations among the foreign element, coal can only now be said to have resumed in full blast. The effects of this, however, have not made any material change in the local situation, which still continues hard, and is the source of considerable anxiety, although not by any means as acute as was the case a month or two ago. In fact, the present anxiety is confined more to dealers who are loaded up with high-priced speculative coal, which they are now beginning to fear they will not be able to dispose of at a profitable figure.

Pea, stove and chestnut are in short supply and heavy demand, and are the leading features in the hard-coal market. Nut is still about normal, with egg quite plentiful and broken a trifle short. The weather still continues to be the

controlling feature in the market and pending no change in this respect a break in hard coal can hardly be looked for before March.

PHILADELPHIA, PENN.

The unusually open weather conditions that have prevailed in this vicinity, with only an occasional touch of real winter, has done more to relieve the situation as far as supplies of coal are concerned, than any other factor. It is safe to say that anywhere from one to two tons of coal have been saved each householder, and this explains why, notwithstanding the unusual demand for coal, everyone seems to be able to get a supply within a fairly reasonable time.

It has been the case, generally, all through the season that when it was absolutely necessary to have fuel, orders were filled, not promptly by any means, but without any unusual delay, except for certain sizes; the supplies received by the dealers have just enabled them to cover to this demand. A heavy snow storm or the cessation of traffic on any of the railroads centering in this city, would have soon shown to what extent this locality was in danger of discomfort or possibly a famine, as regards supplies.

There has been but one fall of snow thus far, which interfered little with deliveries, but a heavy storm, coupled with any freezing weather, is likely to bring about the condition, which the dealers have been anticipating the entire season. Supplies of stove, chestnut and pea, do not seem to be improving. Local offices of the large operators, and the individuals as well, are still besiged by the dealers, urging completion or partial fulfillment of their orders The future of the anthracite business has never looked so bright at the beginning of a new year as it does at the present time, and the dealers would consider conditions perfect, if they could only keep up to within a reasonable distance of their orders. Egg is getting to an easy stage, and is now used as a substitute for the other sizes. Shipments of the latter are contingent upon orders for the former, and even the first intimations of cutting prices on this size have been heard. One large individual operator, who ships largely to this market, indicated that their orders for egg coal were all completed, and this spells concessions, if the current production cannot be handled.

PITTSBURGH, PENN.

Bituminous—Production of coal continues to be interfered with. High water last week closed nearly all the river mines, and these are not yet again running. It also interfered with railroad operations and produced a fresh car shortage. While the weather has not been conducive to a heavy demand for domestic coal, production on the whole has been more interfered with, resulting in prices for prompt coal being established at a level measurably above the minimum contract prices. Slack has commanded a slight premium for some time, and in the past few days this has been quite heavy, small lots for spot shipment bringing $1.50, or 60c. above the contract price. Mine-run and screened coal are regularly quotable at 20c. to 30c. above circular prices, making mine-run $1.50@1.60. The anomaly of slack bringing as much as mine-run in some instances is explained by the fact of stoker-using consumers being caught short and requiring the slack. The regular minimum contract prices are being well maintained, and on contracts for six months' premium of 5c. to 10c. have been obtained in several instances in the past week. The regular minimum contract prices remain as follows: Slack, 90c.; nut, $1.05; nut and slack, $1.25; mine-run, $1.30; ¾-in., $1.40; 1¼-in., $1.55 per ton at mine, Pittsburgh district.

The undertone of the market is strong and operators express more confidence in the future, from the standpoint of financial results, than they have for two years or more. Demand is expected to be good throughout the year, and a heavy demand in the lake trade is regarded as assured.

Connellsville Coke—The coke market is rather dull and lifeless, and in sharp contrast with some of the predictions which were made of a special shortage. At various times since the beginning of the holidays $4 has been shaded on prompt furnace coke, the market occasionally dropping to $3.80 for a day or two. In the past few days there has been a slight stiffening, and $4 is regarded as the minimum, but there is little demand at this figure. Demand has also been light as to contract furnace coke, some furnaces which were inquiring having apparently lost interest. In the case of idle merchant furnaces, the definite statement is now made that nothing will be done unless coke can be had at lower figures, or pig iron advances. Genuine foundry coke continues scarce. Much furnace coke is being shipped on contract, and there is little, if any, really standard foundry coke available for prompt shipment. There may be 72-hour coke available, but it is likely to run high in sulphur, and as to shipment in box cars this condition is extremely difficult to meet. We quote: Prompt furnace, $4; contract furnace (nominal), first half, $3.25@3.50; year, $3@3.25; prompt foundry, $4.25@4.50; contract foundry, $3.25@3.75.

BALTIMORE, MD.

Toward the latter part of the week, the market eased off slightly due to the exceptionally unseasonable weather conditions which have prevailed. Prices, however, did not undergo much change because of the fact that there was a shortage of the coal, due to the fact that hundreds of miners did not resume work during the previous week.

One of the features of the week was the spot-line business, the demand being much greater than at tide, with slightly better prices. At the beginning of the week the $2 quotation for the low grades was well maintained, but toward the close consumers purchased in any quantity at prices ranging from $1.80 to $1.90.

The weather which has prevailed in Baltimore all through the second week of the new year, was more like summer than winter. Such conditions, however, were conducive to favorable train movements, and there was no complaint at all about slow deliveries. The car situation is far better than some weeks ago, and many of the roads are ordering additional equipment to take care of increasing business. The Baltimore & Ohio is now negotiating for 1000 additional cars.

It is stated that there was a marked falling off in the demand for anthracite, but dealers say that a cold spell will revive their business.

BUFFALO, N. Y.

The bituminous market is active and all members of the trade look for an advance in prices soon, unless the production can be increased materially. It is hard to say at present just how production and consumption will line up eventually as conditions have been so abnormal lately. The holidays cut down both, and then mining was brought to a standstill by the floods. The car shortage is still present and promises to continue, in spite of the fact that it has let up in most other branches.

Some of the jobbers are already asking an advance of 10c. to new customers and this will be general soon if present conditions hold. There is no surplus coal anywhere. In fact, the stringency in bituminous is now greater than it is in anthracite, some sections being at times in fear of an actual famine.

The lack of motive power is accountable for the shortage as much as anything. Some of the towns across the Niagara in Canada are blocked; the Toronto, Hamilton & Buffalo R.R. has for several days refused to take at Welland any coal, except fuel, for the Canadian Pacific, and other roads have since followed. Again the roads themselves have no fuel supply ahead and shippers never know where their consignments will go.

There is a heavy call this way for low-volatile coal for office-building fuel and this is made all the more active by the anti-smoke agitation, which is doing what it can to shut off coal smoke. Mayor Fuhrman, of Buffalo, in a message to the city council recommended that all the railroads entering the city be forced to electrify their passenger terminals. It would be hard, though, to cut off this class of smoke without making the abolition general.

The promise of winter weather lately added firmness to all coal prices, but that has now passed off and the rainy conditions have returned. For about the first time the coal trade is fairly welcoming mild weather. This was true of the anthracite trade only, but it is now extending to bituminous also, on account of the slow running of the railroads.

Bituminous quotations for the week were $3 for Pittsburgh lump, $2.85 for three-quarter, $2.75 for mine-run and $2.50 for slack with a strong upward tendency. Allegheny Valley prices continue about 25c. lower than Pittsburgh. Coke is active and fairly strong at $6.25 for best Connellsville foundry.

The demand for anthracite is strong, with only egg at all easy. The price of independent, for the stove sizes is from $1 to $1.25 over circular, which is the best gage of that market at present.

COLUMBUS, OHIO

There are reports of some of the larger steam users attempting to accumulate a surplus to guard against an emergency, especially an acute car shortage or congestion. But their efforts have not been very strong and surpluses are the exception instead of the rule. Dealers stocks are said to be rather light for the season of the year and lower temperatures are expected to bring about a rush of orders for immediate shipment. The Chicago market is fairly strong

which aids in maintaining quotations in the Buckeye state.

The steam trade is by far the strongest point in the market. The requirements of the larger manufacturing plants are heavy and railroads are also taking a larger tonnage to move a good freight business. There is no indication of a let-up in industrial activity and as a result steam contracts are good; renewal of contracts, which expire at this time, are being made on a slightly higher basis as a rule. At least the reign of exceedingly cheap fuel contracts on the part of the railroads is a thing of the past.

One of the best features of the trade is the good demand for the small sizes. Nut, pea and slack and coarse slack are all strong in every mining district of the state and spot orders are taken at a high figure. The supply of that sort of coal appears to be limited.

Retailers are having some difficulty in making deliveries because of the slippery condition of the streets. Retail prices are firm at the levels which have prevailed for some time.

	Hocking	Pittsburgh	Pomeroy	Kanawha
Domestic lump	$2.00	.....	$2.25	$2.00
¾-inch	1 80	$1.70	2 00	1 70
Nut	1 50	.	2.00	.....
Nut, pea and slack	1 20	...	1 25	1 20
Mine-run	1 40	1.25	1 35	1.40
Coarse slack	1 00	1.15	1.10	1.00

CLEVELAND, OHIO

With the comparatively mild weather prevailing, no particular change in the market has resulted. Producers report a slight curtailment in domestic shipments, but this condition will have little effect on the market.

Present wholesale quotations are as follows per short ton f.o.b. mines:

District	Freight Rate	¾-in.	Mine Run	Slack
Youghiogheny	$1.00	$1.35	$1.25	$1.10
Pittsburgh No. 8	0.90	1.20	1.10	1 20
Goshen No. 6	0.70	1.45	1.35	1.20
Coshocton	0 70	1.75	1.50	1.30

Pocahontas coal is quite scarce. Lump and egg is quoted at $2.50; run-of-mine, $1.35, and slack, 90c. f.o.b. mines; $2.50 is quoted on Massillon 1¼-in. lump at the mines. Foundry coke is selling at $4.50 and furnace at $4 f.o.b. ovens.

While the car supply has been less stringent since the holidays, railroads continue to use every possible means to expedite the movement of their equipment. They are also impressing upon shippers the necessity of loading all cars to the fullest possible extent.

The pressing demand for steam coal coupled with the curtailed production due to high water in the vicinity of Pittsburgh and Wheeling will undoubtedly keep the market firm for some time.

BIRMINGHAM, ALA.

The temperature has been high for this season of the year, and some claim that the winter is already over and that spring will be with us within six weeks. Although prices are still firm, both the domestic and steam situation is just a bit easier. To many of the mines this situation is a great relief. There is ample business for all as the railroads are taking maximum tonnages on contracts placed in this district, and in some instances they were compelled to confiscate coal just after the holidays. This was especially true of railroad lines not touching the coal fields.

The coke market remains strong in all its departments. The iron melt in the South is breaking all previous high records and this has reflected directly in the foundry coke trade.

LOUISVILLE, KY.

There has been a substantial slump in the local market—not so much in prices, although they have naturally fallen off, as in demand. Many operators, in consequence, are simply not offering coal, rather than be compelled to take summer prices or thereabouts for their product.

This situation is largely due to the fact that the holiday lay-off permitted the accumulation of a large supply of cars. Even the largest operators have, therefore, been able to load out their entire capacity for the past week or ten days, with the result that buyers have all the coal they want, and are largely out of the market. The average industrial concern has no storage capacity to speak of, and consequently gets along on a more or less hand-to-mouth basis, taking only enough coal to answer its immediate requirements when there is a plentiful supply, and staggering along on the verge of famine when there is any shortage whatever.

Owing to the conditions noted, prices are extremely uncertain, and cover a wide range between one sale and another. Block is selling f.o.b. mines in eastern Kentucky at $2@2.25, and it is hard to say just what other domestic grades should bring at this time. Mine-run ranges between $1.10@1.25, and nut and slack has been sold as low as 60c., and on up to 80@85c. Western Kentucky prices on the steam grades are ruling as high or higher than those in eastern Kentucky, which is unusual. There is an abundance of river coal available, as has been the case all winter.

MEMPHIS, TENN.

The conditions here have changed little during the past three to four weeks, and there is a light demand on all grades of coal throughout the entire section. While there is no surplus to speak of, the prices have gradually gone lower from time to time, and now that the car situation is improving, it looks as though there will be a weak market for the balance of the season, unless weather conditions make the demand heavier and shipping conditions worse. Prices on west Kentucky coal are practically unchanged. East Tennessee-Kentucky coals have held fairly well, inasmuch as there were light stocks of this grade throughout the territory. These are now selling in the Jellico district at $2.50@2.75; Straight Creek and Holland Field, $2@2.25; Illinois 6-in. lump and egg, $1.40 per ton f.o.b. mines.

INDIANAPOLIS, IND.

Conditions have changed little within the week. Although the weather man has been predicting cold waves, none have arrived, but one is again said to be immediately ahead of us. Prices hold steady at the recent slight declines. The weather is giving retail dealers a chance to stock up as consumption has been light under moderate temperature. The car situation is, on the whole, satisfactory, and operators are not complaining. While the domestic consumption has been below the average at this season, the demand for steam grades is good. The movement of coal from the East shows some falling off. Mines are not working full time, but are averaging well.

The following represents closely the Indiana mine prices, Indianapolis prices being 50c. higher, to cover freight:

No. 4 mine-run	$1.10	Domestic lump 5- and 6-in.	$1 65
Nos. 5 and 6 mine-run	1.00	Screenings, No. 4	0.70
No. 4 steam lump, 1½-in.	1.25	Screenings No. 5 and 6	0 60
Nut, No. 4	1.30	Washed coal, Nos. 1 & 2	$1.75@2.00
Egg	1.40	Brazil block	2.20
Domestic lump 2½-in.	1.50		

DETROIT, MICH.

Bituminous—A few weeks of most discouraging weather created a congestion of both steam and domestic fuel, and caused a decided weakness in the coal market but operators are now highly elated because of the change.

There has been no improvement in the domestic trade for the past week which is attributed to the mild weather; dealers seem to be stocked to their utmost. The steam trade seems to be a little stronger and some of the large manufacturers are making inquiries as to closing of contracts.

The prevailing prices for today are as follows:

	W. Va. Splint	Gas	Hocking	Pitts. No. 8	Jackson Hill	Pocahontas
Domestic lump	$1 60	.....	$1.70	.....	$2.40	$2 50
Egg	1.60	.....	.....	.....	2.40	2.50
Nut	1.40	.....	1 60	.....	.....	.....
¾-lump	1.30	$1.30	.....	$1.30	.....	.....
Mine-run	1.15	1 15	1 20	1.20	.....	1.40
Slack	1.10	1.00	1 00	1.00	.....	1.15

CHICAGO

Anthracite coal is strong, with some premium prices being paid where dealers are running short and must have coal. All grades of steam coal, with the exception of screenings, are firm. The price of fine coal has been boosted about 10c. a ton. A drop of about 25c. a ton has been noted in prices for coke.

Prices for Hocking coal cover a wide range. Some is selling on track at $1.50, and $1.75 is being obtained for consignments in transit. There is a strong spot market for smokeless, prices ranging from $1.50 to $1.75 for mine-run. Lump and egg is quoted at from $2 to $2.25 at the mines. There are a variety of prices for splint coal. The better prepared grade is sold for delivery in the country in box cars at prices ranging from $2.10 to $2.20 at the mines. Other coal in open cars is being sold in transit at $1.75.

Prevailing prices at Chicago are:

	Sullivan Co.	Springfield	Clinton	W. Va.
4-in. lump	$2 62	.....	.....	.....
Domestic lump	.....	$2.32	$2.27	.....
Egg	2 52	.....	.....	$4 05 @ 4 30
Steam lump	2 07 @ 2 17	2 12	2.17	.....
Mine-run	.....	1 97	1 97	3.55 @ 3.80
Screenings	1.72 @ 1 77	1 57 @ 1.62	1.57 @ 1.62	.....

Prices asked for coke are: Connellsville and Wise County, $6.50@6.75; byproduct, egg, stove and nut, $5.75@6; gas house $6.

MINNEAPOLIS—ST. PAUL

During the past week the weather has been a great deal more favorable to the coal trade than at any time previous this season. However, conditions have not changed materially, and coal in nearly all grades is to be had in plenty and can be bought at a low price, considering the period of the year. Another week or two of this cold weather is what dealers are hoping for, and if it does come, conditions will be greatly changed.

Prices are uncertain and spotty on nearly all grades. Illinois screenings are selling at fairly good prices, in fact, much stronger than during the previous five or six weeks. The demand for Illinois steam lump and mine-run has been steady, with prices firm. While some of the larger Franklin County operators have been trying to hold at $2 for lump and egg, they have been practically forced by the smaller mines to sell for $1.75, and in some cases for $1.50.

Demurrage coal is reported at nearly every terminal between here and the mines and lower prices than the above have been made to move same. Reports from Illinois mines bear out the fact that the car supply is much better than heretofore.

ST. LOUIS, MO.

St. Louis experienced a sleet storm during the past week; the rain, which started in Sunday morning, turned to sleet Sunday night, and continued for a day or so. However, this did not have a tendency to advance prices on Carterville coal any, although Standard went somewhat higher Monday. On Tuesday prices on all grades went up, and continued that way throughout the week, until Saturday, when there was considerable Carterville offered at lower prices than it had been selling for all week. This was due to the operators and shippers wanting to clean up over Sunday.

However, during the week prices were made for only a day at a time, the operators and jobbers hoping that each day would see an advance, but there was no material change after Tuesday. Prices to the country trade were made for wire acceptance only.

The prevailing prices are:

	Carterville and Franklin Co.	Trenton and Big Muddy	Mt Olive	Standard
2-in. lump				$1 05 @ 1 15
3-in. lump			$1 40	
6-in. lump	$1.40 @ 1.50		1 60	1 25 @ 1.35
Lump and egg	1 45 @ 1.60	$2 25		
No. 1 nut	1 30 @ 1 40			
Screenings	0 75 @ 0.85			0 60 @ 0 65
Mine-run	1 10 @ 1 20			0 90 @ 1 00
No. 1 washed nut	1.50 @ 1.60			
No. 2 washed nut	1.35 @ 1 40			
No. 3 washed nut	1.35 @ 1 40			
No. 4 washed nut	1 30 @ 1.35			
No. 5 washed nut	0.85 @ 0.90			

OGDEN, UTAH

During the past week there has been a decided change, and winter weather is prevailing over the entire intermountain territory. The general storm made itself felt in the Northwest about Jan. 3, with a rapid drop in temperature. Seattle, Tacoma, Spokane and surrounding country experienced some real winter weather. The storm followed a southeasterly direction and California experienced the lowest temperature in years, with ice and snow at Sacramento, San Francisco and inland points.

The storm found the dealers well stocked with coal which was quickly delivered to the consumer and as the railroads have been furnishing a good supply of cars, there was a large tonnage of coal in transit. No reports of a coal shortage have been received, but judging from the way orders are being placed the supply at the various points is rapidly being exhausted and should the low temperature continue there will be a shortage of coal.

Both Wyoming and Utah quotations remain unchanged, as follows: Lump, $2.75; nut, $2.25; mine-run, $1.85, and Utah slack at $1.25 with Wyoming 25c. lower.

PORTLAND, ORE.

Portland and the Pacific Northwest had its first real cold spell this winter, but it was of rather short duration, the weather moderating in four days. However, it had the effect of increasing the demand for fuel for domestic purposes and coal dealers here were preparing to add on $1 per ton in case of an avalanche of orders. But for the moderation in the weather the rush no doubt would have followed.

From Ellensburg, Wash., comes the report that, owing to a snow blockade on the Roslyn-Clé-Elum branch of the Northern Pacific, urgent calls for coal are pouring into the mines of that section. As a result of the temporary tie-up of this line there is a shortage in many quarters, on Roslyn coal.

PRODUCTION AND TRANSPORTATION STATISTICS

ANTHRACITE SHIPMENTS

The following is a comparative state of anthracite shipments for December, 1911-12, and the totals for the year, in long tons:

	December 1912	December 1911	Year 1912	Year 1911
Phila. & Reading	1,223,880	1,238,727	12,852,386	13,265,758
Lehigh Valley	1,108,765	1,109,705	11,791,601	12,603,000
Cent. R. R. N. J	760,479	820,963	8,342,447	9,218,802
Del. Lack. & West	850,977	827,348	9,065,622	9,809,620
Del. & Hudson	598,969	592,922	6,361,238	7,206,731
Pennsylvania	543,361	600,803	7,435,697	8,800,179
Erie	667,532	722,093	7,435,697	8,800,179
Ont. & Western	190,539	202,966	2,213,382	2,495,476
Total	5,944,502	6,115,427	63,610,587	69,954,299

CONNELLSVILLE COKE

The "Courier" reports production and shipments in the Connellsville region for the week ended Jan. 11, as follows:

Production (tons)	Week	2 weeks	*Shipments (cars)*	Week	2 weeks
			Pittsburgh	4,189	8,437
Connellsville	223,834	436,446	W. of Pittsburgh	6,828	13,080
Lower Connellsv'le	185,630	357,222	E. of Region	917	1,814
Total	409,464	793,668	Total	11,934	23,331
Same period 1912	315,432	623,338		9,341	18,436

FOREIGN MARKETS

GREAT BRITAIN

Jan. 3—The tone of the market is very steady. Collieries appear to be heavily booked for January. Quotations are approximately as follows:

Best Welsh steam	$4.50	Best Monmouthshires	$4.20
Best seconds	4 26	Seconds	3.72
Seconds	4.20	Best Cardiff smalls	3 72
Best dry coals	4.38	Seconds	3 48

The prices for Cardiff coals are f.o.b. Cardiff, Penarth, or Barry, while those for Monmouthshire descriptions are f.o.b. Newport; both exclusive of wharfage, and for cash in 30 days —less 2½ %.

COAL SECURITIES

The following table gives the range of various active coal securities and dividends paid during the week ending Jan. 11.

Company	High	Low	Last
American Coal Products	90	90	90
American Coal Products Pref.	111	111	111
Colorado Fuel & Iron	36	33⅜	35
Consolidation Coal of Maryland	103⅞	103⅛	103⅛
Island Creek Coal Pref.	87½	87½	87½
Lehigh Valley Coal Sales	240	204	204
Pittsburgh Coal	24¼	23¼	23¼
Pittsburgh Coal Pref.	95	93	93¼
Pond Creek	28	25½	26
Reading	168¼	165¼	167
Reading 1st Pref.	90	90	90
Reading 2nd Pref.	93	93	93
Virginia Iron, Coal & Coke	58	55	55

Bonds Company	Closing Bid	Asked	Week's Range or Last Sale		Year's Range	
Colo. F. & I. gen. s f g 5s	97½		98	Dec. '12	97	100⅜
Colo. F. & I. gen. 6s			107½	June '12	107½	107½
Col. Ind. 1st & coll. 5s. gu	83¾	Sale	83⅜	83⅜	72¾	85⅛
Cons. Ind. Coal Me. 1s 5s		84½	85	June '11		
Cons. Coal 1st and ref. 5s		94	93	Oct. '12	93	94
Gr. Riv. Coal & C. 1st g 6s	97	102	102⅜	Apr. '06		
K. & H. C. & C. 1st s f g 5s			98	Dec. '12	97⅜	98⅛
Pocah. Con. Coll. 1st s f 5s	87	88⅞	87⅞	Jan. '13	81⅛	89⅛
St. L. Rky. Mt. & Pac. 1st 5s	78⅛	Sale	78⅛	79⅛	79⅛	84⅜
Tenn. Coal gen. 5s	102⅛	103⅛	102⅞	102⅞	101⅛	103⅞
Birm. Div. 1st consol. 6s	102⅛	103	102⅛	Dec. '12	102⅛	104⅛
Tenn. Div. 1st g 6s	101⅛	103⅛	101⅞	Dec. '12	101⅞	104
Cah. C. M. Co. 1st g 6s	103⅜		110	Jan. '09		
Utah Fuel 1st g 5s						
Victor Fuel 1st s f 5s		83	85⅞	Oct. '12	85⅛	86
Va. I. Coal & Coke 1st g 5s	96⅛	96⅞	96⅛	97	94⅛	98⅛

Dominion Coal Co., Ltd.—Dividend No. 40 on preferred, of 3½% payable Feb. 1 to holders of record Jan. 18.

INDEX OF COAL LITERATURE

The following is a list of abbreviations used below:
A.E.G.-Ztg. = A.E.G.-Zeitung.
Am. Lab. Legis. Rev. = American Labor Legislation Revue.
Ann. Mines = Annales des Mines.
Ann. Mines Belgique = Annales des Mines de Belgique.
Austral. Min. Stand. = Australian Mining Standard.
Berg-Huttenmänn. Rdsch. = Berg- und Huttenmännische Rundschau.
Bull. Am. Inst. Min. Eng. = Bulletin American Institute of Mining Engineers.
Can. Eng. = Canadian Engineer.
Can. Min. Jl. = Canadian Mining Journal.
Chem. Eng. = Chemical Engineer.
Coll. Guard. = Colliery Guardian.
Comp.-Air Mag. = Compressed Air Magazine.
Compt. Rendus Acad. Sc. = Comptes Rendus de l'Académie des Sciences.
El. Eng. = Electrical Engineering.
El. Jl. = Electrical Journal.
El. Kraftbetr. = Electrische Kraftbetriebe und Bahnen.
Eng. Contract. = Engineering Contractor.
Eng. Min. Jl. = Engineering and Mining Journal.
Eng. News = Engineering News.
Fördertechnik = Die Fördertechnik.
Geol. Mag. = Geological Magazine.
Handel und Ind. = Handel und Industrie.
Int. Mar. Eng. = International Marine Engineering
Inst. Min. Metal = Institute of Mining and Metallurgy.
Lit. Volkswirt = Internationaler Volkswirt.
Iron Coal Trades Rev. = Iron and Coal Trades Review.
Jl. Soc. Chem. Ind. = Journal of the Society of Chemical Industry.
Jl. Ind. Engin. Chem. = Journal of Industrial and Engineering Chemistry.
Jl. Royal Soc. Arts = Journal of the Royal Society of Arts.
Jl. S. Afr. Inst. Eng. = Journal of the South African Institute of Engineers.
Kohle Erz = Kohle und Erz.
Lumière El. = Lumière Electrique.
Min. Eng. = Mining Engineer.
Mines Minerals = Mines and Minerals.
Min. Sc. Press = Mining and Scientific Press.
Min. World Eng. Rec. = Mining World and Engineering Record.
Mon. Ind. Gaz. = Moniteur de l'Industrie du Gaz et de l'Electricité.
Montan. Rdsch. = Montanistische Rundschau.
Oesterr. Z. Berg- Huttenwes. = Oesterreichische Zeitschrift für Berg und Hüttenwesen.
Portefeuille Econ. Machines = Portefeuille économique des machines.
Proc. Acad. Pol. Sc. N. Y. = Proceedings of Academy of Political Science, New York.
Proc. Am. Inst. El. Eng. = Proceedings of American Institute of Electrical Engineers.
Proc. S. Wales Inst. Eng. = Proceedings of South Wales Institute of Engineers.
Rev. Noire = Revue Noire.
Rev. Univ. Mines = Revue Universelle des Mines.
Saarbrucker Berg. Kal. = Saarbrucker Bergmanns Kalendar.
S. Afr. Min. Jl. = South African Mining Journal.
Soz.-Technik = Sozial-Technik.
Stahl Eisen = Stahl und Eisen.
Stein-Braunkohle = Stein und Braunkohle.
Tech. Rdsch. = Technische Rundschau.
Techn. Wirtsch. = Technik und Wirtschaft.
Tekn. Tidskrift = Teknisk Tidskrift.
Trans. Min. Inst. Scot. = Transactions of Mining Institute of Scotland.
Trans. Inst. Min. Eng. = Transactions of the Institute of Mining Engineers
Trans. Manchester Geol. Min. Soc. = Transactions of the Manchester Geological and Mining Society.
Ung. Mont. Ind. = Ungarische Montanindustrie und Handelszeitung.
Z. Dampfkessel-Betr = Zeitschrift für Dampfkessel und Maschinenbetrieb
Z. El. Mach. = Zeitschrift fur Elektrotechnik und Maschinenbau.

Note: We shall be glad to obtain for readers, where possible, copies of the papers referred to.

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I—GENERAL

Efficiency Engineering Applied to Mining. G. A. Collins. "Am. Inst. Min, Eng." Bull. 69, p. 995-1008 2 fig.

Coal Mining Statistics, Colonial and Foreign. "Coll. Guard." vol. 104. 2706. p. 938-9. 15c.

The Results of Upper Silesian Coal Mining, in 1911. (Die Ergebnisse des Oberschlesischen Steinkohlenbergbaues im Jahre 1911.) "Stein Braunkohle." 1912. 11. p. 131. 35c.

Austrian Mines. "Min. Jl." vol. 99. 4030. p. 1115-7. (Coal is $6.65 per cent. of the mineral output of the empire, iron is 7.79 per cent. and the remainder covers the production of lead, copper, zinc and silver and gold.) 25c.

Conditions of Labor in the Mines and Similar Industries in the Prussian Mining Districts. (Die Arbeitsverhaeltnisse auf den Bergwerks- und aehnlichen Betrieben in der preussischen Oberbergamtsbezirken.) "Bergbau." 1912. 20. p. 277-8. 50c.

Successes of the Trade Union Movement in Mining. (Erfolge der Gerwerkschaftsbewegung im Bergbau.) 8 vo. 44 p. Cologne 1912. Christl. Gewerkschaftsverlag. 50c.

The Shadow of a Great Strike; The Miners' Victory. Samuel Gompers. "Am Federationist." vol. 19. 7. 1912. p. 517-29.

Consequences of the English Miners' Strike. Alms. (Die Folgen des deutschen und englishen Bergarbeiterstreiks.) "Bergbau." 1912. 25. p. 349-52. 50c.

The New Insurance Regulations for Mining Officials. (Die Neuregelung des Versicherungswesens fuer die Grubenbeamten.) "Bergbau." 1912. 39. p. 547-50; 40. p. 569-71. $7.

Workmen's Insurance and Hygienics. Hanauer. (Arbeiterversicherung und Gewerbehygiene.) "Bergbau." 1912 15 p. 211. 50c.

List of Patents Granted by the German Patent Office in 1911. (Verzeichnis der v. dem kaiserl. Patentamt im J. 1911 erteilten Patente.) Published by the German Patent Office. 2 pts. 906 p. Berlin, Heymann, 1912. $12.

Mining Law Development. H. C. & L. H. Hoover. "Eng. Min. Jl." vol. 94. 18. p. 823-5. (The early growth of mining law gave individuals widening rights at the expense of the State; the tendency now is to restrict the individual for the good of the State.)

The New English Mining Law. H. A. Walter. (Das neue englische Grubengesetz.) "Bergbau." 1912. 14. p. 191-5 50c.

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Remarks on a Few Objects Shown at the Mining Exhibition at Essen. Schultze. (Mitteilungen ueber einige auf der bergmaennischen Ausstellung zu Essen ausgestellte Gegenstaende.) "Bergbau." 1912. 27. p. 377-80; p. 390-2. 17. fig. $1.

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II—GEOLOGY

The Southeastern Coalfield. The Associated Rocks and the Buried Plateau. "Coll. Guard." vol. 104. 2706. p. 940-1. 15c.

A New Stratum in the Gas-flaming Coal Section of the Ruhr Coal District. (Eine neue Schict in der Gasflammkohlen-Partie des Ruhrkohlen-Bezirkes.) "Tiefbohrwes." 1912. 12. p. 47. 50c.

Map of Workable Mineral Deposits. Evernng, H. (Karte der nutzbaren Lagerstaetten Deutschlands.) H. Baumann & F. Schuenemann, 1911. Geolog. Landesanstalt. 1912. M3. (Group: Prussia and neighboring Federal States. Pt. 1 contains sheets: Cleeves, Wesel, Muenster (Westphalia) Erkelenz, Duesseldorf, Arnsberg, Aachen, Cologne, Siegen Malmedy, Cochem and Coblenz. Two tables, introduction, and explanatory note of coloring.)

Development of the Coal Measures in the West Galician Weichsel District of the Upper Silesian Coal Region. Michael, R. (Die Entwicklung der Steinkohlenformation im westgalizischen Weichselgebiet des oberschleischen Steinkohlenbezirkes.) "Jb. d. kgl. preuss. geol. Landesanst." Lex. 8 vo. p. 159-306. 1 ill. Berlin, Geolog. Landesanstalt. 1912. $2.

III—MINING TECHNOLOGY

How Penn-Mary Coal Mine Doubled its Capacity. "Coal Age." vol. 2. p. 606-8. 7 fig. (Heat formerly wasted was utilized, excess direct electrical current converted into alternating for use in new portions of the mine.)

The Lathrop Coal Company. J. H. Williams. "Mines Min." vol. 33. 4. p. 179-81. 1 plan. 1 ill. (The new plant installation and methods of mining employed.)

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Underground Layout and Working Arrangements for a New Colliery. J. Turtington. "Min Eng" vol. 16 222. p. 225-9. 4 fig.

A Recent Swedish Compressed Air Plant. Hjalmar Erikson. (Eine neuzeitliche schwedische Druckluftanlage.) "Glueckauf" 1912 34 p. 1368-72 8 fig. (Description of plant for the production of compressed air, recently built by the Striber Co. for their mines.) 75c

A Stonedust Distributing Machine. "Colliery Guard." vol 104. 2710. p. 1139. 1 fig. (The apparatus employed in the Victor-American Fuel Co.'s collieries, Colorado, to cover the sides and roofs of haulage ways with stonedust and free them from coal dust.) 15c

IV—WORKING OF MINERALS

Planning Our Workings in a Mine and Various Methods of Making Levels. Graf, E. (Einteilung des Grubenfeldes

in Baufelder und die verschiedene Art der Sohlenbildung.) "Stein. Braunkohle." 1912. 17. p. 200-1. 35c.

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Facts about Anthracite Mining. E. W. Parker. "Mines Min." vol. 33. 4. p. 202-3. (The history of the industry and development of economy in production.)

Jasper Park Colliery at Pocahontas, Alberta. "Canad. Min. Jl." vol. 33. 21. p. 750-2. 3 fig. (Development operation with plant lay-out and construction.) 40c.

Improvements at the Old Silkstone Collieries. "Coal Merch." vol. 25. 634. p. 513-4. 2 fig. (A washery capable of dealing with 1200 tons of coal in ten hours; eighty Koppers latest type of regenerative ovens and recovery plant; the output will be 3500 tons of coke per week.) 15c.

V—BORING, SHAFT SINKING AND TUNNELING

New Patterns in Deep Boring Machines and Tools. (Neukonstruktionen in Tiefbohrmaschinen und Geraeten.) "Tiefbohrwes." 1912. 18. p. 73-80. 19. p. 85-7. 23 fig.

Water Flush Percussion Method of Shaft Boring. Krecke. (Spuelschalgverfahren zum Abbohren von Schaechten.) "Glueckauf." 1912. 36. p. 1471-3. 2 fig. (Supplement to previous paper by the same author on the Stockfish Method.) 75c.

Appliances Used for Determining the Deflection of Boreholes in Shaft Sinking. (Die beim Schachtbau verwendeten Apparate zur Messung von Bohrlochsabweichungen.) "Kohle Erz." 1912. 40. p. 993-1002. 5 fig.; 41. p. 1025-32. 3 fig. (Abstract of paper read by Maurice Bodart before the Association of Old Instruments at the Liege School of Engineering, on the methods used for measuring the deflection of boreholes in sinking shafts by the congelation process through quicksands in Belgium.) $1.

Shaft Sinking in Presence of Large Inflows of Salt Water. Groeting, Heinr. (Ein Beitrag zum Schachtabteufen bei grossem Salzwasserzufluss.) "Bergbau." 1912. 42. p. 585-6. 3 fig. 50c.

Method of Thawing-out a Shaft Sunk by the Congelation Process. (Verfahren zum Auftauen eines unter Anwendung des Gefrierverfahrens ausgefuehrten Schachtes.) "Tiefbohrwes." 1912. 14. p. 95-6. 1 fig. 50c.

VI—BLASTING, EXPLOSIVES

Progress in Mine Blasting. (Fortschritte auf dem Gebiete der Minenzuendung.) "Kohle Erz." 1912. 42. p. 1089-92. 4 fig. 50c.

The Influence of Temperature and Pressure on the Combustion Speed of Fuses. Walter Snelling and Willard Cope. (Ueber den Einfluss der Temperatur und des Druckes auf die Verbrennungsgeschwindigkeit der Zuendschnur.) "Z. Schiess-Sprengstoffe." 1912. 14. p. 285-9. 15 p. 305-8. 18. p. 362-7.

Powder Which Is Soluble in Water. F. Rasching. (Wasserloesliches Schiesspulver.) "Bergbau," 1912. 29. p. 407-8. 50c.

Storage of Explosives at Mines. "Colliery Guard." vol. 104. 2707. p. 987-9. 2 tab. 15c.

Chemical Testing of Mining Explosives. J. Moir. "Chem. Tr. Jl" vol. 51. 1328. p. 457-8. 10c.

VII—TIMBERING, PACKING, ETC.

Method of Lining Shafts with Ferro-concrete Without False Work. (Verfahren zur Herstellung von Schachtauskleidungen aus Eisenbeton ohne Schalung.) "Tiefbohrwes." 1912. 17. p. 69. 3 fig. 50c.

The Preservation of Mine Timber. Max Landau. (Konservierung von Grubenhoelzern.) "Bergbau," 1912. 40. p. 563-4. 50c.

VIII—HOISTING AND HAULAGE

The Braking of High Speed Winding Engines. G. K. Chambers. "S. Afric. Min. Jl." vol. 22. 1099. p. 216. 50c.

Compressed Air Hoisting at Butte, Mont. T. T. Read. "Min. Sci. Press." vol. 105. 18. p. 554-6. 2 fig. (Hoisting shafts in a half-mile radius with central power plant and air storage system.)

Air-balanced Hoisting Engine. R. H. Carbett. "Min. Min." vol. 33. 4. p. 221-2. 2 fig. (The power developed by the descending skip compresses air to be used in hoisting.)

Winding Engine Control. "Canad. Min. Jl." vol. 33. 21. p. 734-42. 16 fig. (Apparatus controlling over-speeding and over-winding recently introduced.) 40c.

Electric Hoists at the Hecla Mine. E. M. Murphy. "Am. Inst. Ming. Eng." Bull. 69. p. 977-94. 14 fig.

Electric Hauling and Pumping in the Penn-Mary Colliery. "Coal Age." vol. 2. 19. p. 641-3. 11 fig. 1 tab.; 20. p. 674-6. 14 fig. (The steepness of the grade makes many hoists necessary; an electric larry with a reel mounted below the frame carries the rock to the end of a long dump.)

First Cost and Efficiency of Electric Main Hauling Machines. Karl Meller. (Anlagekosten und Wirkungsgrad bei elektrisch betriebenen Hauptschachtfoerder-maschinen. "Glueckauf." 1912. 42. p. 1719-21. 2 fig. 75c.

Experiments with Electrical and Steam Winding Engines. Robbert. (Untersuchungen an elektrische und mit Dampf betriebenen Foerdermaschinen.) "Z. Ver. D. Ing." 1912. 36. p. 1456-60. 5 fig. (Comparative trials of four steam and four electrical engines. Short description of plant and results. Fundamental principles affecting the consumption of energy. Results of individual trials with steam winding engines.) 50c.

Overwind Prevention in England. "Coal Age." vol. 2. 21. p. 710-11. 7 fig.

The Use of Old Wire Ropes in Timbering Roadways. J. McLuckie. "Trans. Min. Inst. Scot." vol. 35. 1. p. 37-40. $1.50.

New Cage Chains. Puetz, O. (Ein neues Soerderkorb-Zwischengeschirr.) "Glueckauf." 1912. 38. p. 1554-5. 2 fig. 75c.

Compressed Air Mine Locomotives. (Druckluft-Gruben-lokomotiven. "Z. Ver. D. Ing." 1912. 34. p. 13746. 1. ill. 6 tab. (Comparative experiments, carried out in Germany. 50c.

The Electric Locomotive Haulage with Single Phase Current at the Pit, Rosenblumendelle. (Die elektrische Lokomotivfoerderung mit einphasigem Wechselstrom auf der Zeche Rosenblumendelle.) "Bergbau." 1912. 8 p. 93-4. 50c.

Automotor Haulage Incline. Kusch, Karl. (Ein Auto-motorischer Bremsberg.) "Motan-Rdsch." 1912. 6. p. 249-51. 5 fig. (Plant at the Michaeli Colliery, Ostrau-Karwin.) 30c.

IX—SIGNALING

Wireless Telephony in Mines. O. Dobbelstein. (Drahtlose Grubentelephonie.) "Glueckauf." 1912. 40. p. 1623-8. 12 fig. (Description of installation made at the Pit Karolinenglueck, Bochum, for the purpose of determining the possibility of using wireless telephony in mines.) 75c.

Wireless Telephony in Mines. E. P. Buffet. "Coal Age." vol. 2. 19. p. 646-8. 3 fig.

Electric System Signal, Argonaut Mine. R. S. Rainsford. "Eng. Min. Jl." vol. 94. 17. p. 783-4. 4 fig.

X—LIGHTING

Prize Competition for Safety Lamps. (Preisaus-schreiben fuer Sichereitslampen.) "Stahl-Eisen." 1912. 43. p. 1791-2. 70c.

The Forerunners of the Safety Lamp. (Die Vorlaeufer der Wetterlampen.) "Bergbau." 1912. 40. p. 563. 50c.

The Safety Lamp for Gaseous Mines. A. Rzehulsa. (Die Sicherheitslamps fuer Schlagwettergruben.) "Stein Braunkohle." 1912. 19-20. p. 233-7. 35c.

XI—VENTILATION

Ventilation of a Bituminous Coal Mine. G. W. Hamilton. "El. Jl." vol. 9. 11. p. 10,325. 1 fig. 1 tab. (A note is made that while there are set rules for the volume of air required, the application of the rules must depend on present conditions and the plan of future developments.)

Facts and Theories Relating to Mine Fans. D. M. Mowat. "Trans. Min. Inst. Scot." vol. 35. 1. p. 26-36. 1 double plate. $1.50.

Experiments in Ventilation by Means of Brattice Pipes. Arlt, W. (Untersuchungen ueber Wetterfuehrung mittels Lutten.) "Kohle-Erz." 1912. 43. p. 111-4. 50c.

Driving of Mine Fans by Three Phase Motors for Variable Speed. Sauvage. (Antrieb von Gruebenventilatoren durch Drehstrommotoren mit regelbarer Umlaufzahl.) "Glueckauf." 1912. 41. p. 1668-72. 4 fig. 75c.

XII—MINE GASES, TESTING

Causes and Prevention of Firedamp Disasters. Paul Grabein. (Die Ursachen der Schlagwetterkatastrophen und deren Verhuetung.) "Stein-Braunkohle." 1912. 16. p. 187-8. 35c.

XIII—COAL DUST

A Contribution to the History of the Coal Dust Question. v. Rosen. (Einiges aus der Geschichte der Kohlenstaubfrage.) "Bergbau." 1912. 29. p. 405-7. 50c.

A New Type of Mine Air Humidifier. "Min. Sci. Press." vol. 105. 18. p. 569-70. 1 fig. (A hollow wheel mounted on the shaft of an electric motor is fitted with water intake, spray nozzles on its periphery, and fan-blades at its back, and produces a fine water mist.)

XIV—EXPLOSIONS

Experiments with Coaldust Explosions in the French Experimental Station. (Versuche mit Kohlenstaubexplosionen in der franzoesischen Versuchsstrecks.) "Vulkan." 1912. 18. p. 73.

Prevention of Mine Gas Explosions. J. Schnitzler. (Verhuetung von Schlagwetter-Explosioner "Kohle-Erz." 1912. 36. p. 897-900. 50c.

The Mining Disaster at the Pit Lothringen. (Das Grubenunglueck auf Zeche Lothringen.) "Bergbau." 1912. 41. p. 575-7. 50c.

XV—RESCUE AND AMBULANCE

Compressed Oxygen Rescue Helmets. "Coal Age" vol. 2. 18. p. 609-12. 5 fig. (A self-contained breathing apparatus and the use of the pulmotor.)

XVI—PREPARATION

Preparation of Anthracite Coal. S. V. Tench, "Coal Age." vol. 2. 20. p. 681-2. 1 tab. (The preparation of anthracite and the electrical bonding in mining with data on the loss of efficiency through inadequate bonding and means to overcome it.)

Coal Washing and Briquetting. "Mines Min." vol. 33. 4. p. 193-6. 12 fig. (The plant of the Alstaden Colliery, designed to handle anthracite coal.)

Sizing and Sorting Coal in England. "Coal Age." vol. 2. 21. p. 712-3. 2 fig. (A typical plant is described; the coal being traced through the operations of dumping, screening, picking, etc.)

The Design of Coal Screens. B. Shubart. "Coal Age." vol. 2. 21. p. 709-10. 5 fig.

Commercial Sampling of Coal. C. E. Scott. "Mines Min." vol. 33. 4. p. 199-201. 1 fig. 1 tab. (Precautions necessary that the sample may accurately represent the lot when selling by analysis.)

XVII—BRIQUETTES

Briquetting Tests at the United States Fuel Testing Plant, Norfolk, Virginia, 1907-8. C. L. Wright. (U. S. Bur. of Mines.) 8 vo. 42. p. 9 plates. 1912.

COAL AGE

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The Mine Mule

(Written expressly for Coal Age)

By Berton Braley

He sees the pleasant daylight only once or twice a year,
When they take him out to gambol on the grass;
But he cocks those funny eyes of his and waves a crazy ear,
And you bet he's wise to all that comes to pass.
He is meaner than the skinner—and the skinner's awful mean—
But he's stronger than the cable on the cage;
And of all the critters underground it's plainly to be seen
That the mule's the boy who always earns his wage!

The skinner is a driver who swears a purple streak,
But profanity is love talk to the mule;
He would kick the gentle miner to the middle of next week,
But when the skinner beats him he is cool.
For the mule he loves the skinner, and the skinner loves him back,
Though you sure would never know it by his talk;
And the mule he hauls a string of cars along the bumpy track
And very, very seldom will he balk.

But if the mule gets sulky he can tangle up the mine,
While the pit boss and the cager stand and swear;
And the cars are backed behind him in a long, unbroken line
And the skinner hops around and tears his hair.
Yet when the mule is ready he will start to work again,
And merrily he hauls the cars away;
For like that guy, Sir Galahad, he has the strength of ten
When he really wants to bring it into play.

So, here's to Mr. Long Ears with the tassel on his tail,
May he prosper like a dividend that's fat;
And when he's done with working and he hits the spirit trail,
May he go where all the saintly mules are at!
Where there isn't any mining and there isn't any coal,
And a skinner is a critter never met;
Where the only occupation is to bray with all his soul
For the mule has earned his Heaven, you can bet!

The Preparation of Bituminous Coal—II

By F. E. Brackett*

SYNOPSIS—The second and concluding article on this subject. This installment discusses gravity chutes and the different types of screens with their comparative advantages and disadvantages. Some valuable data regarding screening areas are given, together with notes and comments on the methods of sizing as practiced in different regions.

In some regions the pan shown in Fig. 1 is very popular. There are a number of different types in use, but the figure shows, perhaps, its most comprehensive form. This pan is not hinged or attached to the chute at its upper end. In its upper position it forms a continuation of the chute, but at a less grade—say 3 in. per foot. Coal entering at the upper end at a high velocity is gradually brought to rest by this change in grade and by the curve at the end of the lower part. The entire pan consists of two separate parts hinged with a bridle, like a clam shell and hung by the bridle at its upper end.

The cables by which it is suspended wind about some sheeves, or small drums, on a shaft, on which there is a band brake. By a proper arrangement of the size of the drums, any ratio of displacement between the upper and lower ends can be maintained; the figure shows a two to one ratio. If the brake be released and the lower end of the chute lowered 2 ft., the upper end will drop one foot. The entire pan is counterbalanced, so as to be held in its upper position when empty. When full of coal, the brake is released and the pan drops to the lower position shown, the "clam shell" being opened by a piece of chain attached to the end.

The whole mechanism can be mounted as a scales for weighing the coal. This arrangement checks the coal more gently than any form of gate, and also shortens the fall after it leaves the pan. It is rather doubtful though, whether this drop is less than could be accomplished by any well adjusted chute. However, where a certain amount of fall is to be neutralized and the requisite horizontal space is not available, this pan certainly does possess a decided advantage. This form of pan is more commonly hinged at its upper end and sometimes, where the main problem is to overcome height, the two parts are made of equal length and just alike. The pan then becomes a short box 10x6 ft. overall, and several feet deep, and when loaded with coal, it slides down on guides to the car, and opens up on the same principle as the one shown. The pan, as well as the monkey, requires some little time for operation, which should not be lost sight of in computing output; the plain gate is much more rapid.

The Question of Sizing

With the smaller sizes of coal carefully separated from one another, the depth of fire on the grate bars can be so adjusted that each size will get proper draught. This process of sizing can be carried on until a grade is obtained so small that it would hardly be possible to carry a fire light enough to get the proper draught, without at the same time having it so thin that holes are liable to be sucked through the fire-bed, and thus reduce the temperature of the firebox.

The minimum of useful size is about one-fourth of an inch, or at least, that is about the smallest mesh used on bituminous-coal screens. However, with mechanical stokers, even the very finest coal can be economically burned, although with these, there is no advantage in sizing below a certain limit. The harder and less coking qualities a coal has, the more advantages there are in sizing. For this reason we find the most extensive sizing plants in the anthracite region, while the least sizing is done to the soft Eastern steam coals.

In general there does not seem to be any great uniformity of practice in sizing, in the bituminous coal fields. Speaking in round figures, lump coal is such as

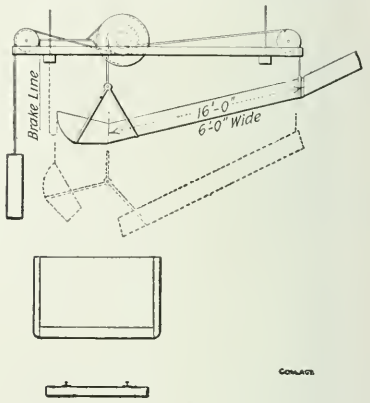

Fig. 1. Pan for Lowering Coal

passes over a 1¼-in. bar screen 12 ft. long and 6 ft. wide. Nut passes through a 1¼-in. bar screen and over a ¾-in.; slack passes through the ¾-in. screen. We do, however, find 2-, 3-, 4-, 5- and 6-in. lump on the market, as well as the various sizes of so called "egg" which these lumps produce. Also pea coal and buckwheat are sometimes made from the "throughs" of the nut screens.

Perhaps these grades are usually about as follows: Nut coal, through 1¼-in. and over 1-in.; pea coal, through 1-in. and over ¾-in.; buckwheat, through ¾-in. and over ¼-in. It would seem that the grades of lump over, say, 4-in., were really superfluous, and that one, below nut coal, was really enough at most. The sizes would then run: Domestic lump, all over 4-in.; lump, all over 1¼-in.; ¾-lump, all over ¾-in.; egg, over 1¼-in. and under 4-in.; nut, over ¾-in. and under 1¼-in.; pea, over ⅜-in. and under ¾-in.; slack, under ⅜-in. However, certain market conditions undoubtedly require further sizing, though in the majority of conditions there are usually less.

Types of Screens

There are three types of screens in use—the bar screen, the revolving screen and the shaking screen. The bar screen is the most popular, and is used to make the first

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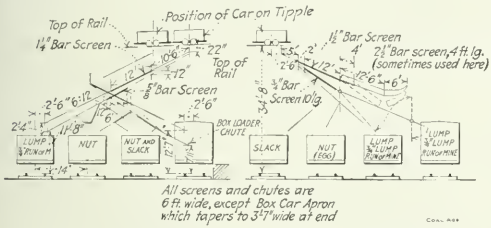
or lump separation in the vast majority of cases. Everything going through the lump screen is treated either on another bar screen, or on some form of the mechanical screen. In some regions, however, the shaking screen is used to make the lump separations as well as the fine-coal separations.

Bar screens are built of a great number of bars, supported on cross pieces, notched to receive the lower edge of the bars. There is usually a little taper in the section between the top and the bottoms; this assists the fine coal in passing through and also helps hold the bar in its supporting notch. The standard lump screen, as before stated, has a 1¼-in. space between the bars, is 12 ft. long and 6 ft. wide. The slope is usually from 4½ to 6 in. per


Top of Rail
Position of Car on Tipple
1¼" Bar Screen
1½" Bar Screen
2½" Bar screen, 4 ft. lg. (sometimes used here)
Top of Rail
¾" Bar Screen
¾" Bar Screen 10 lg.
BOX LOADER CHUTE
LUMP ¾ RUN OF MINE
NUT
NUT AND SLACK
SLACK
NUT (EGG)
LUMP ¾ LUMP RUN OF MINE
LUMP ¾ LUMP RUN OF MINE
All screens and chutes are 6 ft. wide, except Box Car Apron which tapers to 3'-7" wide at end

Figs. 2 and 3. Typical Cross-track Tipples

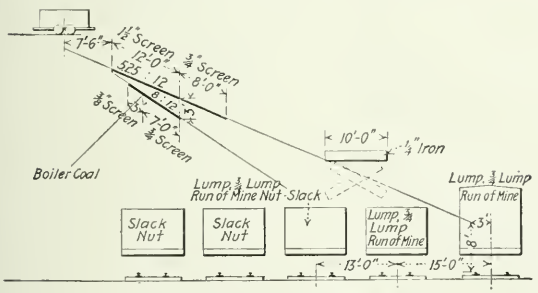


Fig. 4. Typical Gravity-screen Layout

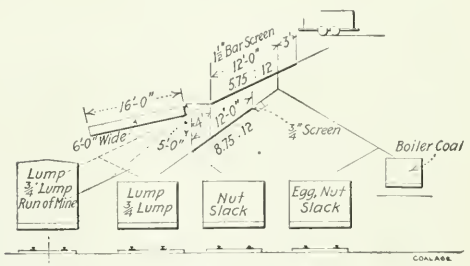


Fig. 5. A Double Lump-screen Arrangement

foot, horizontal measurement. In most cases this is the initial screen and is the only one placed in the chute.

For screening the "through," or fine coal from the lump screen, there seems to be a great diversity of plans. For 6 ft. wide the length of the nut screen has been reduced to 6 ft. without seriously impairing the results. The reason for this is, no doubt, that there is much less coal coming to this screen than to the lump screen, and as it is usually placed under the latter, much of the coal falls right through, instead of sliding along on top of a larger size, for a time. At the same time the customary size for the nut screen seems to be about the same as for the lump.

The capacity of the latter is about three mine cars per minute, or say six tons per minute of run-of-mine coal; usually two-thirds of this goes over the screen and one-third through. It would, therefore, seem that, if convenient, the nut screen could be made smaller than the lump. But since the objection to a little fine coal in the lump is not as great as a like percentage would be in the nut, it would hardly be practical to reduce the area of the nut screen to one-third of the lump screen; coal for commercial purposes, smaller than the nut size, is usually prepared on some form of mechanical screen. For use at the mine, however, smaller bar screens are sometimes placed above the nut screen, so as to take a small quantity of fine slack for boiler purposes. For the larger sizes of lump, the tendency seems to be to shorten the screen.

Bar and Revolving Screens

In setting the bars for the bar screens, care should be taken that there is no binder over the top, at the lower end, to hold them; the upper surface of the bars at that point should be placed a little higher than the surface of the sheet iron in the chute. This is particularly important in the fine-coal screens, because small lumps catch on the binder, or on the sheet iron, and the weight of the coal is not sufficient to force the lump past. The screen thus begins to clog, even when given a heavy pitch. The lump screens do not give trouble in this way, under ordinary circumstances, because of the weight of the coal.

The bar screen cannot be replaced by a perforated metal screen, because the coal travels over it too fast to be properly screened. The wire screen is, of course, too rough. For mechanical screens, however, both wire and perforated metal give a high efficiency.

In revolving screens, the screen proper forms the periphery of a cylinder or frustum of a cone. If the form is cylindrical, the axis must be given an inclination of about 5½ deg., or about 1⅛ in. per ft., to force the material to travel through the screen; hexagonal screens sometimes replace the circular ones. The periphery of a revolving screen should travel about 200 ft. per min. There should be about 1 sq.ft. of screen surface for every ton of coal fed into the screen per day of eight hours, when the mesh is ¾ in., and with ¼-in. mesh there should be 2 sq.ft. per ton. If the coal is wet, this should be increased.

Revolving screens are sometimes jacketed; that is, two or more screens are placed concentrically on the same shaft, the inner being the coarsest, and each succeeding screen making additional separations. This reduces the space and height required for the same amount of screening. In other cases, a long cylindrical screen has coarse mesh near its discharge end and finer near the entrance end, thus making two or more through products besides the overproduct.

The disadvantage of "jacketed" screens is that the necessarily slow speed of the innermost screen reduces the capacity of the entire combination, so that if rapid work is essential, it is necessary to use large diameters; there is also some difficulty in renewing and cleaning the

inner jackets. The disadvantage of using two or more mesh of different sizes, placed one after the other on the same frame, is that all the material must pass the finer mesh, which, as a result, is rapidly worn out. Also as more work must be done, the finer mesh must necessarily be of greater area than they would be were they placed so as to screen only that which passes through the larger mesh.

Shaking screens probably possess a greater cleaning efficiency, per square foot of surface, than do the bar screens, and do not require so great a pitch. They occupy must less room and are more conveniently arranged than the revolving screen, which usually requires considerable elevating of the fine coal; the shaking screens are also particularly efficient with wet coal. The principal disadvantage of this type is that the reciprocating motion imparts a destructive vibration to the framing of the building.

For sizing bituminous coal, inclined shaking screens are extensively used in certain sections, particularly in the Middle Western states. These screens are given a shaking motion by means of cams and connecting rods, which make from 60 to 100 strokes per minute, the speed varying according to the amount of moisture in the coal; the throw of the eccentric is about 6 in. The screens are 7 ft. wide and vary in length according to the conditions on the tipple, no standard having been adopted. The average inclination at which they set is 14 deg., or 3 in. per ft., but this angle varies from 12 deg. to 15 degrees.

Screening Area Required

The necessary area depends upon the mesh principally; to screen the run-of-mine coal over a ¾-in. perforated screen for making slack, requires 0.028 sq.ft. of screen per ton of run-of-mine per day of eight hours. If the perforations are 2½ in., then 0.014 sq.ft. per ton per day are required. As with the bar screen, there seems to be some tendency to keep the fine-coal or nut screen about the same size as the lump screen, although only about one-third of the run-of-mine will pass through 1½-in. mesh. Even at three times the above figures, however, the ratio of material passing into the screen, to area of screen surface, is far below anthracite practice, where a screen for fine coal, of about ¾-in. mesh, will have about one-half square foot per ton, per 10-hr. day.

It is interesting to note that at six tons per minute, a standard 1¼-in. lump bar screen has an area of 0.025 sq.ft. per ton per 8-hour day, while the perforated shaking screen requires about 0.028 for the ¾-in. mesh. It is doubtful if these lump-screen areas could be reduced below the maximum capacity of the tipple, regardless of the actual mine output, because the rate of the flow of coal across the screen is fixed by the time of dumping a mine car. To avoid this and secure a more even distribution, feeding boxes or small bins are sometimes introduced above shaking screens, though the writer does not know of any case where these are used above the bar screens. The flow from the box is often produced by a shaking motion. For the fine coal, small bins usually exist at some point, which equalizes to a great extent the flow of the coal passing the lump screen.

For the ¾-in. nut screen, of the stationary or bar type, the usual area would be 0.075 sq.ft. per ton per day. The corresponding revolving screen would require, according to usual practice, about 1 sq.ft. per ton, and the shaking screen on anthracite, ½ sq.ft. per ton per day. It would seem rather difficult to reconcile this wide discrepancy even after making full allowance for the intermittent action of dumping.

The relation between the mesh and the area, however, is much more clearly defined than the relation between the output and the area. Thus, for shaking screens of perforated plates, when the diameter of the perforation is increased from ¾ to 2½ in., or as 3 is to 10, which is nearly four times, then the area required is reduced one-half, in other words, the areas vary inversely as the square root of the diameter of the perforation. A similar result, but more approximate, is obtained from the data on revolving screens. This same law is approximately borne out in anthracite practice.

A word might be inserted here about the bins or pockets for fine coal, usually found at bituminous plants. It is not often that these are large enough to carry

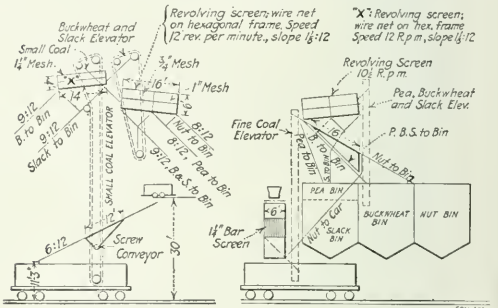

Buckwheat and Slack Elevator
Small Coal 1¼" Mesh.
Revolving screen; wire net on hexagonal frame. Speed 12 rev. per minute., slope ½-12
¾" Mesh
1" Mesh
9-12 Buckwheat to Bin
9-12 Slack to Bin
Nut to Bin
8-12 Pea to Bin
8-12 P. B. S. to Bin
Screen Conveyor
6-12
"X" Revolving screen; wire net on hex. frame Speed 12 R.p.m., slope ½-12
Revolving Screen 10 R.p.m.
Pea, Buckwheat and Slack Elev.
Fine Coal Elevator
P. B. S. to Bin
Nut to Bin
PEA BIN
BUCKWHEAT BIN
NUT BIN
SLACK BIN
14" Bar Screen

Fig. 6. End-dump Tipple Fig. 7. Fine-coal Bins

more than a few days' run, the main object being to allow a carload of the fine to accumulate before it is loaded into the car. Unless these bins are used, there must be a separate track and railroad car for every grade of coal made. With some arrangements, this is more convenient than the bins, but in other regions we find the bin plants more popular.

Tipple and Screen Arrangements

The various combinations of dumping and screening apparatus are, of course, almost endless. There are, however, two main types which will be briefly described. They are the "cross track" plant, with bar screens or shaking screens, and the "end dump" plant, with or without elevators and bins.

In Figs. 2, 3, 4, 5, 9 and 10 are shown typical plants of the "cross track" type with bar screens; Fig. 2 is a double plant consisting of two tipples or dumps and two sets of chutes and screens, one set being preferably used to load box cars. Many of the other figures represent one-half of a double plant, the second tipple and chutes being exactly or nearly the same as the ones shown. There are seldom more than two screens on the same set of chutes used in these plants. The sizing, therefore, confines itself to lump, nut and slack.

In most cases the nut screen is placed directly beneath the lump and is of about the same length and area as in Figs. 3 and 10. In other cases the nut screen is displaced or moved down the chute a little below the lump screen, as in Figs. 2 and 5. Figs. 4 and 9 show two

screens in succession on the main chute. The ¾-in. lump, produced in Fig. 4 by covering the 1½-in. screen, is not the equal of that produced by screening fine over 1½ in. and then adding the nut coal, from the ¾-in. nut screen, to the lump car. In this particular case, it would seem that the ¾-in. screen, being only 8 ft. long, was not sufficient to properly screen the coal. According to established principles and data on screens, given elsewhere in this article, it appears that if 12 ft. were sufficient for a 1½-in. lump screen, that 17 ft. would be the proper length for a ¾-in. lump screen, and not 8 ft. as shown. In the writer's experience ¾-in. lump screens, 12 ft. long, are not sufficient.

It will be noticed that by throwing the chutes across a system of tracks that each grade is conveniently loaded on a separate car with the arrangement of chutes shown in Fig. 9. The height required from top of railroad track to top of mine-car track on tipple is usually about 35 or 40 ft., according to the arrangement. Fig. 10 was laid out to obtain a maximum of convenience with a minimum height.

If shaking screens are used, a similar arrangement of tracks is still convenient. The arrangement of the screens in succession along the main chute, instead of passing lump coal over one screen only, seems more popular with the shaking screens. The reason for this is, no doubt, the increased efficiency in cleaning. This also makes the small coal chutes less complicated, and generally compacts and simplifies arrangements. The low fall required avoids the necessity of much building where height above the railroad does not already exist. Of course, there is an objection, as previously pointed out, to passing the lump coal over every screen, especially the small mesh, but advantages with this particular type seem to have overbalanced this disadvantage. These screens may and should be fed from a feeder box and not from a tipple direct.

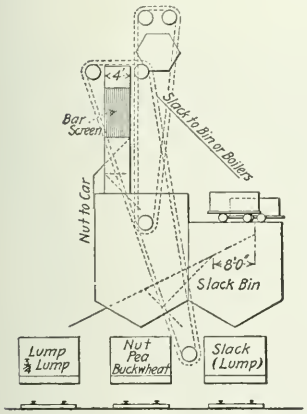


Fig. 8. A Fine-coal Loading Arrangement

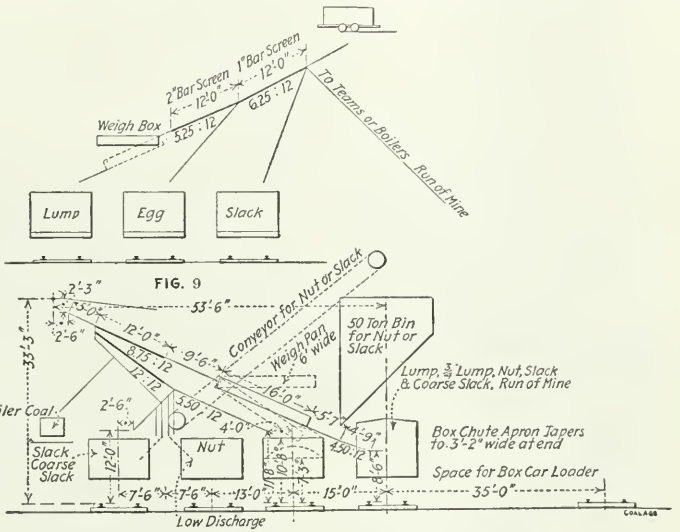


Fig. 10. A Typical Layout to Obtain the Maximum Convenience with the Least Height

The End-dump Tipple

The "end-dump" plant, with elevators and revolving screens, is shown in Fig. 6. The advantage of the end chute is to give a better turn to the cars. Some attempts have been made to turn the ends of "cross chutes" for the same purpose, so as to make them load in an endwise direction. These are called radical chutes, and if properly built, are successful but rather cumbersome. With chute and tipple or dump arranged as in Fig. 6, the point at which the fine coal leaves the pocket beneath the lump screen, makes it inconvenient to carry screening any further, or indeed to dispose of the screenings at all without elevators. Hence elevators and revolving screens are the logical accompaniment of this arrangement.

To avoid many tracks and delays of railroad cars, or waiting on railroad cars for the smaller coals, the fine coal is usually run into a series of bins, which are placed over a single track called the fine-coal track. Figs. 7 and 8 are two views of the same tipple. This is hardly typical, as it represents a combination of the two types, without any well deferred attempt to take full advantage of either. It is, no doubt, the result of the peculiar surroundings.

Before selecting any particular arrangement or preparation for a given locality, all questions must, of course, be carefully considered, the principal details being the texture of the coal, market demands and topography of the surface.

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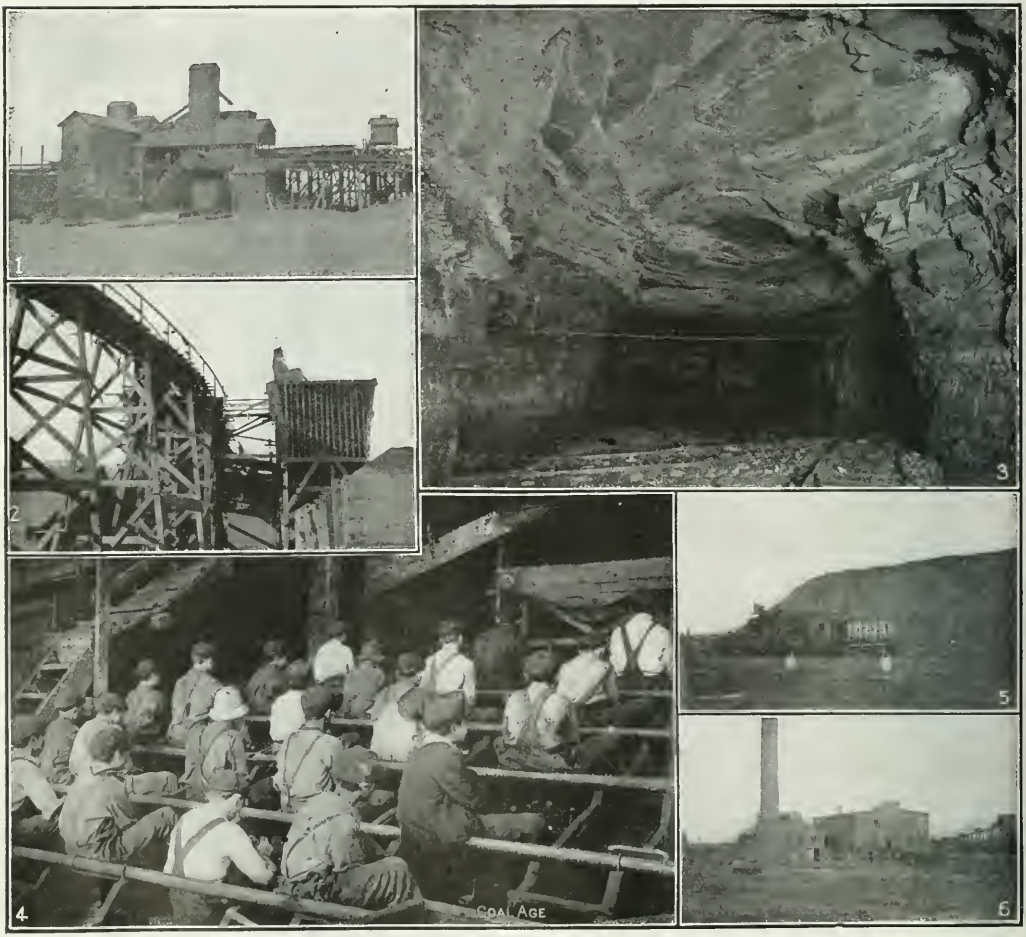
To trace the path of an explosion is a matter calling for the exercise of patience and keen observation. The following points will be found of assistance when undertaking such a task: (1) Deposits of fine dust on the faces of crossbars and timbers. (2) The abrasion of sharp projections on the pillars of coal. (3) Heavy material forced from its position and carried in a definite direction. (4) The formation of eddies of dust in the corner of timber sets and passage ways; these eddies are invariably found on the side opposite to the origin of the blast. (5) Coke dust and other materials, forced into corners of projecting sidewalls, in the same direction as the force of the explosion. (6) The bending of switches and the direction in which timbers and wagons are carried.

SNAP SHOTS IN COAL MINING

1—Sweetwater tipple. Central Coal & Coke Co., in Wyoming.
2—Tipple and trestle of the Oakdale Coal Mining Co., in Colorado.
3—Underground view in Consolidation Coal Co.'s Mine 32, West Virginia division. The place is being prepared for a concrete overcast.
4—Slate pickers in an anthracite breaker.
5—No. 2 Dominion Coal Co., Glace Bay, N. S. Loading banked coal for shipment.
6—Dominion Coal Co.'s No. 6 slope, showing boiler house, compressor house and tipple.
7—General view of the Roundup Coal Mining Co.'s mine at Roundup, Mont., on the Chicago, Milwaukee & Puget Sound R.R.
8—Trestles at mine of Cambria Fuel Co., Wyoming.
9—Car haul at mine of the Bear Creek Coal Co., Montana.
10—Steel tipple at Mine No. 7, West Kentucky Coal Co., Sturgis, Ky.
11—Bear Creek Coal Co. tipple, Montana.
12—Showing steel tipple of Wyoming Coal Mining Co.
13—Tipple of Consolidated Fuel Co., in Utah.
14—Second view of colliery, Oakdale Coal Mining Co.
15—Shaker screen being placed in position at mine in Utah.
16—Tank discharging water from the Gilberton Colliery water-hoisting shaft.
17—"The Inn," company hotel of Clinchfield Coal Corp., Dante, Va.



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Last Year's Coal Mining Accidents

By R. Dawson Hall

SYNOPSIS—A large reduction in the important coal-mine disasters of the United States was effected in the year 1912. Whereas in the previous year, 444 were killed in accidents involving three or more persons, last year only about 254 men died from misadventures of like severity. The greatest disaster in the year was the explosion of the Yubari mine, and of this a brief account is given. Many of the present-day disasters result from too brief an acquaintance with fields which have unforeseen dangers.

The compilation of a list of the accidents of any year is made difficult by the fact that early reports of the smaller domestic accidents and of all foreign catastrophes are the only statements which can be obtained till the annual reports slowly appear.

When the final reports are published, from one to two years after the event occurs, the number of recorded deaths is apt to be decreased in the case of foreign accidents, owing to rescues effected or men escaping after the last report available.

Figures of domestic accidents are liable to be underestimated in our tabulation because after explosions the living victims are so badly injured that death often supervenes. When these further deaths occur, they are rarely reported except to the inspectors or the national bureau and consequently the figures published at the end of the year are frequently too low.

With this introduction, it will easily be understood why the list is only approximately correct. It may omit some important accidents, though it gives almost a complete account of the principal mine disasters in America and the British Isles. Unimportant explosions and other accidents are purposely omitted.

Larger Accidents in Coal Mines of the United States Killed 254 Men

Excluding all accidents where less than three were killed, there were 254 fatalities in our coal mines last year. Great Britain's deaths similarly calculated amount to 117 and those of Canada to 7.

The estimate made by the Bureau of Mines of the number of coal-mine workers killed in the United States during 1911 in accidents killing over two men at one time was 444. Consequently the fatalities this year show a distinct improvement even if we allow a large margin for inaccuracy in the estimate which I ha e made. The drop given is 43 per cent., quite a noticeable reduction.

A Week of Gloom

The greatest domestic mine disaster of the year was that at Jed, W. Va., where 81 persons were killed, the next that at Chant No. 2, in Oklahoma, where there were 74 victims. These accidents came within a week of each other. The first would probably not have occurred had the Jed Coal Co. supplied their men with safety lamps, as was ordered by he inspectorate. The second was probably due to the fact that the men, who were awaiting the clearing of their working place of gas, sat down where the escaping gas passed over their open lights. In fact it is a question whether Chant ought ever to have been worked as an open-light mine.

Part of the improvement in the fatality rate is due probably to our mild and damp winter. "A green Christmas makes a full graveyard." But this is not the case with the mining industry and credit must be given to the weather for its work in making the mines safer than they would otherwise have been. Though we did not have a green Christmas, the winter generally has been mild and marked by frequent rains or soft snows.

The British coal-mine death rate has only been swelled in the past year by one large catastrophe, that of Cadeby Main colliery. At this disaster, 89 persons lost their lives. Had it not been for that explosion, the British record would have been remarkable. But the frequency of mine fires seems to suggest that large disasters were only avoided by a hair's breadth.

The Lack of Precaution in English Mines

Simply as an example, I call attention to the fire at the Headly Park colliery, Feb. 26, which occurred in an oil house on the main haulage-way. For a while it threatened to duplicate the Old Hednesford disaster and it might easily have been as unfortunate as the Price-Pancoast fire. Only two days before, at St. Helen's colliery, a fire took place with 470 miners in the pit. It was only with great difficulty that they finally got out.

The German record is peculiarly bad and would appear worse if we had as complete a record of fatalities as for the United States or Great Britain, and especially if compared with the output of coal in the Empire. Six accidents caused 183 deaths.

The record may be unrepresentative of the true conditions; certainly it does not suggest that the German laws give the mine worker a superlative assurance of safety. Some close observers have been of the opinion that an excess of gold braid on the persons of all officials in charge makes it necessary in Germany to give the mines "absent treatment."

Other Disasters in 1912

France had two bad accidents; one an explosion at La Clarence colliery resulted in the death of 61 persons; the other was from a less common cause, an outburst of carbon dioxide. A Russian explosion is said to have destroyed 45 lives and a fire in Tasmania, from the blowing of a motor fuse, is said to have suffocated 42 men. This fire was, however, in a metal mine.

Little has appeared relative to the greatest catastrophe of the whole year. So little has been said of it that an account may be fitly inserted here. On Apr. 29, at 11 a.m., a violent explosion occurred at the Yubari mine, in the island of Yezo, Japan, which, not satisfied with killing all of the 278 miners and officials in the workings, destroyed the mine buildings on the outside killing 6 men and injuring 5 more.

A brisk fire succeeded the explosion and in the report made in the *Japan Weekly Mail* of May 18, the statement is made that on May 8, only 106 bodies had been recovered, so fierce was the struggle needed to combat the fire in the mine.

Reference should be made here to an explosion reported to have taken place on Dec. 23, at Sapporo, on the same island of Yezo, only about 40 miles from the ill-fated Yubari mine. The *Echo des Mines et de la Métallurgie,* of Paris, reports that of 200 miners in the workings only three have been saved. As the brief mention is unconfirmed, the figures have not been added to those in our table or in our summaries of results.

The Bad Record in Japan

Japan has probably the worst record in the world for mining disasters. It is strange because Japanese companies seem more solicitous about the care of their employees than those of any other nation. The *Nichi Nichi,* a native organ, quotes the following table as an average for five years, ended 1909.

DEATH RATE OF MINERS

	Deaths	Deaths from explosion	Percentage
Japan	2381	1209	58.8
Great Britain	5789	419	7.3
Germany	5729	589	10.3

The *Nichi Nichi* states that explosions in Japanese coal mines can be traced mostly to carelessness on the part of the miners. Match boxes carried with them into the pits often prove to be the cause of catastrophes.

Not Cognizant of Danger Till Warned

Perhaps we may congratulate ourselves not only on a lower death rate this year than last, but on the gradual movement toward safety in the mines. The fact is sometimes overlooked that it takes a certain number of years and a few disasters to exhibit the dangers of any coal field.

They nearly all look harmless enough when first opened. The danger is usually revealed by a tragedy. Nearly every new field has its peculiar dangers and until they are discovered and duly measured, accidents will happen. Until death has shown the way it remains undiscovered.

We are beginning to size up conditions in the United States with some accuracy. In Colorado, Utah, Iowa and Oklahoma, they are watching the extremely dry and

IMPORTANT ACCIDENTS IN 1912 AT HOME AND ABROAD

Date	Colliery	Place	Company	Number Killed	Cause	Other Notes
Jan. 9	Parish-No. 9 Slope	Plymouth, Penn.	Parrish Coal Co.	6	Gas explosion	2 seriously injured
Jan. 12	Knickerbocker	Shenandnah, Penn.	Philadelphia & Reading Coal & Iron Co.	0	Explosion of dynamite caps	6 seriously injured
Jan. 17		Central City, Ky.	Central City Coal & Iron Co.	5	Explosion	200 had just left mine
Jan. 20	No. 4 Mine	Susie, Wyo.	Kemmerer Coal Co.	5	Dust explosion	20 injured
Feb. 12		Antonienbuette, Prussia		27	Mine fire	
Feb. 19	Yard	Bickeshaw, England	Abram Coal Co.	2	Mine fire suffocation	
Feg. 22	No. 5 Mine	Lehigh, Okla.	Western Coal & Mining Co.	8	Mine fire	
Feb. 22	Powell Duffryn	Bargoed, Wales			Explosion	3 injured, 2000 in mine
Feb. ?	Bentley	Near Doncaster, Yorkshire, Eng.	Messrs. Barber, Walker & Co.	3	Gas explosion	
Mar. 7	No. 3	Merritt, B. C.	Diamond Vale Colliery Co	7	Gas explosion	2 injured, only 18 in
Mar. 11	Bentley	Near Doncaster, Yorkshire, Eng.	Messrs. Barber, Walker & Co.	3	Gas explosion	6 men injured
Mar. ?	Great Western	Pontypridd, Wales		2	Outburst of gas	
Mar. 16	Italianka	Uzovka, Russia		45	Explosion	
Mar. 20	Chant No. 2	McCurtain, Okla.	San Bois Coal Co.	74	Gas explosion	105 men underground
Mar. 26	Jed	Jed, W. Va.	Jed Coal & Coke Co.	81	Gas explosion	93 men underground
Mar. 27	Navigation	Bedwas, Wales		3	Gas explosion	
Apr. 21	Coil	Madison, Ky.		6	Explosion	
Apr. 30	Yubari	Yubari, Yezo, Japan	Hokkaido Coal Co.	283	Gas explosion	
Apr. 30		Marvel, Ala.	Roden Coal Co.		Gas explosion	8 injured
May 18		Newport Monmouthshire, England		4	Explosion	Many injured
May 18	Markham	Holybush, Wales		5	Gas explosion in sinking	
May 28	Duke	Hindley, England	Messrs. Crompton & Shawcross	3	Fal of roof	
June 6	Trane	Gilfach Gneh, Wales	Britannic-Merthyr Colliery Co.	4	Gas explosion in sinking	
June 18	Hastings	Hastings, Colo.	Victor-American Fuel Co.	12	Gas explosion	
July 3		Osterfield, Germany		16	Explosion	
July 6	Barnsley Main	Hoyle Mill, Yorkshire, Eng.		3	Explosion	
July 9	Cadeby Main	Cadeby, Yorkshire, Eng.		89	Explosion from gobfire	37 in first explosion 51 in second 1 in later-recovery
July 11	Burnside	Shamokin, Penn.	Philadelphia & Reading Coal & Iron Co.	2	Fall of rock	
July 17	Gayton	Gayton, Va.	Old Dominion Coal Development Co.	6	Explosion	3 seriously injured 90 in mine
July 17	No. 5	South Wilkes-Barre	Lehigh & Wilkes-Barre Coal Co.	3	Gas explosion	4 injured
July 18	Langeliffe	Avoca, Penn.		0	Gas explosion	9 burned
July 19	Lignite Mine	Near Halle, Germany		1	Dust explosion	7 injured severely
July 20	Panama		Ben Franklin Coal Co.	8	Explosion fotlowed by fire	Others injured
July 24	No. 8 slope	Plymouth	Delaware & Hudson Co.	2	Gas explosion	2 injured
July 24	Superba No. 2 Lemont No. 1	Evans Sta., Penn. Evans Sta., Penn.	Superba Coal Co. H. C. Frick Co.	15 3	Stream overflowed mine drowning workmen	
Aug. 8	Lothringen	Gerthe, Westphalia, Ger.		110	Gas explosion followed by fire	23 injured
Aug. 13	Abernant	Abernant, Ala.		19	Gas explosion	58 in mine
Aug. 23	Lincoln		Philadelphia and Reading Coal and Iron Co.	2	Premature explosion of blast	1 seriously injured
Aug 30		Gelsenkirchen, Germany		5	Collapse of platform in shaft	
Sept 3	La Clarence	Calonne-Richouart, Pas de Calais		61 3?	Gas explosion	Normally 350 in shaft, only 70? to 80 at time of explosion
Sept 11	Westende	Duisberg, Germany		5	Gas explosion	
Sept 13	Mineral Springs	Parsons, Penn.		0	Gas explosion	4 badly hurt
Sept 14	Mocanaqua	Mocanaqua, Penn.		0	Gas explosion	5 badly hurt
Sept. 15	No. 7 Netherton	Dudley, England	G. H. Dunn Executors	1	Gas explosion	9 injured
Sept. 16	Coral	Coral, Penn.	Wharton Coal Co.	1	Fire and explosion	2 injured
Sept. 17	Augusta-Victoria	ermany		20	Collapse of partition	
Sept. 26		iddlesboro, Ky.	Continental Coal Co.	3	Explosion of gunpowder	1 severely burned
Sept. 26	Roland Darnell	raig, Okla.		1	Explosion due to blown out shot	Sets fire to mine
	Oak Hill	Clinton Vermillion Co., Ill		2(?)	Shooting after regular hours	
Oct. 25	No. 3	Kansas	Mayer Coal Co	2	Windy shot caused explosion	1 severely injured
Nov 1	Superior No. 2	Superior, Penn.	Latrobe and Connellsville Coal and Coke Co.	2	Fall of rock	2 injured
Nov 8	Simpson Brooks	Lafayette, Colo.		1	Explosion	5 seriously burned
Nov 16	Clifton		Dering Coal Co.	2	Explosion	Shotfirers
Nov 18	Massillon	Massillon, Ohio	Massillon Coal Mining Co.	2	Fall of cribbing and quicksand	
Nov 22	Peoria	Peoria, W Va		2	Gas explosion	
Nov	Barnum	Pittston	Pennsylvania Coal Co	0	Fall of roof	18 injured
Dec. 3	St Martin de Valgalgues	Alais, Gard, France	Nord d'Alais Colliery Co.	24	Outburst of blackdamp	40 men in mine
Dec. 30		Tamaqua, Penn		1	Inundation from another mine	8 rescued after considerable exposure

explosive dust; in the Rocky Mountains, they are learning the inflammability of dried timber; in Ohio, they are endeavoring to meet the mine-fire problem, and in West Virginia, the question faced is that of the leakage from gas wells.

The Unsolved Dangers in Foreign Countries

But foreign countries are also having to contrive answers to new problems as new parts of old fields and new regions are opened. In British Columbia, the trouble is with a roof rock which strikes fire as it falls to the ground. In India is a rock, which breaks loose so suddenly as to create terrible air blasts in its descent. In the deeper workings of Yorkshire, spontaneous combustion in gaseous mines is an ever-present menace. In Germany and France, the outbursts of carbon dioxide create a danger not known in the United States.

At the Alais mine, in southern France, the management has provided rescue chambers, so that men may have a place to which to flee when the gases escape. But such a chamber is of little use when the dust is blown clear to the surface and men are blackened with the projected coal is if they had been burned.

The recent outburst was probably not so severe as to cause the ejection of coal from the shaft mouth, but only those near the landing escaped. They became aware of the accident by the extinguishment of their lights. The shots at Alais are fired from the surface, not to prevent coal-dust explosions from killing the shotfirers, but to protect these workmen from a possible outpouring of dioxide if a crevice is laid bare.

The Explosion in Council

Safety cannot come with a bound. Both operators and men have to be convinced against their will. There is a fight against permissible explosives, safety lamps, the pocket-searcher or some other provision. When the matter is in heated discussion and is about to be settled or shelved on economic grounds, union politics or for the sake of industrial peace, a violent explosion settles the question in a peremptory fashion.

It is to be hoped that we may hereafter have the wisdom to meet the issue before it is thus forced. The evidence seems to favor the idea that eventually the United States may be a leader in the matter of safety.

The Bureau of Mines has done a great deal to enforce the teaching which has been derived from foreign accidents and to popularize the researches which have been made by alien bureaus and commissions. That instruction was preceded and has been supplemented by many ingenious devices which have been originated by clear thinkers at American mines.

There has been too much bickering as to the relative merit of the bureau's work, the labors of the technical press, the ideas imported from abroad, the talent at the mines and the efforts of the inspectorate. Certain it is, that all these factors will eventually combine to make our mines much safer.

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Motor rooms should, when possible, be cut out of stone rather than located in the coal seam. If this is impossible, side walls of fireclay brick should be used. No wood or other inflammable material should be used in their construction. They should be equipped with safety lamps for the detection of gas and pails of sand for use in case of fire, and also with a set of printed rules governing the treatment of persons injured by electric shock. All dust in the vicinity of motor houses should either be removed or thoroughly wet down.

A Spectacular Rescue

Special Correspondence

About noon on Tuesday, Dec. 31, of last year, a break occurred in the East Lehigh colliery at Tamaqua, Penn., which caused the death of one man and the imprisonment of eight others for 34 hours. The mine is operated by E. M. B. Shepp, C. S. Shindel and James Tinley. It is a steep slope 310 ft. deep and it is said that some 20 years ago the same number of men were entombed by an explosion of firedamp and were rescued after nine hours.

The present disaster was due to a body of water standing in the old workings above those now in operation, breaking through and flooding the latter. It appears that danger from this source had been anticipated as, apparently, a bore hole had been drilled through the pillar which failed, some ten days previous, and the water allowed to drain off. After the water ceased running in

Mine Mouth of the East Lehigh Mine

the hole it was assumed that it had all been removed, and the men were permitted to return to work in the adjoining places. It must have been, however, that the hole had simply become clogged.

The break occurred in breast No. 38, about 1710 ft. from the shaft bottom. All the men on the outside effected an escape, although with difficulty in some instances, and those on the inside were caught.

The rescuers had little difficulty in pumping the water out, but it was found that the gangway was choked with débris for several hundred feet. Tappings of the entombed men were heard on the same afternoon or evening, so systematic and determined efforts for rescuing them were undertaken. Over 200 men were employed, the gangs working up to their maximum capacity and being relieved at short intervals. Considerable care had to be exercised in this recovery work, as the conditions in the gangway were quite unsafe. It was 10 o'clock of the following night before the rescue was finally effected.

A Modern Steel Tipple in Pennsylvania

By A. Kauffman*

SYNOPSIS—A brief description of a modern steel surface equipment, having a rated capacity of 4000 tons per day. The plant is divided into two distinct units, each of which may be operated entirely independent of the other. Special provisions are made for effecting a thorough hand picking of the coal.

At Colver, 28 miles from Ebensburg, Penn., on the Cambria & Indiana R.R. is located the new mine of the Ebensburg Coal Co. just recently put into full operation. The surface arrangement at this mine consists of what may be termed a double or duplicate tipple, each a complete unit which can be run entirely independent of the other and having a capacity of loading 4000 tons of bituminous run-of-mine coal per day. The preparation of coal is second in importance only to the cost, and knowing that in order to satisfactorily clean and load this enormous tonnage, new arrangements for picking the foreign matter from the coal must be made, considerable attention was given to the picking tables, and the handling of the slack coal and refuse; also the disposal of rock coming from the mine. Fig. 6 shows diagrammatic views, and Figs. 2 and 1 a view of the approach to, and the outside of, the tipple. There is a storage capacity of 200 cars on each loaded track; the cars have a capacity of 50 tons of coal. They are brought to the foot of the feeder hauls in the tipple by electric motors in trips of from 75 to 100 cars. The motor cuts loose at this point and pushes the trip on the hauls from behind.

These feeder hauls are driven by a variable-speed motor so that a minimum capacity of four cars per minute, or a maximum of six cars per minute, can be obtained. At the head of the feeder, there is a slight incline, allowing the forward car to settle back against the trip, thus making it easy for the attendant to draw the coupling pins. The feeder haul consists of a heavy steel, Link-Belt roller chain, with forged-steel tumbling hooks to engage attachments on the bottom of the mine cars; the drive is fitted with a friction clutch to allow starting and stopping without shutting off the power.

After leaving the feeder the loaded car passes on over a track scale, which is equipped with a quick-weighing dial and then to the Phillips crossover dumps. The empty mine cars, coming from the kickback, are raised to the proper elevation by the empty car haul, which also acts as a trip maker and has a capacity of pushing 75 empty cars around a curve having a radius of 100 ft. Fig. 4 shows the two loaded car hauls in the center and the empty hauls or trip makers at each side of the tipple.

Fig. 1. General View of the Ebensburg Coal Co.'s Tipple at Clover, Penn.

After the mine car has reached the dump, the coal is received by a steel hopper, the bottom of which is fitted with a reciprocating feeder to insure a uniform amount of coal being delivered to the shaking screen; this quantity is regulated by adjusting the length of stroke of the feeder plate. The shaking screen is for the purpose of separating the lump from the fine coal to facilitate the picking of the slack and bone coal from it. The large coal, which passes over the screen, is delivered to the picking band, while the fine portion, which passes through the screen is collected in a shaker chute and fed to a combined slack coal and refuse conveyor located midway between the two picking bands.

These bands are each located over the corresponding loading track, as shown in cross-section. They are of the Link-Belt overlapping corrugated apron type, 60 in. in width, and have 35 ft. of clear length for picking. Moving at a speed of 40 ft. per minute, the picking is done by men stationed along the side of the band. With practically all of the slack coal eliminated and the large lumps spread evenly over the table, an excellent opportunity is afforded the pickers to get at all the impurities; Fig. 5

*Link-Belt Co., Nicetown, Philadelphia, Penn.

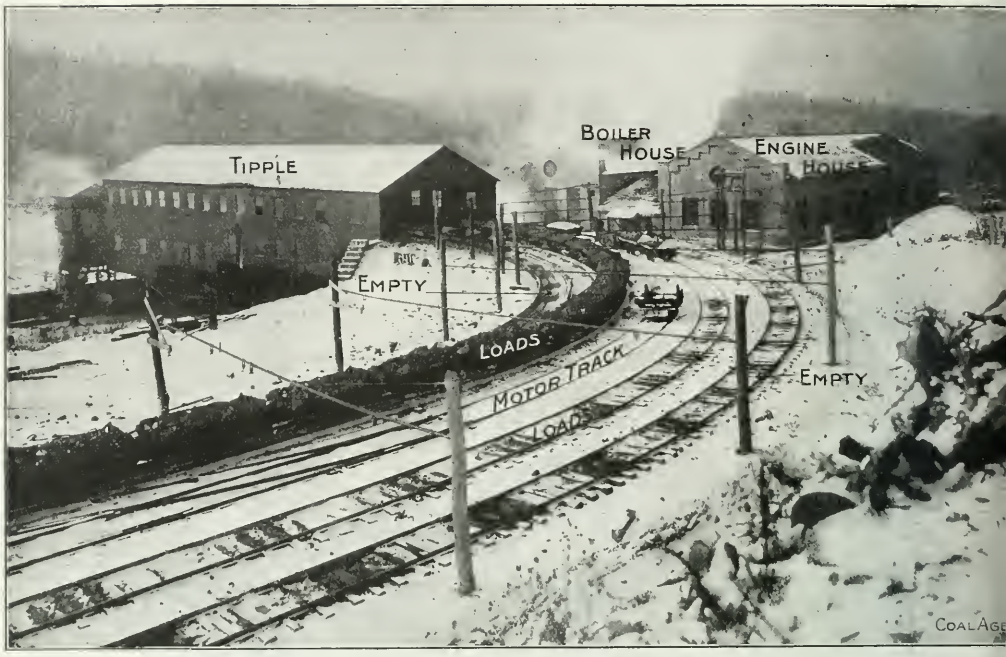


FIG. 2. MINE-CAR TRACK ARRANGEMENT, SHOWING LARGE STORAGE CAPACITY

FIG. 3. NEAR VIEW OF THE TIPPLE, SHOWING THE METHOD OF LOADING CARS

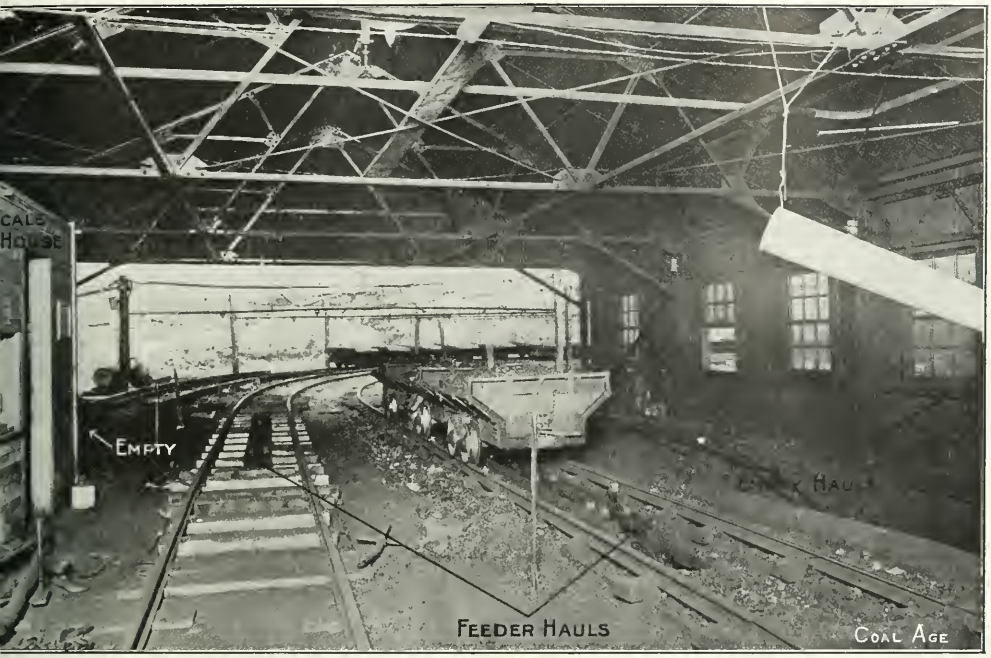


Fig. 4. View on the Tipple, Showing Car-hauls and Method of Operation

Fig. 5. Two Overlapping, Corrugated Apron Type Picking Belts, 35 Ft. Long

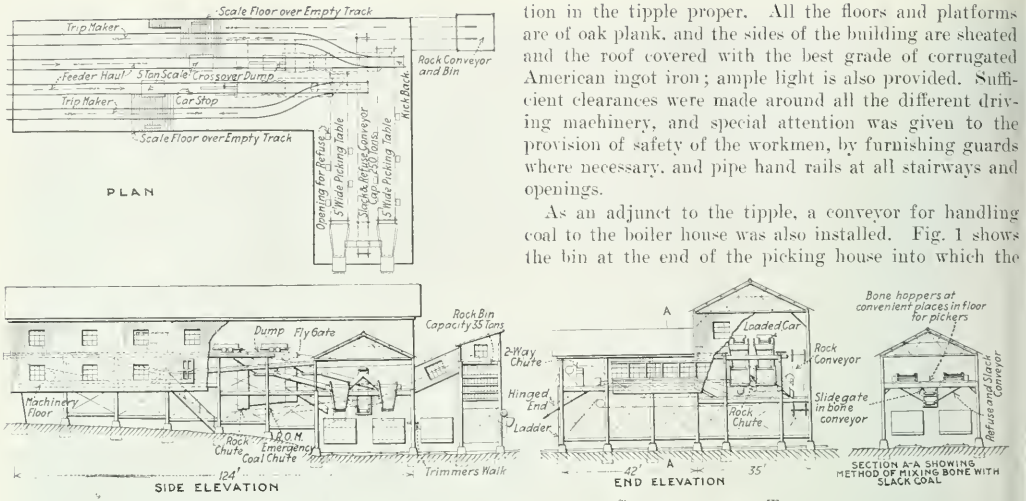


FIG. 6. DIAGRAMMATIC PLAN, ELEVATIONS AND SECTION OF THE TIPPLE

shows two 60-in. picking tables with the bone bins in the center. The conveyor in the center of the two picking tables performs a double function, in that the top run is used for carrying the slack coal from the screens to the head of the picking band, where it is mixed with the picked coal, and loaded as one, into the railroad cars.

The bottom run acts as a refuse conveyor, taking the slate and other refuse delivered to it through the chute alongside the picking tables, and carrying same to the rock conveyor located at the end of the building. The bone coal is stored in hoppers immediately above the top run of the conveyor until such time during the day when no coal is being loaded, when it is also taken by the slack conveyor to a storage bin and then on to the boiler house as described later.

DISPOSAL OF ROCK

The rock being brought out of the mine, along with the coal, the cars are naturally scattered throughout the trip, and to bypass or shunt a car to a rock dump would necessarily cause a delay in the operation of the tipple. Consequently, the rock car is brought along to the Phillips dump, a fly gate is opened in the bottom of the coal-receiving hopper, and the rock is bypassed and fed to a conveyor which takes it to the rock bin located on the outside of the passing track, as shown in Fig. 1. This conveyor is made up of two strands of Link-Belt steel strap roller chain, to which are fastened steel plates, lined with 3-in. plank, thus making a continuous moving apron. Wooden skirt boards, steel lined, form stationary sides throughout the entire length of the conveyor. The machine is electrically operated, the drive being placed at the head of the rock bin. The bin is fitted with a steam-operated Link-Belt under-cut gate (see Fig. 7), which delivers the rock to a larry and takes it to the rock dump.

The tipple is a steel structure throughout, the structural framework being well braced and stiffened to insure sufficient strength and rigidity. Particular attention was given to the design of the shaking-screen supports which are built so as to be entirely independent of any other part of the tipple, thus eliminating practically all vibration in the tipple proper. All the floors and platforms are of oak plank, and the sides of the building are sheated and the roof covered with the best grade of corrugated American ingot iron; ample light is also provided. Sufficient clearances were made around all the different driving machinery, and special attention was given to the provision of safety of the workmen, by furnishing guards where necessary, and pipe hand rails at all stairways and openings.

As an adjunct to the tipple, a conveyor for handling coal to the boiler house was also installed. Fig. 1 shows the bin at the end of the picking house into which the

FIG. 7. ROCK BIN EQUIPPED WITH A STEAM GATE

slack conveyor delivers the bone coal. From here it is fed to a two-roll crusher, the inclined conveyor delivering the crushed coal to the storage bin in the boiler house from which the stokers are fed.

The tipple was designed and the machinery furnished and erected by the Link-Belt Co., of Philadelphia and Chicago. The work of preparing for the installation of this tipple, and the opening of the new mine was under the direction of E. Dawson Coleman, formerly president of the Ebensburg Coal Co., J. Edgar Long and W. D. Kirk.

Notes on Mine Gas Problems—II

By G. A. Burrell*

SYNOPSIS—Carbon dioxide has a more dampening effect on the acetylene and oil-fed flames than nitrogen. The percentage of blackdamp present can be estimated from the brilliancy of the acetylene flame. An acetylene light in air which will extinguish a candle resembles an oil flame burning in normal air. Afterdamp, taken 1/20 of a second after an explosion, contained 8.15 per cent. of carbon monoxide and 2.55 of uncombined hydrogen. Sparrows cannot be kept in captivity; mice are too sluggish and pigeons not sensitive enough for indicators of carbon monoxide in rescue work. Inhalation of that gas does not have a cumulative effect on canaries. Natural gas is not measurably more dangerous than methane in a mine. The rapidity and uncertainty of its entrance makes its occurrence significant. Hydrogen, ethylene, ethane and carbon monoxide are not emitted by American coals.

The bureau has already called attention to the tenacity with which the acetylene flame resists extinction and to the fact that it will continue to burn in atmospheres in which the ordinary wick-fed flame is extinguished. It was found that a residual atmosphere in which an acetylene flame had been extinguished contained 11.7 per cent. oxygen and 6.30 per cent. carbon dioxide.

It was also found that when about one-half of the carbon dioxide was removed as it was formed, the acetylene flame continued to burn in a slightly greater oxygen deficiency. For this last experiment the flame was placed in a gas-tight cabinet having a capacity of 25 cu.ft. The residual atmosphere after the flame had been extinguished had the following composition:

EXTINCTIVE ATMOSPHERE FOR CARBIDE LAMP

	Sample from Middle of Chamber	Sample from Bottom of Chamber
CO_2	3 22	3 17
O_2	10 99	11 12

The bureau has noted that residual atmospheres containing about 6 per cent. of carbon dioxide, closely resemble those encountered in a mine. Where the oxygen has decreased to 11 per cent., an average of about 6 per cent. of carbon dioxide will be present. An objection has been raised to the use of the acetylene lamp, because it is only extinguished when there is grave danger that the men who are using the light will be asphyxiated by blackdamp.

The acetylene, like other flames, burns less brightly as the proportion of oxygen in mine air diminishes. It was observed at the laboratory of the bureau that when the oxygen content of air decreases to about 16 or 16.5 per cent., the flame somewhat resembles the ordinary wick-fed light when the latter burns in pure air, that is, in air containing 21 per cent. of oxygen. This indication can be used as a guide before venturing into workings filled with blackdamp and containing an even smaller proportion of oxygen.

Effect of Carbon Dioxide on Miners' Oil Lamps

The ordinary miner's lamp is extinguished when the oxygen falls to about 16.5 or 17 per cent. This extinguishment is almost entirely due to the oxygen deficiency and not to the carbon dioxide, since this constituent is rarely ever present in sufficient quantity to exert any appreciable effect when the oxygen in mine air drops to 16 or 17 per cent. When a lighted candle was placed in a bell jar filled with ordinary air it went out when the oxygen percentage fell to 16.24 per cent.

The carbon dioxide produced by the burning amounted to 2.95 per cent. When 3.22 per cent. of carbon dioxide was originally in the air, the atmosphere, after the extinguishment of the flame, contained 16.68 per cent. oxygen. When the atmosphere originally contained 13.52 per cent. carbon dioxide, the flame went out as soon as the oxygen content fell to 17.39 per cent. These analyses are tabulated below.

SOME ATMOSPHERES WHICH WILL EXTINGUISH A CANDLE

Experiment No.	Composition of Atmosphere at Beginning of Experiment CO_2	O_2	Composition of Atmosphere in Which Flame Went Out CO_2	O_2
1	0 04	21 00	2 95	16 34
2	3 22	21 13	6 51	16 68
3	13 52	20 67	16 00	17 39

A little difficulty, experienced in thoroughly mixing the atmosphere in the vessel, accounts in part for the fact that the carbon dioxide added and that produced by combustion do not exactly check.

It will be observed that the initial presence of a large amount of carbon dioxide had little effect on the flame extinguishment. These flames were extinguished in a still air; in mines, a jerk of the lamp or slight puff of air would snuff out a diminishing flame in an atmosphere containing slightly more oxygen.

Effect of Vitiated Air on the Luminosity of Miners' Lamps

J. S. Haldane† recently made an important contribution to mining literature when he determined the effect of atmospheres deficient in oxygen on the light of a safety lamp. Mine air always contains less oxygen than outside air. This deficiency in the air which is traveling through the mine may vary from 0.10 to 0.20 per cent. or even more, while at advancing faces under ordinary working conditions, the air may be depleted of 2 or more per cent. of oxygen. Doctor Haldane observed that when the oxygen percentage fell to about 19, the illumination of the lamp decreased 73 per cent. and that, roughly speaking, every diminution of 0.10 per cent. in the oxygen caused a decrease of 3.5 per cent. from the value of the light in the pure air.

Afterdamp

Two samples of afterdamp atmospheres are here presented. They are of interest as showing the large amount of carbon monoxide present shortly after an explosion.

Sample No. 1 was collected 30 min. after an explosion had occurred at the experimental mine of the bureau at Bruceton, Penn. It was taken in the main entry where the first right heading is broken off. Ventilation had been restored at that time in the main entry. Sample No. 2 was taken at the face of the first right butt entry, 100 ft. from where sample No. 1 was collected. Ventilation had not been restored in this heading.

*Chemist, Gas Investigations, Bureau of Mines, Pittsburgh, Penn.

Note—Part of an article read at the winter meeting of the West Virginia Coal Mining Institute, Parkersburg, W. Va., Dec 11, 1912. Continued from Vol. III, p. 104.

†"Colliery Guardian," Oct. 25, 1912.

SOME SAMPLES OF DILUTED AFTERDAMP

	Sample No. 1		Sample No. 2
CO_2	0.26	CO_2	1.54
O_2	20.26	O_2	17.79
CO	0.16	CO	1.89
CH_4	0.12	CH_4	0.65
N_2	79.20	N_2	78.13
	100.00		100.00

Hydrogen was not present in these samples in quantity greater than 0.2 per cent. Samples were not obtained which were large enough to make quantitative tests for sulphurous acid. This constituent is probably mainly responsible for the eye and throat irritation caused by afterdamp. Large samples of such gases are being obtained at the Bruceton mine in order that we may study their composition.

These analyses are instructive as showing that very dangerous atmospheres may exist after an explosion in a mine in close proximity to those wherein men would not soon feel distress. The bureau found that in 0.16 per cent. carbon dioxide, a mouse only shows slight signs of weakness at the end of one hour's time. In the same atmosphere a bird showed signs of distress in 3 min. and fell from its perch in 18 minutes.

In exploring a mine containing afterdamp, a person could, by disregarding the warning of a sensitive animal like a canary, travel in a very short time from an atmosphere which would not distress him into one where collapse would quickly follow.

Automatic Gas Samplers

In order that the chemistry of the explosions in the experimental mine at Bruceton may be better studied, the bureau has lately developed an automatic mine-gas sampler to a stage of completion where it is believed samples of after-gases can be trapped at the time an explosion wave goes by and at prearranged intervals thereafter.

An analysis of a sample collected at the Altofts Experimental Station (England) $^1/_{20}$ of a second after the explosion had passed contained the following constituents:

AFTERDAMP ALMOST UNDILUTED

Gas	Percentage	Gas	Percentage
CO_2	11.25 per cent.	H_2	2.75 per cent.
O_2	1.15 per cent.	CH_4	2.95 per cent.
CO	8.15 per cent.	N_2	73.75 per cent.
			100.00

The high percentage of carbon monoxide will be noticed. The British report calls attention to the presence of oxygen as showing that an inrush of air had taken place even in the short space of time succeeding the explosion. They state that at the instant of the passage of the flame, the oxygen should have been entirely consumed. The gallery at Altofts is above ground, however, and the inrush of pure air would be quicker than in a mine where an explosion had occurred.

Use of Birds for Continued Exploration Work

The bureau has made experiments relating to the use of canaries in continued exploration work, having in mind the fact that the same animal might be used and overcome several times in the same day. It was found that even after they had been repeatedly exposed to carbon monoxide and had as often recovered, upon subsequent exposures they showed distress and collapsed and revived in about the same period of time as on the first exposure. Consequently these animals can be used again and again for all practical purposes, with the knowledge that they will not be less or more sensitive to whitedamp even after repeated exposures. No parallel can be drawn regarding the effects on men of carbon monoxide from these experiments. Men have been months recovering from severe cases of poisoning, and the after-effects have been formidable. To show how differently carbon monoxide affects men and animals, the following experiments performed by the bureau are here tabulated.

PHYSIOLOGIC EFFECTS OF CARBON MONOXIDE

Quantity of CO used—0.25 per cent.

Subject	Time Exposed	Distress	Collapse	Recovery
Canary	3 min.	2 min.	3 min.	7 min.
Mouse	12 min.	6 min.	12 min.	25 min.
Man	20 min.	1 hr.	not determined	8 hr.

Whereas the animals were left in the mixture until they collapsed, the man left the atmosphere experiencing but little discomfort at the end of 20 min. One hour later he became very sick.

Use of Sparrows for Recovery Work

The bureau has attempted to use English sparrows for recovery work in mines, but with little success, because those so far obtained have not survived captivity. Pigeons are not sensitive enough, for at the end of 11 min. in an atmosphere containing 0.25 per cent. of carbon monoxide, they showed but slight signs of distress. Mice are more sluggish and not so easily affected as canaries, but they are useful nevertheless. A mouse and a canary together would make a good combination. The usefulness of small animals for detecting bad air in mines has been so well recognized in England that the law requires them to be kept at collieries.

Escape of Natural Gas into Coal Mines

Natural gas has found its way into some coal mines with disastrous consequences. Old abandoned wells are an especial menace in that nobody knows the exact whereabouts of some of them. Natural gases of the Appalachian fields contain other paraffin hydrocarbons than methane, principally ethane. The following analysis shows the composition of the natural gas used at Pittsburgh. This gas is drawn largely from West Virginia, but some comes from western Pennsylvania.

COMPOSITION OF NATURAL GAS AT PITTSBURGH

Gas	Symbol	Percentage
Carbon dioxide	CO_2	trace (less than 0.10 per cent.)
Oxygen	O_2	0.00
Methane	CH_4	82.5 per cent.
Ethane	C_2H_6	16.0 per cent.
Nitrogen	N_2	1.5 per cent.

Carbon monoxide, hydrogen or ethylene are not contained in the gas, not even in traces.

Below are shown the explosive limits of methane-air mixtures, and Pittsburgh natural gas-air mixtures. Ignition was effected by a small electric spark from an induction coil.

LIMITS OF EXPLOSIBILITY OF METHANE AND NATURAL GAS

	Methane	Natural Gas
Low limit	5.50 per cent.	4.92 per cent.
High limit	12.40 per cent.	11.40 per cent.

Below are given the ignition temperatures of methane and ethane, determined by Dixon & Coward[1].

IGNITION TEMPERATURE

Gas	Degrees Centigrade
Methane	650–750
Ethane	520–630

It does not appear from the above that natural gas

[1] "Chemical News," Vol. 99, 1909, p. 139.

is so much more sensitive to inflammation than methane as to produce an added menace from this cause should it escape into a mine. Sudden inrushes of large bodies of inflammable gas have not always been sufficiently controlled to avert disaster. It is also fortunate that carbon monoxide is not present in the gas for its escape into a mine would produce an additional danger. Many published analyses show that natural gas contains this constituent, but the statement is erroneous. Higher paraffin hydrocarbons than methane in natural gas give to the latter its characteristic oily odor.

Inflammable Character of the Gases Present in Mine Air

The bureau has almost ready for publication a report showing the exact character of the inflammable gases present in many samples of mine air. In many textbooks, the statement is made that hydrogen, ethylene and ethane and even carbon monoxide may be present in mine air under normal conditions of operation. As far as the authors of these books are concerned, they are justified because analyses showing these constituents have been reported occasionally.

Because these gases are said to exist in mine air, the question has at times been raised regarding the application to mining conditions of experiments performed in the laboratory or in testing galleries in which methane or the nearly similar natural gas is used. In the report of the bureau, mine-gas samples are listed from about 50 mines, and the methods of examination are described.

It is shown that in no case are any of the gases mentioned present, except in some mines round the oil regions, into which natural gas may have escaped, and as a consequence other paraffin hydrocarbons than methane found. It is also proved that very small errors, which can hardly be avoided in the manipulation of many forms of gas-analyzing apparatus, may result in the reporting of one or more per cent. of combustible gases other than methane. Of course, if a careful analyst reports these gases in even a few samples, then one is justified in suspecting that they may occur in others.

Various Conflicting Definitions of Blackdamp and Firedamp

Blackdamp is still sometimes wrongfully used as if meaning carbon dioxide, instead of a mixture of nitrogen with that gas. Carbon dioxide usually plays but a small part in the combustion effects produced by the mixture. The deficiency of oxygen, which always accompanies excessive proportions of blackdamp, is the main factor in flame extinguishment in mines. On the other hand, any physiological effects produced in men when they are in atmospheres in which lamps do not burn, are largely due to the carbon dioxide. This statement has reference to atmospheres in old workings, etc., and not to those that have been vitiated by mine fires, explosions, etc., and wherein carbon monoxide might exist.

Different meanings have been attributed to the word firedamp. To some it means methane, to others any mixture of methane and air. That other gases than methane may frequently be present is sometimes stated. The writer believes the best definition to be; any inflammable mixture of methane and air. This definition is used by some at present.

Afterdamp

Sufficient data are not at hand to describe completely the constituents present in afterdamp. That the products of incomplete combustion of methane, coal dust and air can be quite complex, is shown by work already performed on single gases and air. This statement has reference to the immediate after-products of an explosion.

After a stagnant mine atmosphere has been clarified of smoke particles and easily condensible gases that irritate, a clear atmosphere can remain for a long time, containing oxygen, carbon dioxide, nitrogen, methane, hydrogen and carbon monoxide. In this atmosphere a lamp may burn fairly well, with no flame indication. Only the characteristic burnt odor will reveal to the senses the fact that there has been an explosion, but the atmosphere may be fatal because of the presence of carbon monoxide.

Largest Mine Hoist in the World

An order, for what is thought to be the largest mine hoist in the world, has been recently placed with the Nordberg Manufacturing Co., Milwaukee, Wis., in competition with both German and English bidders.

The hoist is to be used at the Inverness Railway & Coal Co.'s mine at Inverness, Cape Breton Island, and is of the Nordberg-Corliss, duplex type. The cylinders are 34 and 34x72 in., and the hoist is provided with two drums, each of which is equipped with a Nordberg axial clutch and post brake, enabling independent operation of either.

The hoist is designed for the following service: A train of 12 cars, each weighing 1150 lb., and containing one long ton of coal, must be hauled up a 10,000-ft. incline, which is 16 deg. at the surface and 35 deg. at the bottom. This makes the pull on the rope about 41,000 lb., and in view of this rope stress and the length of cable, this hoist is thought to be the largest ever constructed.

Hoists with larger cylinders have been built for the copper-mining business, notably the two Nordberg hoists at the Tamarack mines in Calumet, Mich., but these are surpassed in the present case in the two particular features mentioned.

As might be expected, the brakes, clutches, reverse and throttle are not operated directly by hand, but by auxiliary engines.

A British Coal Exporter Here

That Wales and the other British coal-producing centers fear an American invasion of their South American trade was evident from the remarks of D. A. Thomas, head of the Cambrian Combination, who is now in New York. He said he expected to remain for a month inspecting coal fields and investigating American methods of mining. His remarks follow:

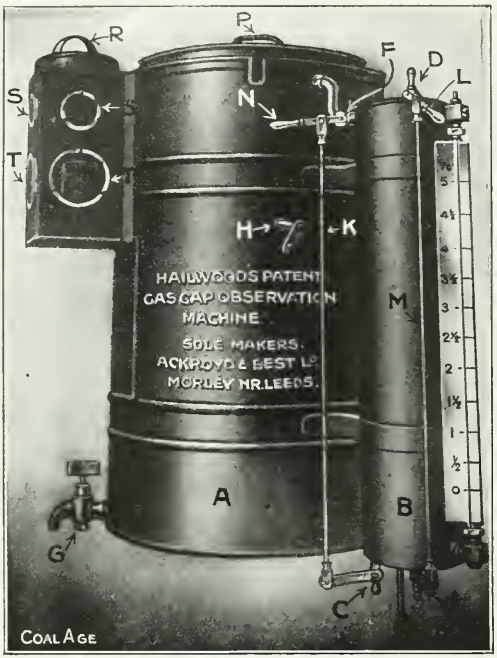
> In South Wales we produce the finest hard coal in the world, but in the cost of production we are not on a level footing with the American companies. In spite of a vast difference in carrying distance the rates in America are so much lower than ours that your coal can be delivered at the sea coast cheaper than we can do it.
>
> These factors have made the Welsh mining interests a bit fearful of their South American trade.

Mr. Thomas said that he might look over some properties with a view to purchasing them.

A New Apparatus for the Observation of Gas Caps

FOREIGN CORRESPONDENCE

Messrs. Ackroyd and Best have just placed on the market a new apparatus for use in the observation of gas caps. This appliance is illustrated herewith. It consists of a large drum marked *A* and at the right-hand side of the same is a measuring drum marked *B* and at the left-hand side, a receptacle for holding almost any kind of lamp. The lamp is placed in a water-ring seal,



AN APPARATUS FOR DETERMINING THE ABILITY OF FIREBOSSES TO DETECT FIREDAMP

so arranged that the pricker wire can be easily operated from the outside.

THE GAS MIXTURE CAN BE REGULATED AT WILL

The appliance is adapted for use with gas from the municipal mains or from high-pressure cylinders. To work the apparatus the bottom tap *C* is opened and the measuring chamber *B* filled with water. A gas tap *D* connected to either the gas service or the cylinder of compressed coal gas, is then opened.

By opening a tap *J* almost all the water is now allowed to pass from the measuring chamber, gas entering and taking its place, a little water up to the level of the zero mark being left at the bottom to form a seal. Tap *E* is then momentarily opened permitting the escape of the surplus gas so that the contents of the measuring chamber are reduced to atmospheric pressure.

Tap *F*, in a pipe which communicates between the upper part of the measuring chamber and drum *A* is then opened. Water is simultaneously allowed to reënter the bottom of the measuring drum *B* through tap *C* till it reaches the desired level, as indicated by marks at the back of the water gage connected to drum *B*. Each division on this scale represents the quantity of gas which, when passed into the chamber (which is normally full of air) adds to it one-half per cent. of gas. Thus to obtain one per cent. of gas in the drum it is only necessary to pass water into the measuring cylinder to cover two divisions of the scale.

THE CARBON DIOXIDE IS REMOVED

To allow an equivalent quantity of air to escape from drum *A*, a tap *G* in the base of same, is opened while gas is being driven into the drum and a handle *H* connected with a large mixer is rotated from time to time to blend the mixture adequately. To absorb the carbonic acid given off by the lamp, a tray of caustic soda or ordinary ground lime may be placed in the drum *A*. The lid of that drum is detachable and is closed by a water seal.

Taps *C* and *F* are coupled together by a rod *K* to ensure their working in unison. It may be mentioned that with this appliance, it is an easy matter to change very rapidly from small percentages up to 5 per cent. (a 5-per cent. cap reaching toward the top of the lamp gauze). It may also be noted that the mixing chamber is of comparatively small capacity. If a mixture containing more than 5 per cent. of gas is desired, it may readily be obtained by refilling the small chamber *B* from the mains or from cylinders and operating the machine as described above.

Working with very low percentages the gas cap would remain steady for 15 or 20 min.; when testing high percentages the cap would remain unchanged for a few minutes; the makers, however, recommend taking an average of not more than five minutes for observations of each percentage of gas. If it be desired that each cap be capable of remaining steady for more than five minutes, larger chambers are made for this purpose.

⁂

Greatest Western Coal State

Colorado leads all western states in the production of coal, according to the U. S. Geological Survey, and in 1911 was second only to California in the production of gold. Colorado is also the leading western state in the manufacture of pig iron and of coke and is the leading state in the production of tungsten ores and vanadium minerals. The total value of all mineral products of the state in 1911 was $51,958,239. The following statement shows the values of the principal mineral products in 1911:

Gold	$19,138,800
Coal	14,747,764
Zinc	4,814,562
Silver	3,958,800
Lead	2,755,890

⁂

Prof. E. W. Reiss, in an interesting paper on the fossil plants of the coal seams of England, says that the structure of coal-measure plants can be studied in microscopic preparations as effectively as that of recent plants. It is possible to form some idea of the habit of the coal-measure plants by studying their detailed structure. The wide air spaces in the cortical tissues of Calamitean roots have led to the belief that many of the coal-measure plants were rooted under water or in water-logged soil. Some plants were evidently carried by wind and water to that portion of the country where coal is now found. Fragments of marsh and nonaquatic plants are bedded close together in the coal seams.

EDITORIALS

The New Anthracite Mining Code

That the present mining laws under which the anthracite mines of Pennsylvania have been operated and are still governed are badly in need of revision is evident by the interest recently taken, by both operators and miners alike, in the report of the subcommittee to the commission appointed to revise and codify the present law. As previously announced, the commission held an open session for listening to the arguments and suggestions of coal operators, Tuesday, the 14th; and another for the same purpose on Wednesday, when the miners were heard.

It is pleasing to note the tone of conciliation on the part of the operators in their recommendations to the commission. Among those present at the session were: Col. R. A. Phillips, of the Delaware & Lackawanna Coal Co.; C. F. Huber, Lehigh & Wilkes-Barre Coal Co.; W. W. Inglis and Alexander Bryden, Pennsylvania Coal Co.; W. J. Bennett, Philadelphia & Reading Coal Co.; W. L. Allen, Scranton Coal Co., and W. G. Robertson, operator, Scranton, Penn.

The operators presented a hundred-page typewritten statement, containing many valuable suggestions. Prominent among these was the indorsement of the appointive system of choosing mine inspectors, the appointments to be made by the governor. In reference to this matter, the recommendations of the anthracite mine operators read as follows:

> In addition to the comments offered we are of the opinion that, for the benefit of the service, the change from an elective to an appointive system is to the best interest of the commonwealth, the miner and the operator. The further the position is removed from politics the better it will be for all concerned. We go further and suggest that the term of mine inspector should not be less than five years, provided he shall not be guilty of neglect.

The operators favor the acceptance of a certificate of a miner from other countries; and it was even suggested by Colonel Phillips that the provision of the present law requiring a two years' citizenship before a miner could obtain a certificate, should not be made a part of the new code. It was recommended that a board of qualified miners should be appointed to examine candidates for miners' certificates.

The operators favor a mine inspectors' examining board composed of nine citizens, proportioned as follows: Three mining engineers, three mine foremen and three miners; instead of a board of nine members, composed of four mining engineers and five miners, as suggested in the subcommittee's report.

Colonel Phillips addressed the commission at considerable length, and his remarks were well received as coming from one of long experience in the anthracite region. A gratifying feature in the work of the commission is the disposition on the part of the members to hear all parties and to profit, as far as may be, by their suggestions. It is hoped that this attitude of the commission will be rewarded by the codification of a set of mining laws that will meet the growing needs of the coal-mining industry.

Speaking of the rapid growth of electrical equipment in mines, Colonel Phillips suggested the appointment of a board of expert electrical engineers to draft a law covering the use of electricity in the anthracite mines. This is a good suggestion and it is understood, of course, that the electrical engineers so appointed would be only those thoroughly familiar with mining work and conditions in the anthracite mines.

Mr. Burrell's Address

Inexorable considerations of space compelled us to shorten our remarks relative to Mr. Burrell's address at the West Virginia Coal Mining Institute. The editor has the truly Procrustean habit of cutting us off at lengths to suit the bed in which we must lie. This will be our excuse for displaying our weary, wayworn feet and tattered sandals at the head of this editorial.

We took exception last week to the use of the word "explosion" to cover an inflammation so gentle that, to quote Mr. Burrell: "The flame travels with comparative slowness and can be followed by the eye." It is no wonder that, having entangled himself with such a definition, Mr. Burrell does not agree with us and others who believe an explosion to be both forcible and noisy. No surprise should be expressed that we have placed the low limit of explosibility somewhat higher than he favors.

But we are not disposed to pass on without a threefold commendation of Mr. Burrell. First, he has defined clearly what he means by an explosion. He has not misled people by using a word in an unusual sense without letting his hearers understand what he really means. That practice leading to much obscurity, is only too common in scientific books. Second, he has shown clearly what happens when his "lower limit of explosibility" is reached and when what he terms an "explosion" takes place. Throughout his article, no misunderstanding can arise as to his meaning.

And third, he has called attention to an important point on the scale of inflammability. It specifies a percentage volume at which heat will be generated over a large area, and at which the flame by coming in contact with dust in suspension and with the mine rib is likely to be fed till it may possibly become explosive in a real sense, due to liberated hydrocarbons. We think his so called "lower explosive point" is one, at which, perchance, under natural mine conditions, an explosion might result by reason of added methane, and other gases distilled by the heat of the flame.

E. P. Perman, of University College, Cardiff, Wales, has placed the lower limit of explosibility even lower than Mr. Burrell. To him 2.5 per cent. seems the correct figure, not 5.5, and the higher limit is 21 per cent., which is nearly twice as high as that stated in the address to which we have referred. Such results are so con-

trary to all previous figures that, at first sight, one is prone to regard them as percentages by weight instead of by volume; but the tendency in Great Britain to twist the word "explosion" explains the difficulty.

We do not feel disposed to alter our judgment regarding the canary. That bird may possibly serve the purposes of an indicator of carbon monoxide when helmets are available in sufficient quantities to make exploration work safe and efficient. But where this is not the case, the rescuers will be needlessly delayed in their work by basing their judgment of their powers of safe resistance by so susceptible a bird. In short, the canary unit is too low.

If we assume, with the Bureau of Mines, that the resistance of a canary gives the correct limit for human temerity, then why experiment with a heavy phlegmatic bird like a pigeon. It was to be anticipated that it would have a higher resistance than the bureau desires, without the corresponding advantage of lightness and lack of bulk.

Moreover, we are inclined to believe that it might not show so many intermediate signs between normal conditions and collapse as are afforded by the volatile canary, and further it would possibly be proved that "the resiliency of its nerves," if we may be pardoned for the expression, is unequal to that of the smaller bird. As Mr. Burrell believes that the canary has a power of recovery from afterdamp, as nearly perfect as desired, the pigeon could not be, in that respect, superior.

We are disposed to believe that the test has been prompted largely by the desire to placate those, within and without the bureau, who look upon the use of the canary as undignified. We are not disposed to regard the matter in that foolish light. If the canary is that animal of all animals which will note the moment for retreat or for the donning of helmets, by all means let it be used.

Because this bird is the delight of old maids and other childless women, and is dear to the hearts and replenishing to the pockets of the fortune-telling vagrant, is no reason why it should not serve to defend life. We have no patience with those who have regarded the canary as an unpractical introduction and a useless craze. Our objection has always been that the canary succumbed too easily to make it a correct index on which to base human action.

Mr. Burrell, toward the end of his address, attacked the belief that there were other gases in firedamp beside those given in any of his analyses. This conclusion is extremely interesting, as it shows, for instance, that carbon monoxide is not to be feared as a coal emanation in any of our mines and that ethane is only to be expected where gas leaks in from gas and oil wells.

But we do not believe it is safe for Mr. Burrell to deny, without examination, that such gases may be found in Europe, from which source the condemned analyses arise. In some English mines petroleum has been found, and it is needless to point out some peculiarities in European workings, among which are greater heat and depth, outbursts of carbon dioxide, excessive tendencies toward spontaneous combustion and the presence of coal in a granulated condition.

The surmise of Mr. Burrell may be correct. It is true we are not disposed to clothe analyses made many years ago with the authority of those conducted today, nor do we feel any real assurance that spectroscopic determinations are reliable, at least quantitatively. Nevertheless it is not safe to declare that because firedamp is ethaneless here, it also must be free of that hydrocarbon in the Old World.

Finally, seeing that, quite recently, M. Mahler has declared that carbon monoxide is formed by coal from Anzin, Decazeville, Azincourt and Courrières at moderate temperatures, we are disposed to think that it is unsafe to follow this conclusion of Mr. Burrell till the other side has been heard.

The Weather Bureau Mine Service

Some prominence is again given to the influence of atmospheric pressure on mine atmospheres, and the relation of the rise and fall of the barometer to mine explosions, in a circular recently issued by the Weather Bureau, at Scranton, Penn. The circular shows a laudable desire on the part of the Weather Bureau to extend their service and make it of some practical value in the operation of mines, with a view to furnish prompt information of a sudden change of barometric pressure, by telephone to the superintendent or other mine official.

It is a well established fact that mine atmospheres often experience a sudden increase in the percentage of gas, owing to the outflow of gas from large abandoned areas or other void cavities, in the mine, where gas has accumulated. This outflow of gas into the mine workings accompanies any considerable drop or fall of the barometer due to a decrease of atmospheric pressure. The effect in the mine is generally felt from 2 to 3 hr. after the fall of the barometer occurs.

Such are the practical difficulties of coal mining, with respect to the ventilation of abandoned areas, that it is impossible often to prevent the accumulation of dangerous quantities of firedamp in these workings. Such abandoned and unventilated areas are a menace to safe mining.

The equipment of most uptodate mines today includes a standard mercurial barometer, and its readings are closely watched and recorded. It is the custom of cautious mine foremen and firebosses to observe the reading of the barometer before entering the mine. The service proposed by the Weather Bureau is a responsible one and will be appreciated by the officials of those mines having no barometer at the shaft.

The circular reads as follows:

Atmospheric Pressure and Mine Explosions

It is an established fact that the pressure of the atmosphere has a direct bearing on the explosions in coal mines, in that while the pressure is high the gas in the mines is confined in pockets and the danger of an explosion is at a minimum; but, when there is a marked fall in pressure (not necessarily, however, to abnormally low pressure) causing the gas to spread from the pockets where it has been confined, the chances of explosion are greatly increased.

I am directed by the chief of the Weather Bureau to ask that you notify this office if you wish this service, and if so, that you kindly forward the name of the person or mine superintendent that should be notified, together with his telephone number, to the end that the necessary protective steps may be taken.

In this connection I wish to say that mine superintendents can obtain readings from the standard barometers in this office, for comparison with the instruments they may have in use for this purpose; also that on application to this office they can have their aneroids set to compare with weather bureau standard barometers.

WILLIAM DUDLEY,
Local forecaster in charge.

Scranton, Penn., Jan. 13, 1913.

SOCIOLOGICAL DEPARTMENT

First Aid to the Injured

By J. H. Young* and J. L. Simons†

Anyone conversant with the history of the medical profession knows that it is a long unbroken record of differences of opinion. The treatments of today are tomorrow replaced by others diametrically opposite. Upon one subject, however, all members of the medical profession agree, viz., the advisability of enlightening the general public as to the best means of alleviating suffering. For diseases and domestic accidents, well known household remedies are still and have been in use for many years.

The Origin of First Aid

Until a comparatively recent date, however, industrial and other accidents have been tended exclusively by members of the medical profession. Although for a long time it was felt that the physician could not be at or near the scene of all accidents, it was not until the Crimean war, in 1854 to 1856, that the first steps were taken in this direction. On Oct. 21, 1854, Florence Nightingale, accompanied by 34 nurses, started from England for the Crimea to organize a nursing department. Her heroic efforts in this struggle mark the beginning of professional nursing and of first-aid-to-the-injured.

In 1861 to 1865, Clara Barton performed a similar service in the American Civil War, and in 1881, in conjunction with Miss Nightingale and others, she organized the International Red Cross, which today heads all nursing and first-aid-to-the-injured movements, not only in America but throughout the civilized countries of the world.

In 1877, the St. John's Ambulance Association, of London, took steps to meet the want felt for aid in industrial accidents and arranged for holding classes in which the pupils were taught the proper methods of aiding the injured, pending the arrival of medical attendance. The movement met with signal success, and during 1877 and 1878, it was extended to include all the important towns of England.

About the same time, similar movements were started in Germany, France, Belgium and Austria. In 1879, the movement spread to Scotland, but the organization of the St. Andrew's Ambulance Association, in Glasgow, in 1882, with precisely the same object in view, removed the necessity for further activity of the English association in Scotland.

The American Movement Delayed 22 Years

Probably the first case of an American movement of this kind, among those employed in industrial pursuits, was the organization of first-aid-to-the-injured corps throughout the anthracite-coal fields of Pennsylvania. Various authorities differ in stating just where the movement originated, some giving the honor to Dr. George Halberstadt, whose endeavors along these lines with the employees of the Philadelphia & Reading Coal & Iron Co. have met with praiseworthy results, and others claim the honor for Dr. M. J. Shields, now first lieutenant, Medical Reserve Corps, United States Army, but at that time affiliated with the Delaware & Hudson Co.

Doctor Halberstadt's and Doctor Shields' movements, although differing in some small ways, are directed toward the same end. To whomsoever this honor belongs, it is an established fact that first-aid-to-the-injured in industrial plants had its beginning in America about 1899. During the past 13 years, its spread has been so great that today it is an institution recognized, not only by the anthracite-coal operators of Pennsylvania, but by the bituminous-coal companies throughout the United States, by railroads, and, in fact, by almost every industry employing large numbers of men.

Case "A," Bandaging of Simple Fracture of Lower Half of Left Leg

Case "B," Method of Supporting a Dislocated Hip

*Physician.
†Fire Inspector.
Note—Paper read at the meeting of the Panther Valley Mining Institute, Dec. 7, 1912.

The Burden of Accidents

In Great Britain alone, it has been calculated that 17,000 persons, annually, die from accidents. This, of course, represents a small proportion of those temporarily or permanently disabled. One authority calculates this number in England as 1,500,000 annually.

Lynch and Shields, judging from the incomplete records kept in the United States upon this subject, tell us that 500,000 are so disabled, every year. Accepting the figures of Lynch and Shields, which, it will be seen are low in comparison with those given for Great Britain, and considering the earning capacity of each man injured at a conservative figure of, say, $500 per year, we have an annual loss, to victims and their families, of $250,000,000.

From German statistics, which are carefully compiled, it appears that 57.95 per cent. of all accidents are due to the negligence of employees or employers, and 42.05 per cent. to the inevitable risks of the employed. Lynch and Shields estimate, from such records as are obtainable, that in this country percentages run 66 and 34 per cent., respectively. Upon the subject of inevitable risks, Sir Edward Watkin, M. P., an Englishman who has made an exhaustive study of the subject, says in a small pamphlet entitled "Is Accidental Death Inevitable": "I have at last come to the conclusion that a certain proportion of accidental deaths are as inevitable as the measles. All education in the world will not avail to stop accidents which may end fatally." We conclude therefore, that although the greater number of accidents are caused by negligence of employees and employers, that, even could all accidents from negligence be eliminated, there would still be a small number of unavoidable accidents.

The Importance of Early Assistance

A noted surgical writer has said that the fate of any injured person depends chiefly upon the acts of the rescuer into whose hands he first falls. We are in the habit of saying, when speaking of fires, that the first five minutes are the most important. The same holds good in case of accidents, the difference being that in fires the consideration is property, and in accidents it is human life, which is, undoubtedly, of vastly greater importance.

The value of prompt attendance to injuries was clearly shown during the war with Spain, and in the South African conflict. From statistics dealing with these wars, we find that the loss of life and limb has been reduced to the lowest ratio in the whole history of warfare.

There is nothing more important in the event of accidents than that some one with sufficient coolness and information should assume command and begin to set things right. Such a man will rarely fail to be recognized by those less efficient and will usually find it easy to direct them so that they render valuable assistance, or at least, do no harm to the sufferer.

The last remark brings to our minds the objections advanced by a former division superintendent to the training of first-aid men. His objection was that they would do more harm than good by the over-zealous handling of injured persons; that they would probably poke their dirty fingers into wounds, etc. This cannot happen when men are properly trained. Training is incomplete if the proper handling of wounds is omitted. We do not intend to convert first-aid men into physicians and surgeons. We purpose simply to instruct them as to what they should do and what they should not do, in endeavoring to save life, limb and suffering.

Case "C," Bandaging of Fracture at Base of Skull

Case "X," Dressing a Crushed Right Lower Leg

No Accident Is to Be Regarded as Trivial

The first principle of first aid is to do that which is understood to be helpful; the second, to do nothing which is known to be harmful. Should any doubt arise in the mind of the first-aid man concerning the nature of an injury, he is trained to regard the accident as serious until the patient is placed in the hands of a physician.

"A" was injured by having a timber fall upon his leg, causing a simple fracture of a large bone of the left lower leg. He was allowed to walk three miles across a large city to his home, where a fracture was discovered by the physician. Only good fortune prevented the fracture from being compounded and resulting in a six months' to two years' confinement with possible infection and loss of limb, instead of six weeks of practically painless disability.

"B" sustained dislocation of his hip, 55 miles from home, while working on a railroad. Fellow-workmen failed to recognize the trouble and sat him down on the pilot of an engine and thus moved him 55 miles, causing him untold suffering. Had the injury been recognized, medical attention could have been procured in five minutes.

"C" standing on a freight train entering a tunnel

was struck and was unconscious for 10 min. He was revived and the injury not being recognized by his fellow-workmen, he was allowed to walk unassisted 1½ miles to his home. He fell twice on the way and upon reaching the house fell dead from effects caused by a fracture at the base of the skull, as was discovered in a post-mortem examination. Had the injury been recognized and the proper precautions taken, "C's" life might have been saved.

A man, subject to fits, fell on "D," a four-year old girl, and she sustained a simple fracture of the thigh. She was picked up and carried in cars four miles without a dressing of any kind. The physician was not seen for two hours. Fortunately, the fracture was not compounded, but we can imagine the suffering which she must have endured.

To look at the brighter side, we will now cite three cases where nothing but the presence of mind of the first-aid man saved the patient.

"X," a boy, 15 years of age, fell under a locomotive, having his leg totally crushed to the knee. Prompt application of the tourniquet by first-aid men and proper dressing prevented loss of much blood and made it possible to operate on the patient two hours after the accident.

"Y" was run down by detached cars from a trip and had his arm and shoulder crushed. It was impossible to control bleeding by the tourniquet, but the effusion was stopped by an original dressing devised by a first-aid man, who understood the needs of the case.

"Z" was attacked and beaten by four men, with a tea kettle and stove lid, at his home, and was undoubtedly bleeding to death when a first-aid man passing the house entered, controlled the bleeding, recognized that the skull was fractured and treated the patient accordingly. "Z's" life was saved. The emergency treatment of the case was commended by the surgeon of the hospital.

The accompanying illustrations "A," "B," "C" and "X" show the proper method of dressing injuries like those of victims "A," "B," "C" and "X," respectively, referred to in this article.

Safety Boosting Banquet

On Saturday evening, Jan. 4, the United States Coal & Coke Co., at Gary, W. Va., gave its 3d annual "Safety-boosting" banquet. About two hundred persons were present.

The hall was beautifully decorated with spruce and rhododendron and was brilliantly lighted. The object of the banquet was to discuss the prevention of accidents to employees, and the decorations were arranged to impress this more forcibly upon the minds of all present. On the front of the hall, facing the guests as they entered, the slogan of the company, "Safety the First Consideration," was printed in large letters. The invitations also were decorated with safety gems, such as, "When in doubt, take the safe course." "The prevention of accidents and injuries by all possible means, is a personal duty which everyone owes, not to himself alone, but also to his fellow workmen." Even the cigars which were served bore the brand mark, "Safety First."

For the past several years the United States Coal & Coke Co. has been making special effort to reduce accidents to its employees, and while the management feels that it has not made the progress it should, the figures for the past four years show decided improvement. For the year 1912, the total tons of coal produced per fatal accident inside increased 49 per cent. over the year 1911, 104 per cent. over the year 1910, and 190 per cent. over the year 1909.

Premiums for Safety

In order to give the officials an incentive to be constantly on the lookout for dangers which might be the cause of accidents, the company gives a premium each month to its foremen and assistant foremen, who have a clear accident record, and a special feature of the banquet was the "Foreman's Honor Table," at which were seated 19 foremen and assistants who have a clear accident record of 6 months or longer, some as long as 17 months. These men, after having operated their mine sections for 6 consecutive months without an accident, receive a special premium of from $15 to $25.

Notwithstanding the marked improvement that has already been made in the prevention of accidents, it is the intention of the company to put forth a still greater effort to reduce accidents for the year 1913. Each day during the year there will be mailed to every superintendent, mine foreman and assistant mine foreman of the company a short description of some accident which has occurred during the preceding years, with a statement showing how to avoid similar accidents. This is done so that each foreman and assistant will have the question of accidents brought directly to his attention daily. These reports will also be posted at the mines each day, so that the possible causes of accidents will also be brought to the attention of the workmen as they enter the mines in the morning.

When coffee was served, the following addresses were delivered, with Edward O'Toole, General Superintendent, acting as toastmaster:

"Underground Management of Coal Mines, with a View to Eliminating Accidents to Operatives, in Actual Mining," James Booth, Mine Foreman.

"Underground Management of Coal Mines, with a View to Eliminating Accidents to Operatives in the Transportation Department," J. V. Rhodes, Mine Foreman.

"Underground Management of Coal Mines, with a View to Eliminating Accidents to Operatives from Gas and Dust Explosions," A. H. Hahn, Mine Foreman.

A short talk from the Assistant Mine Foreman's "Honor Table" on "How to Keep a Clear Accident Record," Joseph Andring, Asst. Mine Foreman.

"Inspection of Mines, with a View to Eliminating Accidents to Operatives," W. P. Kearns, Mine Inspector.

"Mining Engineering, Relative to Coal Mines, with a View to Eliminating Accidents to Operatives," H. W. Saunders, Division Engineer.

"Mechanical Engineering, Relative to Coal Mines, with a View to Eliminating Accidents to Operatives," C. H. Williams, Mechanical Engineer.

"Electrical Engineering, Relative to Coal Mines, with a View to Eliminating Accidents to Operatives," Eli Clemens, Chief Electrician.

"Superintending of Coal Mines, with a View to Eliminating Accidents to Operatives," F. A. Kearns, W. W. Harding, A. N. Harris and H. T. Graham, Superintendents.

"Statistics on Accidents," H. N. Eavenson, Chief Engineer.

Leisenring Hall

By Special Correspondent

The H. C. Frick Coke Co. built a hall in the year 1912, at its Leisenring No. 1 plant, near the large swimming pool described in our issue of Oct. 5, 1912, and illustrated on the front cover of that issue. The building, which is to be used for the amusement and recreation of its employees, measures 60x30 ft., with a 42x17-ft. side wing.

It is divided into two stories; the basement is a concrete structure and is used as a game and reading room, having installed therein a bowling alley, pool tables, punching bags and other gymnastic apparatus. This room is also used on certain nights as a reading room and school of instruction and at that time is in charge of a paid instructor.

Opening into this game and reading room is a complete lavatory for men, connected to which is a row of shower baths for the use of employees after athletic exercises. The wing of the building, opening into this room, is divided into two sections, one of which is fitted up for a complete kitchen and contains a cooking range, dishes and other utensils. This kitchen is used, in connection with the basement, as a dining room for suppers and similar entertainments.

In the other section of the wing is located a large boiler. This furnishes steam for the heating of the building and for the swimming pool adjacent, and supplies hot water to both. The story above the reading room is used for basketball and dancing, being equipped with basketball apparatus and having an alcove fitted with a piano and seats for the orchestra.

As on the first floor, the wing of the second story is divided into two sections, one of which is a complete ladies' toilet and cloak room, the other being used as a barber shop, the proprietor being the custodian of the hall. Though the two floors are connected by a stairway, access to each floor is provided by ladies and gentlemen's outside entrances.

Managed by Employees' Association

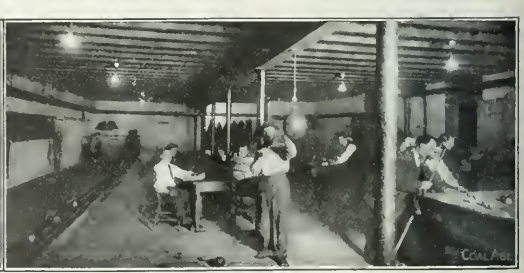
The building, which cost the H. C. Frick Coke Co. about $2500, erected, exclusive of material obtained from an old building of this size, has been put in charge of an association formed among the employees and known as the Leisenring Athletic Association. This body is required to equip and maintain the hall from its treasury.

The association membership fee as fixed by the company is $1 with a monthly assessment of 25c. per member. The present membership totals 85 employees, including members of employees' families. The association, however, is not granted the exclusive right to use the hall, all employees of the company, whether members of the association or not, having free right to its advantages and any equipment therein. The membership of the association has rapidly increased since its formation and the society has thus far received and expended about $300, most of which has been used toward the equipment of the hall. It is estimated that it will require an equal amount to complete its outfitting.

Leisenring Hall, Erected by the H. C. Frick Coke Co.

Front View of the Hall from the Swimming Pool

Room for Basket Ball and Dances, Leisenring Hall



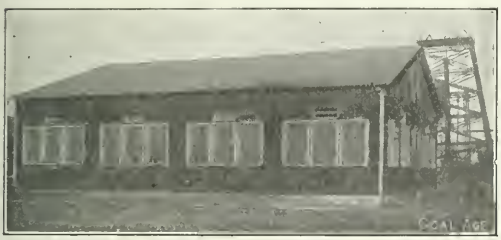
Room for Games and Reading in Same Building

No charge is made for admission to dances or basketball games, the only method used for obtaining money being the association membership, assessment fees and money derived from the sale of eatables at suppers and festivals held in this building. The work of the association is under the charge of a president, vice-president, secretary and treasurer, with executive and house committees.

The association has adopted by-laws regulating its own affairs and providing for the proper use of the hall. These relate particularly to the behavior of employees and association members while in the building. The laws are strictly enforced by the officers of the association and the custodian. The hall, which was built as an experiment, has proved a great success and is being used by old and young, men and women, native and foreign born, alike.

Club Room at Prospect Colliery

The Lehigh Valley Coal Co., under the advice of F. M. Chase, its general manager and vice-president, has installed a club house close to the breaker of the Prospect colliery. Hitherto the workers in the breaker have taken their mid-day lunch either in the dust-laden building itself or in or even under box cars. The latter did not form safe places, as it was not certain but that a shifter might at any time put the cars in motion.



Exterior View of Prospect Colliery Club House Near Wilkes-Barre, Penn.

The building measures 52x56 ft., and is well lighted and ventilated. The walls and ceilings are of cement, and have been prettily decorated by the painters. The dado is painted black, so that the diners will not disfigure the walls by contact with their working clothes.

Dining Room for Employees at Club House, Decorated in Black and White

The walls, however, above this blackened section are white, so that the rooms are light and cheerful.

The chief room of the building is the mess, club or assembly room. It measures 26x56 ft., being well lighted and heated. Benches and tables of varnished hardwood are provided. These are fastened securely to the cement floor and extend the whole length of the building, providing accommodations for about 300 men. This room will be used by the employees when eating their meals, and for conversation, reading and smoking. Appliances are on hand for heating tea and coffee, and fresh running water is on tap at all times.

On the opposite side of the building is the coat and locker room, measuring 20x26 ft. Steel lockers are provided free for each man. The wash room measures 26x27 ft., and

Interior of Mess or Assembly Room, Showing Visitors at Lunch as Guests of Officials

has hot and cold running water. Twenty enameled basins have been installed. A lavatory 8x26 ft., with urinals and closets, takes up the rest of the floor space.

The company will provide janitors free of all cost to the men to look after their club room. But the management of the building will be entirely in the hands of the employees. They will be asked to name their own committees to see that reasonable order is maintained.

Any meeting they may wish to hold may be held in the club room, as the building belongs to them. The extension of the men's club scheme depends on the degree of appreciation shown toward the new plan. If it is successful at the Prospect colliery, more club houses will be built.

While testing Draeger and Meco types of rescue apparatus, it has been discovered that the series of fine wire gages used to prevent the entrance of rust or grit, into the injector nozzle, may possibly become broken, then if small pieces of broken wires, dislodged from the gauze, fall, they may completely stop the passage and cut off the supply of oxygen. This has occurred several times while making tests. The wearer of the apparatus may fall or some other sudden jar or jerk may cause the broken wires to fall, and the man may be rendered unconscious with little or no warning that anything is wrong.

Welfare Work of the H. C. Frick Co.

By Thomas W. Dawson*

Safety, relief, sanitation and welfare, as practiced by the H. C. Frick Coke Co., a subsidiary of the United States Steel Corporation, are so closely associated that I have grouped them under "Welfare," the topic of this paper.

Bureaus of Safety

The United States Steel Corporation has a "bureau of safety" which is intended to assist in coördinating all efforts which are being made among the subsidiary companies for improving the conditions of the employees. It is not only a clearing house for everything of this sort done within the corporation, but it is also an observation station for everything of the kind done by other companies.

It is established to make sure that each subsidiary company knows the best methods adopted everywhere, and also the most successful systems tried by the corporation. The bureaus see that the companies adopt the measures which have been proved to save life.

The Origin of the Expression "Safety First"

"Safety the First Consideration" appears on all letterheads, blank forms, circulars and stationery used at the mine and general offices of the company. This slogan originated with the president of the H. C. Frick Coke Co., which has formulated 25 rules, printed them in pamphlet form, and given a copy in his own language to each workman. The first of these regulations states that:

"Strict compliance with the mining law of the state of Pennsylvania shall be the first duty of each and every employee, at all times, and under all circumstances; and, 'Safety must be the first consideration' of all superintendents, mine foremen and all others exercising authority, or charged with the direction of operations in every department; quality of product, second; and cost of production, third."

Every official and foreman of the company is continually impressed with the fact that safety is to be the first consideration, and all these officials and their subordinates are brought together as one great committee on safety; thus, the strenuous campaign, started several years ago, is being vigorously continued.

The 25 general rules of the company, printed in the various languages of the employees, are posted at conspicuous points about the mine where workmen have the best opportunity to peruse them. Pamphlets setting forth the duties of the miner and the manner in which he may protect himself against danger and giving the safety regulations for those working around machinery have been printed and generally distributed.

The sign significant of danger is the standard sign required by the mining law of the state of Pennsylvania. You will find it at all points in the mine where there is the least possibility of an accident. A similar sign, indicative of the particular danger which may be encountered, is used in and about that part of the plant situated on the surface. These signs are of substantial construction, being made of enameled steel. They have a white background, a red disk in the center, and black letters. Care is exercised to have these in use at all times.

Signs and Locks

When men are working in shafts, the "Men in Shaft" sign is placed so that by no mistake can an accident be caused by the moving of the cages. Where there are explosives, gasoline or inflammable material of any kind, you will see the danger sign indicating the same.

Should a hoisting engineer be repairing or cleaning the machinery in his charge a "Do Not Move" sign is placed at the levers. When workmen are cleaning or making repairs to the inside of a steam boiler, a "Man in the Boiler" sign is displayed. As a further precaution against accident to these men, the steam valve for the particular boiler in which they are working is locked, and one of them carries the key in his pocket, so that steam cannot be turned into the boiler while the men are within the same.

Also when workmen are repairing or cleaning coke-drawing machines, the "Do Not Move" sign is placed on the controller, and as a further precaution those men are instructed to lock the trolley wheel and carry the key until they have finished such repairs or cleaning.

A "No Clearance" sign is conspicuously displayed at all points in and about the plant where there is not clearance for a man between moving cars and buildings, tipples, yard walls and the like. Where tracks approach tipples, bridges or any other overhead obstructions which do not admit of sufficient clearance for a man standing on top of a railroad car, or a teamster sitting on his wagon when passing underneath, bridge guards or overhead warning signs are placed at a sufficient distance from these obstructions, thus giving warning of the danger ahead.

Careless Men Need Not Apply

The man seeking employment observes the sign that unless he is willing to be careful to avoid injury to himself and his fellow workmen, he is not to ask for employment, indicating that the company does not want careless men in their employ.

The sign "Safety First," printed in various languages, is displayed in all the offices, boiler rooms, power buildings, pump rooms and at the mine entrance, reminding the employee that this is to be his foremost thought. A number of these signs are illuminated. They are made of glass on both sides, so that the legend shows in two directions. They are placed at mine entrances, shaft bottoms and in other like places where they will intrude their warning on the attention of the employee and the public.

In the mine, guide signs in the various languages are posted at road junctions, and on traveling ways, indicating the safest way out of the mine.

(*To be continued in an early issue*)

*Assistant chief engineer, H. C. Frick Coke Co., Scottdale, Penn.

Note—Abstract from paper entitled "Welfare, H. C. Frick Coke Co.," read before the winter meeting of the Coal Mining Institute of America, Dec. 18, 1912.

The January meeting of the Nanticoke Mining Institute was held on Jan. 18, in the auditorium of the Susquehanna Coal Co. Papers were read by David Humphreys on "Mine Ventilation," and by Edward Curtis on "Formation of Coal." During the intervals, music was furnished by a double quartette, with Thomas Lloyd as leader.

DISCUSSION BY READERS

Reducing Ventilation at Firing Time

Letter No. 2—I first advocated slowing down or stopping the fan at Iowa mines, during shotfiring time, about n years ago. I did this after giving the matter long d careful consideration in all its bearings and fully alizing my responsibility in the premises. The practice s since become fairly general, in Iowa. Since its adopon, I have not discovered a single case giving the ghtest indication that life or property was endangered; t, on the other hand, I believe it has contributed marially to the safety of shotfirers and the protection of operty.

I had long been convinced that the presence of strong aft, at firing time, is a greater menace than the presce of dust, and later evidence has so strengthened that nviction that I not only recommended the slowing down stopping of the fan, but have since requested the comete closing of the intake openings whenever this seemed me advisable.

The following is an instance. About six years ago additional air shaft was sunk at No. 6 mine, of the noky Hollow Coal Co., in Monroe County, Iowa. The w shaft was located in the midst of live workings, conining considerable narrow work, and was about 1½ iles from the slope mouth and ¾ mile from the fan, nich was generally exhausting. A heavy door was built ar the bottom of this shaft. To prevent the entrance to the live workings of a strong, cold air current, at ing time, the shotfirers, before commencing their work, osed and locked this door, which was not opened again l all the shots had been fired. It was customary to n the fan at a greatly reduced speed for some time fore and during firing time. The only air entering e mine traveled through the main slope a distance of ½ miles before reaching the working face. Notwithnding the fact that many of the places were extremely y, owing to the absorption of moisture by the cold air tering the mine through the new shaft, and windy ots were more or less frequent, no dangerous condions developed and the shotfirers experienced no difflty in doing their work.

The matter of reducing ventilation at firing time may viewed from several angles. In a discussion of this nd, however, the question will naturally be treated rgely from a local rather than from a general standint. I believe that a broader view should be taken the matter. It is more important to investigate the ason for a proposed method or system than to discuss e method itself. Mr. McAllister's method of preventg explosions, for instance, may be objectionable under fferent surroundings, but he seemingly proved its efctiveness in his case and under most trying conditions. hether or not his method is adopted in any mine, is of s importance to the mining men of this country than at they should know and understand the reasons why proved a success in that instance.

Experimentally and otherwise, I found that explosions of fine coal occurred only with a rather intense draft, which always seemed to hasten their occurrence and increase the force of the explosion. I found that to produce a dust explosion the draft must be sufficiently intense and concentrated to pick up and carry the dust along to the flame. If this be true, it is evident that, with the fan stopped and no natural draft, the flame of a shot receives no assistance in the production of draft; and there is an increased margin of safety, because a larger flame and one of longer duration would then be required to make an explosion possible.

Mr. McAllister evidently realized the danger of a strong draft at shotfiring time. He stopped the fan and short-circuited the air; and, finding this still insufficient to stop the dangerous draft, he closed the upcast shaft by doors. The results he obtained speak for themselves.

The method of reducing ventilation at firing time will probably never meet with general approval. In mines where the shots are fired by electricity from the surface, the entire stoppage of draft when firing will probably prove the most effective means of preventing an explosion in the mine. But, much good will have been accomplished if the suggestion arouses an appreciation of the dangerous properties of draft, and the realization of the truth that the magnitude of an explosion is measured by the availability of the air supply as much as by the character and amount of the dust present.

JOHN VERNER.

Chariton, Iowa.

Letter No. 3—The question is: Shall the normal circulation of air, in a mine, be reduced during the time of firing shots? My experience has taught me that a constant supply of fresh air must be kept passing through the entries and workings of a mine, for the following reasons: 1. To remove the foul air produced in the operation of a mine. 2. To dilute and render harmless the noxious gases generated in the mine by the combustion of powder and the explosive gases coming from the coal and strata.

No two mines present the same conditions, however, and what would be an ample provision of air in one mine would prove inadequate in many other mines, working under other conditions. The question of the volume of air required in any given mine to render the workings safe and healthful must depend on the local conditions. But, the present discussion has reference particularly to reducing the normal circulation in a mine before firing shots.

While I believe the normal circulation of air should not be reduced at this time, it is also important that the air current should not be too strong, especially at the working face, where the shots are being fired. A strong air current will raise and carry more dust, which is liable to be ignited by the flame of the shots. The quantity of air passing in any district of a mine should be regulated by a competent

mine foreman in accordance with the requirements of the state mining law and the conditions in the mine. It is important, besides, to give strict attention to the cleaning up of the airways and removing the dust from the roads and spraying all dry working places.

My advice is to keep the velocity of the current at the working face normal and not allow this to be reduced when firing. I believe that it is necessary for the protection of the shotfirers, as well as the health and safety of the workmen. It is also important that all shots should be inspected by a competent person before firing, in order to prevent "shooting off the solid," or firing a "dead hole." Either of these practices is liable to cause a windy shot, which is not only dangerous but the frequent cause of mine explosions.

A. T. WADE.

St. Charles, Va.

Letter No. 4—I have read, with great interest, the debate on the reversible fan, in COAL AGE, and consider these discussions very helpful to men interested in mining.

In regard to the question concerning the reduction of air circulation in the mine, during the firing of shots, it seems to me that this will depend entirely on conditions, as some mines are gaseous, while others are free from gas. If I were firing shots in a gaseous mine, I would not, under any circumstances, want the air short-circuited or cut off, or the amount reduced. I should want air enough to dilute the gases sufficiently to make them harmless, and, also, to drive the smoke and gas out of the places where the shots are being fired.

In my experience, I have found that where the air is stopped the gas accumulates quickly, in mines generating firedamp. In such mines, I consider a sluggish ventilation or any stoppage of the fan extremely dangerous.

In a nongaseous mine, where there is a considerable accumulation of explosive dust, I deem it safer to short-circuit the air, so as to reduce the circulation to a low ebb, in the places where shots are being fired. My reason for this is that the firing of shots in a dusty mine will raise the dust; and a strong current of air will hold the dust in the atmosphere for a much longer time than a sluggish circulation. My idea is that a slow current of air will let the dust settle more quickly, and there is less danger of its being ignited, in case of a bad shot.

W. J. TYSON.

Ideal, Colo.

Letter No. 5—An experience of many years as shotfirer in mines, during which time I have closely examined 17 mine explosions and been in the mine when three explosions occurred, has convinced me that air and not coal dust is the prime factor in producing an explosion.

In proof of this claim I would refer to the many disasters that have occurred in model mines of this country and draw attention to the fact that, in the majority of cases, the explosion started in a portion of the mine where the air was at the lowest temperature and had the highest velocity. I acknowledge that at this point in the mine we naturally find the most inflammable coal dust.

In mines where the fan was reversible I have been able to prove the correctness of my conclusions, by changing the direction of the air current so that the section of the mine that gave the most trouble from windy shots was placed on the last of the air instead of being swept by a cold air current fresh from the outside. By this means the number of windy shots was greatly reduced, in every case.

It is customary, in most mines, to run the fan at practically the same velocity the year round; notwithstanding the fact that, in most cases, in the summer season we must overcome the natural ventilation due to the difference between the outside and inside temperature. In the winter season, natural ventilation generally assists the artificial ventilation in a mine, and it is at this time of the year that the most disasters occur.

I have observed, also, that the old mines with poor ventilation are almost devoid of explosions, except where a fan has been installed to increase the ventilation, or a new downcast shaft has been sunk on the inside workings of the mine to furnish more air. In the latter case, the cold air is brought directly into the midst of the blasting section. I consider any system of ventilation faulty where a cold-air current is brought directly into the workings of the mine at a high velocity.

When in the mine, at the time of an explosion, I have always noticed a heavy rush of air behind the explosive wave. In most cases, the ventilating power was overcome and reversed by this rush of air, until the recoil of the explosion took place, when the force would be exerted in the opposite direction.

I have also observed that, as the explosion advanced against the air current, the pressure on the stoppings was greater as the explosive wave approached the downcast shaft. The stoppings are first subjected to a pressure on the intake side, which is directly followed by a reverse pressure on the return side.

A careful study led me to believe that if the inrush of air behind an explosion could be prevented, a vacuum would be formed there that would soon develop a greater power than that of the explosive wave and arrest its advance. It was this that led me to build doors folding down on the top of the upcast shaft, and which were to be closed during firing time. I have referred to this in a previous letter. Following up my theory, I have endeavored, at different times, to produce an explosion under the conditions explained, but have failed.

In summing up, let me say we all agree that coal dust will explode when intimately mixed with air and subjected to a flame of high temperature. Cold air contains more oxygen per unit of volume than warm air, owing to its greater density, and this tends to increase the temperature of the flame of a blast of powder. The temperature of the flame is further increased by the additional amount of air passing, which carries the most inflammable coal dust stirred up by the firing of the shots. This causes a constantly increasing explosive condition of the air and, being acted on by the flame of succeeding shots, furnishes the combination necessary to start an explosion.

By closing the doors over the upcast shaft and short-circuiting what air is passing, we practically destroy the life-giving property of the flame—the strong air current—and reduce the temperature incident to blasting. My argument is, briefly, as follows: Should an explosion start in a mine, it will advance toward the intake opening, and the closed doors above the upcast cause a vacuum to form behind the explosion, which will soon develop force sufficient to arrest the same.

ALEXANDER MCALLISTER.

Crowcburg, Kan.

Coal Mining in Oil and Gas Fields

Some time ago a correspondent referred in these columns (Coal Age, June 29, 1912, p. 1255), to the danger arising from gas wells in coal fields. The danger mentioned is not confined to gas wells, but is common also to oil borings.

Coal, oil and gas are great natural resources. Coal must be mined; oil and gas must be produced in quantities to meet the ever-growing demands of communities. In West Virginia these industries are developing rapidly and must eventually come into serious conflict with one another. The same condition, no doubt, exists in other states. This situation given rise to many discussions, and considerable has been written on the subject; but much remains to be done before the problem can be solved and the best and safest ways to adopt rightly determined.

Coal and mineral publications, mining institutes, the U. S. Bureau of Mines and in fact, all mining men should discuss and take steps to prevent, as far as possible, catastrophes that may prove worse than even the Monongah, Marianna, or Darr explosions.

An old, abandoned well, whose location has been covered and forgotten is a menace to mining—a great, hidden danger. As has been illustrated at the Enterprise and Middleton mines, in West Virginia, and at a small country bank near Peora, W. Va., a mine may be blown up before actually cutting into such a well. The question of who is, or who should be liable for accidents of this nature may be hard to answer at the present time and under present conditions and laws.

While every uptodate mine manager strives to insure the protection of his property and the safety of his employees, and to produce a large tonnage at a low cost and recover the greatest possible amount of coal per acre mined; an unlooked for explosion may result from the mere proximity to a hidden gas well and upset the most complete plans that an efficient and capable organization could outline.

Several of the large and responsible oil-and-gas companies now realize the seriousness of the situation and consult quite generally with the coal companies affected relative to the location of proposed wells. The oil-and-gas companies will cement around the casing when the well is drilled through a coal seam. There are, however, at the present time, some companies who locate and proceed to drill their wells without making any attempt to insure the safety of the men who some day will mine coal in the vicinity of these wells.

Coal companies operating in an oil or gas field should be compelled to leave a solid block of coal around all wells whose location should be plainly marked on the mine map.

The size of such block of coal will depend on the character, inclination and thickness of the overlying strata, and other conditions relating to the mining of the coal. Many different opinions are advanced by mining men and men in the oil-and-gas business as to who is responsible for the loss of coal left unmined and the accidents that may result from gas finding its way into the mine from the well; and it is pretty hard to determine just what law of equity should be made. Many old drill men claim that cementing a well is not effective, and many old bosses say that uncovering a gas line, under which are mine pillars are being drawn, does little good, but most mining engineers take the opposite view.

In the writer's opinion, a dry hole bored for oil or gas in a producing field, should be considered and treated the same as a producing well. No wells should be allowed to be drilled through the squeezed or abandoned sections of a mine. All oil-and-gas companies should be compelled by law, to protect adjacent mines, from gas issuing from their wells, and to file with the State Department of Mines and the coal companies alike maps showing the correct location of all wells drilled in a coal field. The maps should show all oil and gas lines laid in that district. The coal companies should also place all such locations on their mine maps. Nitroglycerin magazines should never be erected over mine workings where the covering is light.

Mining Engineer.

Clarksburg, W. Va.

The Price of Coal

For some time past I have wanted to comment on the Foreword in Coal Age, Aug. 3, 1912, by the president of an Ohio coal corporation, followed by your footnote, referring to the subject of the poor returns on capital invested, received by those engaged in the production of coal. I would have written sooner, but for the pressure of other work, which prevented.

It seems strange that those who invest their labor and capital in the extraction of a mineral, a ton of which, it is safe to assume, can be made to earn $500, are scarcely able to realize a dollar on their investment. The question arises: Why is this; what is the reason?

An article in the *Technical World Magazine*, March, 1912, by George H. Cushing, gives some interesting facts and figures about buying and selling coal. He states that he buys his coal through a purchasing agent for a certain large consumer, who buys 3000 tons a day. He quotes the agent as saying that if ever the time comes when the price of coal equals or exceeds the cost of production, his company would start to operate mines of their own; adding, if there is any profit in the coal business, our stockholders want it, as we own coal lands that will last for the next 100 years.

Another large industry in Chicago owns 14,000 acres of coal land in Kentucky and 20,000 acres in West Virginia. Another Pittsburgh corporation owns practically all of the Connellsville field of Pennsylvania and has something like 200,000 acres of coal in southern Illinois. Every coal-carrying road holds a large acreage of virgin coal land, or controls the principal coal-producing companies on its lines.

This, it seems to me, is the key to the whole situation. What enables railroads and other large consumers of coal to dictate the price they pay for fuel is the private ownership of land for which they pay only a nominal tax and interest on the investment. If these coal lands were assessed at their true value, the power of these corporations to dictate the price of coal would be broken. This would seem to be the only remedy.

By the use of improved machinery or by changing the plan of working the mine, it is possible to reduce operating expenses; but the benefit, at the most, is only temporary, as sooner or later, the advantage is absorbed by the large consumers.

Special Correspondent.

Chicago, Ill.

INQUIRIES OF GENERAL INTEREST

Coal Required to Heat Water

How many pounds of bituminous coal would be required to raise the temperature of water from 45 deg. F. to 112 deg. F.; the quantity of water used being 3000 gal. per hour?

MINE SUPERINTENDENT.

Clearfield, Penn.

The weight of water used per hour is

$$\frac{3000 \times 231}{1728} \times 62.5 = 25{,}065 \text{ lb.}$$

The quantity of heat required to raise 1 lb. of water 1 deg. F. is called one British thermal unit (B.t.u.). The rise in temperature, in this case, is 112 — 45 = 67 deg. F. Therefore, the quantity of heat required to raise the given weight of water from 45 deg. to 112 deg. F., is

$$25{,}065 \times 67 = 1{,}679{,}355 \text{ B.t.u.}$$

Now, assuming 1 lb. of bituminous coal has a heating value of 14,000 B.t.u., the weight of coal required per hour is

$$\frac{1{,}679{,}355}{14{,}000} = \text{say } 120 \text{ lb. per hr.}$$

This assumes that all the heat of the coal passes into the water, which is never the case in practice. The efficiency of the heating system will depend upon the arrangement and construction. It may be assumed that the coal burned in heating the water has an efficiency of 7 per cent., if burned under a boiler. Taking the efficiency as 6 per cent., the weight of coal burned per hour would be 120 ÷ 0.06 = 2000 lb. or 1 ton per hour.

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Pumping from Different Elevations in a Shaft or Slope

Referring to COAL AGE, Feb. 10, 1912, p. 586, it is stated, in answer to the second letter of correspondent, that it would be advisable to connect the upper sump to the suction line of the pump at the lower elevation, since by so doing the head of water due to the elevation of the upper basin above the pump becomes available to assist the pump in draining that basin.

The argument apparently is that the water from the upper sump would pass through the pump under a pressure due to the elevation of the upper sump above the pump, and this pressure would balance the corresponding head in the column or discharge pipe, whereby the water from the upper sump would be discharged to the surface as economically as if the pump were located at the upper basin.

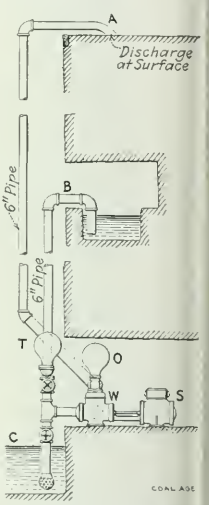
I wish to ask what effect this system would have on a reciprocating pump, as to the action of the suction valves under this pressure; and whether or not the springs controlling the valves would have to be strengthened in order to have the pump work as efficiently as when taking its water under ordinary conditions. If possible, kindly give a reference, in this regard, from someone who has a pump working under similar conditions.

M. J. BRACKEN,
Gen'l Supt., Mountain Coal Company.

Gallitzin, Penn.

The inquiry answered in COAL AGE, to which our correspondent refers, related to pumping from two different elevations, in a slope. The principle is the same whether pumping in a shaft or a slope.

The accompanying figure shows the mine pump located at the lower basin *C*, the column pipe *BC* draining the upper sump, and the discharge pipe *CA* reaching to the surface. As stated in our previous answer, there should be provided two valves, one above and the other below the point where the pipe leading from the upper basin enters the suction pipe of the pump. These valves are shown in the figure. When pumping from the lower basin, the upper valve is closed and the lower valve opened. When pumping from the upper basin, this order is reversed; the lower valve is closed and the upper one opened.



SHOWING ARRANGEMENT OF PUMP AND COLUMN PIPES

No difficulty will be experienced, owing to the pressure on the pump valves, provided the arrangement is such as to avoid a water-hammer in the pipes. This can only be prevented by placing an air chamber at the foot of the pipe conducting the water from the upper basin to the pump. In the figure, *S* is the steam end and *W* the water end of the pump. The usual air chamber *O* is placed on the water end of the pump to prevent water-hammer in the discharge pipe, by maintaining a continuous flow of water in that pipe. A similar air chamber *T* is shown at the foot of the pipe leading from the upper basin to the pump. This air chamber is connected to that pipe just above the valve, and prevents water-hammer in the pipe by maintaining a more or less continuous flow of water from the upper basin to the pump.

William Schwanhausser, chief engineer of the International Pump Co., 115 Broadway, New York City, is authority for the statement that a pump thus arranged will work without difficulty under a pressure due to the head of water on the suction end. In such an arrangement, the only factor to be considered is the inertia of the water columns, which is more or less perfectly overcome by the air chambers connected with the column pipes.

EXAMINATION QUESTIONS

Mine Foremen's Questions

(Answered by Request)

Ques.—(a) What is the angle of inclination and the percentage of grade of a slope that dips 8 in. per yd.? (b) If the slope is 1000 ft. long, measured on the incline, what is its length measured on a map drawn to a scale of 100 ft. per inch?

Ans.—(a) Since there are 36 in. in a yard, the slope dips 8 in 36. Then, calling the angle of inclination of the slope A

$$\tan A = \frac{8}{36} = 0.2222$$

$$A = 12^\circ\ 31'$$

The percentage of grade is found by multiplying the tangent of the angle of inclination by 100. Thus,

Percentage of grade $= 0.2222 \times 100 = 22.22$ *per cent.*

(b) All measurements on a mine map are horizontal distances. The horizontal distance corresponding to 1000 ft. slope measurement is found by multiplying the distance measured on the incline by the cosine of the angle of inclination. Thus.

Horz. Dist. $= 1000 \times \cos 12^\circ\ 31' = 1000 \times 0.9762 =$ 976.2 *ft.*

For a scale of 100 ft. per in., the distance measured on a map drawn to a scale of 100 ft. per inch, is then, $976.2 \div 100 = 9.762$ in., or slightly more than 9¾ in.

Ques.—A cross-heading turned off the main entry is driven due north for a distance of 150 ft., and dips 4 ft. in this distance. The coal seam rises due west 1 ft. in 6 ft. How far east or west from the center of the cross-heading will the line of strike, passing through the face of the heading, cross the main entry?

Ans.—The cross-heading, from the entry to the face, dips 4 ft. Since the seam rises 1 ft. in 6 ft., going due west, the dip of the seam is 1 ft. in 6 ft. due east. The main entry will, therefore, dip 4 ft. in going $4 \times 6 = 24$ ft.; and the line of strike passing through the face of the heading will cross the main entry 24 ft. east of the mouth of the cross-heading.

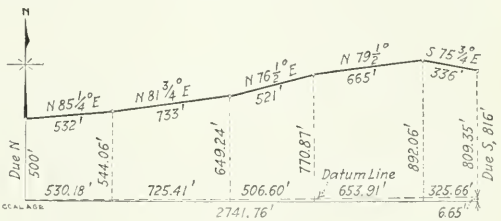
Ques.—(a) How many acres are there in the following described piece of land: Commencing at the southwest corner of the northwest quarter of section 25; thence, due N, 500 ft.; thence, N 85¼ deg. E, 532 ft.; thence, N 81¾ deg. E, 733 ft.; thence, N 76½ deg. E, 521 ft.; thence, N 79½ deg. E, 665 ft.; thence, S 75¾ deg. E. 336 ft.; thence, due S, 816 ft.; thence, westerly to the place of beginning.

(b) If the average thickness of the coal seam is 4 ft. 6 in., how many tons of lump coal can be mined from this tract, allowing 27 cu.ft. of coal, in place, per ton and 20 per cent. waste and 30 per cent. fine coal?

Ans.—(a) The accompanying figure is a plat of this survey. As shown in the figure, the closing course runs west 2741.76 ft., bearing north in this distance, 6.65 ft. The following is the traverse of the survey, showing the *northings, southings, eastings and westings of the several courses, except the closing course.

Bearing	Distance	N.	S	E	W
Due N.	500	500.0			
N 85¼ E.	532	44.06		530.18	
N 81¾ E.	733	105 18		725.41	
N 76½ E.	521	121 63		506.60	
N 79½ E.	665	121 19		653 91	
S 75¾ E.	336		82 71	325.66	
Due S.	816		816 00		
		892 06	898 71	2741 76	
			892.06		
			6 65		

An east and west line through the first station is taken as datum and the total northing of each station, above datum, is calculated by adding the northing of each consecutive course to the total northing of the previous station. The total northing of each station, as thus calculated, is shown on the diagram. The entire area of this survey is thus divided into five trapezoids and one triangle. The area of each of these trapezoids and that of the triangle is then calculated as follows:



PLAT OF SURVEY

	square feet
$\frac{500+544.06}{2} \times 530.18 =$	276,769
$\frac{544.06+649.24}{2} \times 725.41 =$	432,815
$\frac{649.24+770.87}{2} \times 506.6 =$	359,713
$\frac{770.87+892.06}{2} \times 653.91 =$	543,703
$\frac{892.06+809.35}{2} \times 325.66 =$	277,040
$\frac{2741.76}{2} \times 6.65 =$	9,116
Total area	1,899,156

The acreage in the inclosed survey is then $1,899,156 \div 43,560 = 43.6$ acres.

(b) Allowing 27 cu.ft. per ton of coal in place, and deducting 20 per cent. and 30 per cent., respectively, for waste and fine coal, leaving 50 per cent. for lump coal mined, the total tonnage that can be mined from this tract of land, the seam being 4 ft. 6 in. thick, is:

$$\frac{1,899,156 \times 4.5}{27} \times \frac{1}{2} = 158,263 \text{ tons}$$

* The northing or southing of any course is called the latitude of the course, and is calculated by multiplying the length of the course by the cosine of its bearing. The easting or westing of a course is called the departure of the course, and is calculated by multiplying the length of the course by the sine of the angle of the bearing. A course running due north or due south has no departure, and the length of the course is its latitude (northing or southing.)

COAL AND COKE NEWS

Washington, D. C.

It is now understood that Attorney General Wickersham has decided to make a further attack on the so called Hard Coal Trust, by attempting to break up the minor combinations of coal-carrying railroads and coal companies in the Pennsylvania fields, charges against which were dismissed by the Supreme Court without prejudice in its recent decision, because they were held to have been improperly incorporated in the Government's original general bill against the trust.

The work will be in charge of James C. McReynolds, of New York City, who was the Government's counsel in the anthracite trust suit. The attorney-general's idea is to get Mr. McReynolds to clear up the whole situation so far as possible by the proceding which is now contemplated. Mr. McReynolds reported to the attorney-general last week concerning the result of several weeks of study of the general situation and it is understood that he urged that the department go ahead.

The minor combinations not passed upon by the Supreme Court, but left for future consideration and possible action, were those said to have been created in 1898 by the absorption of the New York, Susquehanna & Western by the Erie; in 1901, by the acquisition by the Reading Co., which owned the Philadelphia & Reading Ry., and a coal company of similar name, of the Central Railway of New Jersey with its coal companies; in 1899, by the acquisition by the Erie of the Pennsylvania Coal Co., which is said to have been projecting a new railroad, the Delaware Valley & Kingston.

It is stated that negotiations between the Department of Justice and these concerns are under way looking for a settlement.

Alaska Coal for Testing

Eighty-eight dollars a ton for coal is the rate just paid by the Navy Department for 855 tons, and the department hopes and believes that the money has been well spent. This particular purchase of coal is in the nature of a venture and it is not likely that the Government will buy much more at the same price. But if the venture turns out well it may mean that the United States will be provided with a sufficient amount of coal to supply the entire navy for a long period of years.

The Naval appropriation bill last year contained $75,000 for the development of Alaskan coals. The only way the department could determine the efficiency of this fuel was to get a sufficient quantity of it aboard a ship and actually burn it. Alaska coal has never been brought to market. Billions of tons of it are known to exist, but as yet no means of bringing this fuel within reach of the people have been provided.

The Navy Department was instructed to determine whether there was in Alaska a coal deposit containing fuel in sufficiently large quantities and of proper quality to be regarded as a source of supply for our warships. After Congress granted the $75,000 the Department turned the technical operation of its expedition in search of coal over to the Bureau of Mines, of the Department of the Interior. It was planned to take out about 900 tons of coal from the Bering River district.

The Matanuska field is much further removed from the sea than the Bering River field. The Navy Department is not attempting to solve the Alaskan problem in its present work, but is only concerned in getting out to the seacoast a sufficient quantity to be tested. If it proves satisfactory, a better means of transportation will be devised.

Another Foreign Coal Contract

Strong interest is expressed here in the fact that the Pocahontas Fuel Co. is understood to have made arrangements by which it will furnish coal to the Austrian-Hungarian navy for several months to come. This firm already has the exclusive contract with the Isthmian Canal Commission, shipping about 500,000 tons to Panama per year and is the largest contractor for the coal used by the United States Navy.

Although the State Department is disposed to claim some merit for the progress that American coal has been making of late in the Mediterranean market it would seem that the only reason for this recent success is the high price of Welsh coal which has given American shippers the advantage.

Secretary of the Interior, Walter L. Fisher, has written a long letter to the Senate Committee on Indian affairs concerning the resolution extending the time for the appraisement of the coal lands of the Indians in Oklahoma The measure has been favorably reported to the Senate. Secretary Fisher says in part:

To work out this problem in justice to the owners of the land (the Choctaw and Chickasaw Nations), as well as the persons claiming to be owners of the improvements, I have provided in the proposed resolution that any person claiming payment for improvements must file his claim under oath within 60 days from the date of the approval of the act with the Secretary of the Interior or his authorized representative, and that if no person shall so assert a claim to the improvements on any tract, such improvements shall be sold as a part of the land.

As a conclusive rule of evidence, I also suggest that if a claim be filed by or on behalf of any person within the time allowed, and no adverse claim be filed within such time, the improvements shall be deemed to be the sole property of the person applying therefor.

It is also recommended that where there is no controversy, improvements be sold and the purchase price, except 5 per cent. to cover expenses, be paid immediately to the owner of the improvements; but that in case two or more persons claim the improvements, and one of them is a successful bidder therefor, the sale be conducted as in the case of purchases by strangers, and the proceeds deposited to the credit of the tribes, subject, however, to withdrawal on order of the Secretary of the Interior for payment to the true owner in the event that the right of ownership shall be finally established by a court of competent jurisdiction.

WILKES-BARRE, PENN.

During the year 1912, the working time for the collieries in and near Plymouth was much less than during the preceding year, due principally to the suspension which began April 1, and continued until May 23. The Avondale colliery, of the D., L. & W. Co., made the best record, showing an increase of 160 days and two hours. This mine was idle 11 months during 1911 on account of a squeeze, which almost flooded the mine.

It is expected the breaker at No. 2 D. & H. Colliery will be torn down during the present year and the coal taken out through No. 5 of the same company. Of 12 collieries whose time was examined for the year, seven worked much less time last year than in 1911. The Nottingham and Lance, of the L. & W. B. C. Co., show a net decrease of 15 days and four hours; Nos. 2, 3 and 5, of the D. & H. Co., a net decrease of 129 days and six hours; Buttonwood and Parrish, of the Parrish Coal Co., an increase of 73 days, 3½ hours; Woodward and Avondale, of the D., L. & W. Coal Co., an increase of 198 days and two hours; Gaylord and Gaylord Washery, of the Kingston Coal Co., a net decrease of 23 days; Chauncey, of the George F. Lee Coal Co., a loss of 19 days; and the Dodson, of the Plymouth Coal Co., a decrease of 128 days and seven hours. Part of this loss in the case of the Dodson, however, was caused by the fire in the Red Ash vein, which laid the mine idle from Dec. 12 to the end of the year.

PENNSYLVANIA

Anthracite

Wilkes-Barre—About 3000 employees of the Henry and Prospect Collieries of the Lehigh Valley Coal Co. went on strike, Jan. 17, because 600 workmen at the mines refused to join the union.

On Jan. 1, it was shown that several men had refused to comply with the demands of the unionists, and a canvass was made of the colliery, following which the men decided to strike. The men, however, returned to work the next morning, and appointed a committee to confer with the colliery and company officials.

Bituminous

Butler—The miners at the Cunningham coal mine went on strike recently, but enough men were found so that the mine did not lose much time.

Connellsville—Baltimore, Philadelphia, Atlanta and Toledo capitalists recently inspected the mines of the Buffalo Creek Coal & Coke Co., in Logan County, West Virginia. The company owns 6600 acres of coal and operates five openings, with a daily output of 1500 tons.

Kittanning—The bridge of the Pittsburg, Shawmut & Northern R.R. which crosses the Allegheny River about 7½ miles above Kittanning, was washed out on Jan. 8. This cuts off all connection between the mines of the Allegheny River Mining Co. on the west bank of the Allegheny with the main line of the railroad. The bridge was only partially completed when the flood came. The center span of the bridge was 400 ft. long.

Pittsburgh—An expenditure of $500,000 for the buildings of the Bureau of Mines, located in this city, is proposed by Congress. A bill appropriating $300,000 has been presented in the House.

The buildings are to occupy the new Magee site, near the University of Pittsburgh. This site is being transferred to the Government in exchange for the Arsenal property, in Lawrenceville.

WEST VIRGINIA

Moundsville—It was expected that the Panama mine, operated by the Ben Franklin Coal Co., would resume work Jan. 13. The high water still covers the low ground about the mine. It is said that the company has considerable work to do on the new machinery, which has just been placed at the mine. The management is taking advantage of the shutdown to get this work done.

The Fort Pitt mine, across the river, which closed down on account of the proximity of the water to the airshaft, was expected to resume work at the same time.

KENTUCKY

Louisville—During the past week the 40-ft. stage of the Ohio River at Louisville has caused considerable embarrassment to the Monongahela River Consolidated Coal & Coke Co. For several days the offices have been accessible only by means of skiffs, and deliveries have been, of course, impossible. In view of the weather, however, which has kept the domestic demand down to the absolutely irreducible minimum, the inconvenience has not been great.

OHIO

Columbus—Columbus shippers are very much interested in the recent ruling of the Interstate Commerce Commission establishing a rate of $1 from the Thacker and Konova fields of West Virginia to destinations in Ohio. This means that there will be competition against Ohio coal for domestic consumption in Ohio.

The 50,000 miners in the Buckeye State through the state organization will petition the Ohio General Assembly to appropriate $10,000 for the purchase and equipment of a mine rescue car modeled after the Federal car. The state mine department has safety appliances, and it is proposed to install them on the car.

INDIANA

Diamond—The McClellan coal mine No. 9, which has been in operation with fair production for the past 12 years, will be discontinued within a few days on account of excessive water, defective pipes, machinery, etc. Pillars, tools and machinery are now being removed.

The last of this month the Zellar mine No. 5, which has been running night and day, will also discontinue. With the closing of these mines a great many miners will move their families to Bunsen and West Terre Haute, where extensive collieries are being built.

Clinton—Six mines in this field resumed work, Jan. 16, following a shutdown of a week. The cause of the strike was an assessment of $1, which was levied on each man who remained away from work because the miners' train was late. The mines involved were the two Miami mines, the Jackson Hill mine and the Dering mines Nos. 5, 6 and 8. All are located on the south switch of the Chicago & Eastern Illinois R.R. The grievance is to be taken up, through the district officers.

Indianapolis—A bill to legalize the taxation of minerals in Indiana has been introduced in the state legislature by C. H. Bedwell, representative from Sullivan County. The bill was introduced because of a recent ruling of the Indiana Appellate Court that mineral is not taxable. The passage of such a measure will mean thousands of dollars annually to the coal counties of the state of Indiana.

Bills have also been introduced for the weekly payment of miners and the separation of coal inlaid and apart from real estate for assessment and taxation.

ILLINOIS

Peoria—On Jan. 16, three men were killed by a premature explosion in the Crescent coal mine, six miles west of Peoria. The explosion let down tons of earth and débris upon the men. Their bodies have been recovered.

PERSONALS

Walter Finley has resigned as general manager of the R. O. Campbell Coal Co., which operates several mines in the Eastern Tennessee field.

O. L. Stearnes has been elected president of the Tri-State Power & Milling Co. Mr. Stearnes is also a promoter of the Appalachian Power Co., of Virginia.

Governor McCreary, of Kentucky, has appointed Henry S. Sizemore, of Hopkins County, assistant state mine inspector, succeeding W. B. Brasher, who recently died.

C. J. Johnson, of Electon, Ala., has resigned his position as assistant superintendent of the Blocton Coal Mine Division of the Tennessee Coal, Iron & R.R. Co. His successor has not been appointed.

Neil McHugh, foreman at the Courtdale Colliery of the Kingston Coal Co., has been made superintendent at the Hadleigh Colliery of the Pittston Coal Co. at Sugar Notch. His successor has not yet been named by the Kingston Coal Co.

Andy Beveridge has resigned his position with the Western Coal Mining Co., with whom he has been connected for the past 35 years. For the past several years Mr. Beveridge has been superintendent of the company's plant at Jenny Lind.

Charles A. Frisbie, of Boston Hill, outside foreman at No. 2 D. & H. Colliery, has been promoted to the general outside superintendency of the company's collieries of the Hudson Division, at Scranton, to succeed the late John Bowers. He will be succeeded at No. 2 by William Steevers, of the Boston Colliery.

Harrison S. Matthews, formerly of Birmingham, Ala., and for some time previous to the receivership of the Alabama Consolidated Coal & Iron Co., vice-president and general manager of that company, has been appointed vice-president and general manager of the Western Steel Co., with headquarters at Seattle, Wash., and has gone there to reside.

G. B. Burchell, formerly general manager of the Maritime Coal, Ry. & Power Co., at Joggins Mines, Nova Scotia, has opened a consulting office at 702 Canadian Building, Montreal, Canada. He expects to spend a few months in England and on the Continent. The carbo-electric plant at Chignecto, which was under his management, was described in the Dec. 7 issue of last year.

C. Dorrance, Jr., is appointed chief engineer in charge of the Mining and Mechanical Engineers' Departments, Fuel Testing and Fuel Inspection Departments, Briquetting Plant and Chemical Laboratory, of the Lehigh Coal & Navigation Co. The mining engineer, chief mechanical draftsman, chief coal inspector and chemist will report direct to him. The title of fuel engineer has been abolished.

L. E. Patton, who has for the past several years been manager of the Birmingham office of Hickman, Williams & Co., has resigned that position and organized the Southern Fuel & Iron Co. for the purpose of doing a general brokerage business. Mr. Patton has a broad acquaintance among the producers and consumers of coal and coke and will no doubt command a good volume of business. He is succeeded at Hickman, Williams & Co. by Day Williams, who has for many years been with the St. Louis office of that company.

TRADE CATALOGS

The Keystone Bulletin No. 25. The Keystone Lubricating Co., Philadelphia. This treats exclusively of the lubrication of mining machinery, with particular reference to mine cars. This pamphlet is well worthy of study by those who have lubrication troubles or excessive bills for pit-car oil. Copies mailed free on request.

The Milburn Oxy-Acetylene Welding and Cutting Apparatus. Catalog Q. November 1912. The Alexander Milburn Co., 1120-1426 West Baltimore St., Baltimore, Md. 32 pp.; 6x9 in.; describing various sizes of welding and cutting outfits and accessories. This firm also manufactures various sizes and types of acetylene lighting outfits, including miners' lamps.

OBITUARY

Edwin L. Wolford, a prominent coal operator in Linton, Ind., died at his home Jan. 14, after an illness of several months. Mr. Wolford was president and general manager of the United Fourth Vein Coal Co., which operates in the Linton field. He is survived by a wife, daughter and three sons.

PUBLICATIONS RECEIVED

TWENTY-FIFTH ANNUAL REPORT OF THE BUREAU OF MINES, MINING AND MINE INSPECTION OF THE STATE OF MISSOURI FOR THE YEAR ENDNG DEC. 31, 1912. By Geo. Bartholomaeus, secretary of the bureau. Cloth, 6x9 in.; 160 pages; one illustration, 20 tables.

The report is replete with much information and valuable statistics relating to the production of coal and improvements in the coal mines of the state. There are three lead and zinc mine inspectors. The coal mine inspectors are: Robert Richards, Bevier; Michael Gavin, Lexington; appointed respectively Apr. 15 and Feb. 15, 1909.

STATE OF TENNESSEE, TWENTY-FIRST ANNUAL REPORT OF THE MINING DEPARTMENT. By Geo. E. Sylvester, chief mine inspector, Nashville, Tenn. Cloth, 6x9 in.; 177 pages.

This report contains a number of tables and useful information and is worthy of special attention. Following a full account of the Briceville disaster, Dec. 9, 1911, at the Knoxville Iron Co.'s Cross-Mountain mine No. 1, the report gives valuable suggestions as to the causes and prevention of mine explosions, and devotes several pages to the discussion of gas and dust in relation to explosions. The use of steam, water sprays and salt are fully discussed, together with the application of stone dust and the need of loading out the dust accumulating in the mine workings. The report further treats the subjects of mine fires, mine laws, permissible explosives and first aid in mine rescue work. Following these are full statistics relating to the production of coal in the state and a description of the coal mines.

RECENT COAL AND COKE PATENTS

Coaling Device. C. C. Leftwich, Council, Va. 1,040,703, Oct. 8, 1912. Filed June 7, 1911. Serial No. 631,772.

Ore Screen. C. O. Michaelson, Omaha, Neb. 1,040,251, Oct. 1, 1912. Filed May 20, 1911. Serial No. 628,574.

Coal-borlng Bit. With renewable cutters and auxiliary bit. George A. Moss, Plymouth, Penn. 1,040,383, Oct. 8, 1912.

Ore Bin Door. Oliver H. Dickerson, Duluth, Minn. 1,041,444, Oct. 15, 1912. Filed April 17, 1911. Serial No. 621,633.

Coal Separator. D. J. Middleton, R. M. Keefer and J. F. Ballamy. 1,040,374, Oct. 8, 1912. Filed Sept. 28, 1911. Serial No. 651,839.

Regenerative Coke Oven. Arthur Gohmann, Stettin, Germany. 1,041,457, Oct. 15, 1912. Filed Nov. 15, 1910. Serial No. 592,476.

Gas Producer. F. Merian, assignor to Forter Miller Co., Pittsburgh, Penn. 1,040,723, Oct. 8, 1912. Filed March 14, 1911. Serial No. 614,477.

Method of Making Hot Producer Gas. Emil Fleischer, Dresden-Alstadt, Germany. 1,041,058, Oct. 15, 1912. Filed Oct. 26, 1910. Serial No. 589,178.

Method of Mining Coal. J. H. Hoadley, New York City and W. H. Knight, Portsmouth, R. I. 1,040,679, Oct. 8, 1912. Filed Dec. 9, 1910. Serial No. 596,495.

CONSTRUCTION NEWS

Great Falls, Mont.—It is expected that in the early spring the Milwaukee R.R. will commence work on the survey for their proposed spur into Everson County, from Denton. The object of the spur is said to be to tap the coal deposits in the Everson field.

Danville, Ill.—The Bunsen Coal Co. is preparing to open a new mine on its property south of Danville. This mine will be the largest and best equipped of any colliery in the middle West. It is also stated that the new shaft will employ more than 600 men, when working at full capacity.

Bluefield, W. Va.—It has been learned that work has again been commenced on the survey for the tunnel of the Norfolk & Western through the Elkhorn mountain. When completed, the tunnel will be about three miles long and its grade almost level. The construction work will require about three years' time.

Holt, Ala.—The Central Iron Co., which has a blast furnace, pipe works and byproduct plant at Holt has broken ground for the erection of 20 additional ovens, thereby increasing the capacity 50 per cent. These ovens are of the Semet-Solvay type.

The Central company has recently completed a blast furnace at a cost of $325,000.

Youngstown, Ohio—It has been announced officially by the Republic Iron & Steel Co. that the new coking plant of the company would be built on 15 acres of land which the company has purchased between the Canfield branch of the Pennsylvania R.R. and Lake Erie & Eastern right of way. The contract for the ovens has already been placed with the H. Koppers Co., of Chicago. The new plant will have a capacity of 1000 tons of coke.

Portland, Ore.—The coal fields in Coos County, in the vicinity of Marshfield, will see active development during the coming summer. Considerable work is already under way and the scope will be enlarged with more seasonable weather. C. A. Smith, who is extensively interested in the manufacture of lumber on Coos Bay, is opening up a new mine on Isthmus Inlet, near Marshfield. A short spur has already been built from the Southern Pacific R.R., from Marshfield to Myrtle Point, and machinery for the mine will be hauled in soon. An electric haulage and lighting system will be installed.

From Coos Bay comes also the report that the old Beaver Hill mine of the Southern Pacific Co. is working on a new shaft and should be in good shipping condition the coming summer. This mine has shipped coal to Portland by steamer for several years, but the output has been rather limited.

NEW INCORPORATIONS

Coshocton, Ohio—The Dailey Cannel Coal Co.; capital stock, $25,000; to mine and deal in coal.

Cleveland, Ohio—The Midway Mining Co.; capital stock, $80,000; mining and marketing coal and clay.

Knoxville, Tenn.—The Hickory Coal Co.; capital, $30,000. Incorporators, N. S. Jenkins, Charles Jenkins, Brown Prosser and others.

Columbus, Ohio—The Burr Oak Coal Co.; capital stock, $35,000. Incorporators, Harry D. Shepard, Scott Dentol, Ulysses D. Beard.

Birmingham, Ala.—The Drennan Land Co.; capital stock, $100,000; to do a general land business and also mining coal and other minerals.

Page, N. D.—The Fargo Lumber & Coal Co.; capital stock, $25,000; filed Dec. 31. Incorporators, M. W. Murphy, E. F. Murphy and M. J. Murphy.

Waukegan, Mich.—Waukegan Lumber & Coal Co.; capital, $35,000; dealing in fuel and building materials. Incorporators, T. G. McGay, D. Q. Harts, J. D. Pope.

Topeka, Kan.—The Cherokee-Girard Coal Co.; capital, $30,000. Incorporators, O. S. Hubert, J. E. McFarland, O. E. Griffin, M. G. Slawson and J. O. Majors.

Trenton, N. J.—The Burns Bros. Co.; capital, $7,500,000. This is a consolidation of the coal companies known as the Burns Bros. Co., and the Curtis-Blaisdell Co.

Powhatan, W. Va.—Tierney Mining Co.; capital stock, $150,000; development of coal lands. Incorporators, E. M. Bush and E. V. Townsend, of Huntington, W. Va.

Salt Lake City, Utah—Articles of incorporation of the Ketchum Coal Co. A. T. Miller is president; F. A. Ketchum, vice president, and G. S. Payne, secretary and treasurer.

Fairmont, W. Va.—The Lehigh Coal Co.; capital stock, $150,000; mining. Incorporators, R. A. Pollock, of Massillon, Ohio; Thomas Williams, B. P. Porter, David Morrison, T. and G. D. Ewert, all of Cleveland, Ohio.

Dover, Del.—The Baker Bend Mining Co.; capital stock, $500,000; to do general mining, milling and refining of ores, metals, etc. Incorporators, Louis K. Stam, Chestertown, Md.; J. G. Gray and M. B. Hawkins, Wilmington, Del.

Cincinnati, Ohio—The Mineral Products Co., of New York City; capital stock, $100,000; minerals and mineral rights. Incorporators, Howard F. Campbell, of New York; Charles H. MacDonald, C. F. Hagedom, H. C. Humphreys and T. J. Keogh, all of Chicago, Ill.

Danville, Ky.—The Abigail Mining Co.; capital, $40,000. Incorporators, George P. Crow, John S. Van Winkle, Mitchell Taylor, Thomas Lanier and Judge B. O. Stone, all of Danville. Judge B. O. Stone and J. P. Harper will have active management of the business at the mine.

INDUSTRIAL NEWS

Laurier, Wash.—W. Pfiefer has commenced work at the Laurier mine. He expects to have two shifts working soon.

Birmingham, Ala.—A miner's safety lamp, the recent invention of Thomas A. Edison, is now on exhibition in Birmingham.

East Liverpool, Ohio—The Tri-State Electric & Ry. Co. has optioned 2000 acres of coal near the Island Run mines along Little Beaver Creek.

Pennsville, Penn.—Preparations are being made to fire the 25 ovens of the Pennsville Coke Co. at its Pennsville plant. The plant has not been run for several years.

Boonville, Ind.—Mine No. 3 has been shut down for an indefinite period because of differences between the miners and operators which could not be adjusted.

Jackson, Wyo.—A 5-ft. seam of good quality coal has been struck six miles southeast of Victor, by Cliff Bros. & Co. A tunnel had been driven 125 ft. into the hill, before the find was made.

Lancaster, Penn.—C. H. Holt and Leroy H. Holt have acquired the coal, lumber, grain and feed business at Landsville, together with the real estate occupied by the business, and a dwelling of Ezra Miller.

Du Bois, Penn.—It is stated by persons in a position to know that practically all of the holdings of the New York Central in Indiana County have been optioned by the Rochester & Pittsburgh Coal & Iron Co.

Altoona, Penn.—The mine known as No. 2, at Glen Campbell, is soon to be put in operation by Eastern capitalists. The workings were recently abandoned by the Irish Brothers Coal Mining Co., and sold with land adjoining.

Birmingham, Ala.—The Pratt Consolidated Coal Co. has begun to ship the 40,000-ton coke contract which it has made with the steel works at Monterey, Mex. The contract calls for the delivery of about 6000 tons a month.

Cleveland, Ohio—The coal men of Cleveland are getting busy and have taken options on some tonnage for Milwaukee in addition to covering a block of something more than a million tons, at 30c., for the head of Lake Superior.

Waynesburg, Penn.—W. H. Brown, of Pittsburgh, has purchased a tract of 1325 acres of coal land in Monongahela Township, from J. V. Thompson and associates, of Uniontown. It is reported that $800 an acre was paid for the land.

Sidney, N. S., Can.—The Nova Scotia Steel & Coal Co. has decided to open a new colliery at the Sidney mines. This brings the total plants of the company up to six, and increases the output from 850,000 to 1,000,000 tons annually.

Pottsville, Penn.—Weston, Dodson & Co., Inc., with operations at Morea and Kaskawilliam, announce that they are thoroughly developing their new operation in the north Mahoney region, from which they expect to ship by next autumn.

Benham, Ky.—The Wisconsin Steel Co., controlled by the International Harvester Co., has a million-dollar coke plant at Benham. This company operates the largest battery of ovens in that neighborhood, and ships its product to northern plants.

The Wallsend plant of the Continental Coal Corporation has recently begun operations. Ovens are also in blast in Pike County, in the Elkhorn district and elsewhere.

Rural Valley, Penn.—Colliery No. 2 of the Irish Bros. Coal Co., which has been abandoned for some time, is to resume operations under a different management. Considerable coal land has been bought in the vicinity recently, which will be developed in the near future.

Connellsville, Penn.—F. M. Coursin, representing a syndicate of Pittsburgh men, has purchased a tract of 2500 acres of coal in Washington County. The prices range from $200 to $300 an acre and the total sum involved is said to be in the neighborhood of $500,000.

Cumberland, Md.—The new steel coal tipple of the B. & O. R.R. in South Cumberland, has been completed, and was tested yesterday. By the aid of this modern tipple, one of the large engines was given its usual quantity of coal in exactly 32 seconds.

Butler, Penn.—There is a rumor that the Buffalo & Rochester Iron Co. will take over the coal interests held at present in Indiana County by the New York Central Road. It is expected that this will mean greater activity in the Indiana County field than ever before.

Bluefield, W. Va.—The Electric Transmission Co. has let contracts for buildings, electric machinery, boilers, etc., for the erection of a power plant at the mouth of the Lee County mines. These units represent an expenditure of $300,000. It is expected that the work will be completed by June.

Birmingham, Ala.—Eastern capitalists will soon undertake big coal development in the Birmingham district. The Panama Coal & Iron Co. has added to its holdings until now its total acreage has reached 35,000. The company already has contracts for a daily shipment of 2000 tons to South America.

Windber, Penn.—The Berwind-White Coal Mining Co. is planning several big improvements in its operating plant at Windber this year. Among these is the installation of a new turbine, at the central power house at mine No. 5, together with the addition of four boilers of the same capacity as those now in use.

Moundsville, W. Va.—The Wheeling Coal & Coke Co. has turned over the lease of 1000 acres of coal in Clay district to the Ben Franklin Coal Co. The minimum royalty is to be $12,000 per annum. The tract in question is that which is held in connection with the Panama mine.

Lock Haven, Penn.—Thirty-eight electric companies, in the counties of Lehigh and Northampton, in the anthracite region, have been authorized to combine and merge into the Lehigh Navigation Electric Co., a subsidiary of the Lehigh Coal & Navigation Co. This combination started through a plan to utilize the culm piles of the coal company.

Jenkins, Ky.—The different mines of the Consolidation Coal Co. are shipping an average of from 12 to 18 cars of coal a day and it is said this output will be practically doubled in the next few months. Coal from the McRoberts mines over the new extension of the Lexington & Eastern is now moving at a lively rate, three of the six mines being busy.

Louisville, Ky.—It is understood that both the Chesapeake & Ohio and the Norfolk & Western railways are in the market for coal cars, the former for 2000 of 70-ton capacity and the latter for 1250, of capacity not known as yet. The additional Chesapeake & Ohio equipment will give a better car supply for tidewater, as these cars cannot go west of Cincinnati or off their own lines.

Whitesburg, Ky.—The Berwind coal interests, operating the Pond Creek Coal Co.'s plants, at McVeight, are spending large sums of money in development work and the outlook is exceptionally bright in that locality for the new year. This plant is reached by the branch of the Norfolk & Western running out from Williamson, W. Va. Other plants in this field are showing unusual activity.

Boonville, Ind.—J. T. Blair, representing a Chicago coal firm, has taken options on 1200 acres of coal land for stripping purposes. He claims to be able to put the coal aboard cars for 35c. a ton. It is reported that the new company has an option on the coal lands of Dr. T. D. Scales, a prominent Democratic politician and coal operator of southern Indiana, in which the consideration is placed at $70,000.

McRoberts, Ky.—The Consolidation Coal Co.'s developments, on Wright's Fork, in the newest section of the Harlan field, have reached a point where its daily shipments over the Lexington & Eastern amount to from 20 to 30 cars. Four out of the company's seven mines are supplying this amount, and when the other three begin shipping the daily shipments of the company are expected to reach an average somewhere between 75 and 100 cars.

Louisville, Ky.—The proposed consolidation of the mines in Muhlenburg and Ohio Counties, in the western Kentucky district, appears to be considerably closer to consummation than was at first supposed. Reports from that section indicate that the representatives of the Du Pont interests on the ground are having considerable success in obtaining options on the properties desired, and it is said that a very short time will see the completion of the deal. If the plan succeeds, the holding company, which will be known as the Du Pont Coal Co., will control the greater portion of the entire output of western Kentucky, inasmuch as Muhlenberg County has for some years past produced more coal than any other county in that part of the state.

COAL TRADE REVIEWS

GENERAL REVIEW

The premiums on anthracite are gradually disappearing and the snappy condition of the trade has undoubtedly given way to what may be considered a slump. Because of the unseasonable weather conditions, and the fact that the summer reduction in the circular is now only about two months off, dealers are becoming decidedly cautious about acquiring new stocks. Consumers are certainly displaying a marked lack of interest in the trade and dealers are beginning to fear that the customary dull period in March, prefacing the April reduction in quotations, will find them overstocked. Some contracts are being renewed at last year's figures. Coastwise shipping has been interfered with by the heavy gales, and, as a consequence, loading has been rather slow.

The first break in a long time on bituminous, occurred during the past week, and there has been a generally receding market, with prices weak and materially off. While there is still a shortage in some few quarters, good-sized tonnages are being offered and large corporations are now buying at lower figures; shippers not only have free coal for sale, but are actively canvassing for buyers. The open winter has been decidedly unfavorable to consumption and operators are coming nearer meeting their contract obligations.

The floods in the Pittsburgh district have interfered with the manufacturing consumption, the mild weather has curtailed the domestic demand, and the prompt market is now quotable at only a little above the contract circular; the river mines are still idle, although they are slowly getting in operation again. However, there is a strong natural consumption, which, together with the delays in transportation, has made the accumulation of an over-supply out of the question.

The high temperatures have affected a falling off in the Ohio market, where prices are lower than at any time during the past five months, particularly on domestic, the steam grades still being fairly strong. It is entirely a weather market and it is believed that consumers have been buying in excess of their requirements for the past 60 days or more. There is a downward tendency in quotations at Hampton Roads, due to the unexpectedly heavy loading at the mines and the diverting of Western tonnages into the Eastern markets, because of the floods. The situation in the Southern markets appears to be somewhat better, there being a fair demand and prices ruling firm; coke is particularly strong, with considerable inquiries from the Western smelters.

The Middlewestern market is weak in all branches, with the exception of steam, which is only fair. The movement on the railroads has been quite free, and considerable demurrage coal has collected on tracks at various points which cannot be moved. The delayed winter has had disastrous results on this market.

BOSTON, MASS.

The week has shown a generally receding market and prices are off materially in bituminous. The Hampton Roads shippers have eased their situation so much that some of them now have coal for sale, and not only that, but are actively looking for orders. The Pennsylvania grades have sagged in consequence, and the continued mild weather and the abundant supply of water power through New England are reducing consumption to the minimum for January. There is still a shortage in many quarters, but the demand is by no means insistent and there is quite a volume of coal being offered at the various distributing points. The big corporations are still buying, but at much lower figures than a week ago. A drop of 40c. about measures the scaling down of the different grades of bituminous for consignment to this section.

Already there are signs of the approaching contract season. It is rumored that $2.85 f.o.b. Hampton Roads, is to be the initial figure for Pocahontas and New River for shipment prior to Oct. 1, and it will be interesting to see how well it carries out. The top contract price in 1912 was $2.70, but by far the most of the business was closed at $2.50@2.60; $2.85 would net $1.45 at the mines, less the selling commission.

All-rail there is much less speculative coal offering. The movement on contract seems to be fairly regular, except where there are restrictions as to kinds of cars. Some of the Pennsylvania districts have suffered from floods and empty cars in transit have been appropriated more or less by connecting lines. The Georges Creek situation is practically unchanged. Shipments are few and far between, and distributors at this end are hard to put to it to keep contractors going. In many cases they have had to admit their inability to do so, and all manner of expedients is being resorted to. Coal from Somerset County, Penn., and from West Virginia is being freely shipped to take care of Georges Creek orders.

The premium market on anthracite seems to be fading away. On rail shipments at least, egg size is quoted at only 10c. over the regular company circular and the slackness of the retail demand has about eliminated fancy-priced coal for the present. Coastwise conditions have been unfavorable of late, and gales have been the steady thing for a week or ten days. Loading continues slow and most of the dealers are getting only enough to keep them in business. There begins to be an accumulation of egg and chestnut in some places, but retailers are still taking these sizes in their eagerness to get stove and pea. It will be a long time before shipments have caught up, although at this end things are apparently easier than at any time since September.

Current wholesale prices are about as follows:

Clearfields, f.o.b. mine	$1.55@$1.85
Clearfields, f.o.b. Philadelphia	2.80@ 3.10
Clearfields, f.o.b. New York	3.15@ 3.40
Somersets, f.o.b. mine	1.70@ 1.95
Somersets, f.o.b. Philadelphia	2.95@ 3.20
Pocahontas, New River, f.o.b. Hampton Roads	3.15@ 3.35
Pocahontas, New River, on cars Providence	4.30@ 4.50
Pocahontas, New River, on cars Boston	4.40@ 4.50

NEW YORK

Anthracite—The past week has witnessed a still further easing off of the hard-coal situation here and it has now reached such a stage that the large companies are beginning to receive cancellations on certain grades. The weather conditions have certainly been most favorable to the hard-coal companies, in view of the shortage of some six million tons in production. The season is now so far advanced, that even the most abnormal weather conditions could not cause any great distress before spring.

As a matter of fact, the operators would like to see a little more activity in the market. With the reduced summer circular going into effect Apr. 1, requisitions for fuel during March are naturally cut to the lowest point possible, so that dealers have now only about one month left in which to dispose of the comparatively high-priced stocks on hand. However, it seems reasonable to believe that the next 30 days will develop some more seasonable weather. The mines are reported as working good, and the car supply is fair and all that is to be expected for this period of the year.

We quote New York prices on both hard and soft coal on the following basis:

	Anthracite		Bituminous	
	Circular	Individual		
Broken*	$5.50	$5.00@5.10	West Virginia, steam	$3.05@3.25
Chestnut†	5.50	6.00@6.15	Fair grades, Penna.	3.15@3.25
Pea*	2.75	3.75@4.35	Good grade, Penna.	3.30@3.40
Buckwheat**	2.75	2.75@2.80	Best miller, Penna.	3.40@3.50
Buckwheat†	2.50	2.40@2.50	Georges Creek	3.50
Rice**	2.25	2.25@2.30		
Rice†	1.95	1.85@1.95		
Barley†	1.75	1.25@1.50		

* Scranton and Lehigh. ** Scranton. † Lehigh and Schuylkill.

Bituminous—For the first time in over a month, there has been a slight break in the soft-coal market. While the effects of this are not yet very clearly felt at tidewater, it is, nevertheless, a fact that concessions under last week's quotations are now readily obtainable in the mining region. This applies more particularly to the lower grades and it is doubtful if the quotations on the better qualities have suffered in any way as yet. While free tonnages are obtainable at the mines, some of the large operators are quite short on their contracts at tidewater.

It is still essentially a weather market, and it is rather remarkable that it has held so good under the unusually unseasonable weather conditions prevailing through the fall and winter. This is only accounted for by the shortage in transportation facilities and, had the weather conditions been as normally, there would have been a heavy shortage at this point accompanied by the usual spectacular market.

Floods in the Pennsylvania district have handicapped operations somewhat, but not seriously. The car supply has been rather inadequate, but there is a fair amount of labor available, and, on the whole, production has been good in the region.

PHILADELPHIA, PENN.

The same unseasonable weather still continues in this vicinity, and as a consequence, there has been a decided falling off in the demand for anthracite. Egg coal is a drug on the market, and while it is understood the large companies are moving off their product, it must be in other directions. The snappy condition of the trade has undoubtedly given way to what might be almost considered a slump. Stove and pea seem to be the only sizes for which there is any demand at all; egg and chestnut cancellations are coming in thick.

It is now simply a question of the weather conditions. It is a fact, nevertheless, that the dealers are not well stocked with any particular sizes, although orders are being filled fairly promptly, that is, for stove and pea, but any sudden cold spell would be likely to bring about a sudden strengthening in the situation. The uncertainty of the weather, however, is causing the dealers to be cautious about laying in stocks of coal that they are likely to be caught with during the month of March, when the trade, as a rule, is rather stagnant.

Prices still remain at the same level, at retail, $6.75 for egg, $7 for stove, $7.25 for chestnut and $5.50 for pea. It is understood that the parties who contract for their fuel requirements at this season of the year, are, as a rule, renewing their arrangements for the ensuing year. The same prices prevailing last year are in effect, with the exception of pea, on which there has been an advance in the contract price of 50c. per ton; the price of this coal has made it practically out of reach of the majority of steam users, and most if not all of this demand has been diverted onto buckwheat, which is $1 per ton less. Pea coal is becoming, more and more a domestic fuel in this market, and the demand far exceeds the supply during most of the winter months.

PITTSBURGH, PENN.

Bituminous—River mines, which were closed on account of high water are still idle, although partial resumptions are occurring this week. The car supply is better, railroads being aided by unusually good January weather. Floods have seriously affected manufacturing operations along the rivers and have somewhat decreased coal consumption, while on account of mild weather the domestic demand is limited. Prompt coal has declined with these conditions and is quotable at but little above regular contract prices, which are well maintained as follows: Slack, 90c.; nut and slack, $1.05; nut, $1.25; mine-run, $1.30; ¾-in., $1.40; 1¼-in., $1.55, per ton at mine, Pittsburgh district.

Connellsville Coke—The market has been uneventful. There has been practically no contract business, while the spot business has been light, much lighter than was expected. Practically the entire production is going out on contracts and little prompt coke is available, so that prices for this have not declined in the face of a small demand. The $4 price for prompt furnace, however, is not invariably maintained. Occasionally a consumer can buy for a shade less, while as a rule a dealer can shade the $4 price enough to make a comfortable brokerage, securing $4 from the consumer, which is usually obtainable. Foundry coke for prompt shipment is not closely quotable for the reason that there is little if any really standard foundry coke available in the prompt market. Foundries caught short must usually be content with furnace coke, sometimes selected and sometimes not, and frequently shipped in open cars. The mere shipment in box cars raises the price to $4.25 or even $4.50. We quote: Prompt furnace, $4; contract furnace (nominal), first half, $3.25@3.50; year, $3@3.25; prompt foundry, $4.25@4.75; contract foundry, $3.25@3.75.

BALTIMORE, MD.

Prevailing open-weather conditions tended to create an easier market in Baltimore during the past week, although one or two of the larger operators reported that they experienced no falling off in the demand. Prices, however, declined from 10 to 15c.; one firm was offering coal at $1.75 and appeared to have plenty on hand to meet all demands.

Local consumers appear totally indifferent to the market, realizing perhaps that weather conditions are such as to permit them to purchase in any quantities desired at a reasonable price. There was practically no spot business during the week.

The car supply appears to be adequate, the train movements are excellent and contract obligations are being carefully met. The output of the mines is also increasing, as the miners are rapidly getting back to work again.

There has been considerable activity at the local coal piers, and at least a half-dozen vessels will load here during the next ten days.

The anthracite trade is feeling the effects of the most remarkable weather conditions experienced in this section for twenty-five or thirty years. All through the week it was too warm to keep fires going in furnaces, and practically all the fuel consumed in the households was for cooking purposes.

BUFFALO, N. Y.

The weather has been doing its best to shut off the sale of coal, but other conditions are such that a moderate degree of dullness is about all that has been accomplished. There is a big natural demand and the slow movement has made it impossible for the operators to flood the market. So far they have not been able to accumulate any great amount of coal at any point and the consumer has to look for his supplies or he does not get them.

With the weather as favorable to freight movements as it could possibly be at this time of the year, and with the rush in the grain business out of the way, there is about as great a shortage of coal cars as ever. The consumption also promises to keep up as business is paying next to no attention to politics. Bituminous quotations will therefore remain rather weak at $3 for Pittsburgh select lump, $2.85 for three-quarter, $2.75 for mine-run and $2.50 for slack, with Allegheny Valley about 25c. less. The coke market holds fairly strong, the high prices remaining on account of the production about reaching its limit of late. Prices f.o.b. Buffalo are still on a basis of $6.25 for best Connellsville foundry.

There is still much water to contend with in the mining districts of the Allegheny Valley and beyond, but at present only the convenience of working certain mines is affected. The running of trains has not been interferred with for a week or more.

The anthracite shippers are getting some orders to hold or cancel former shipping directions but they are not disturbed. A single day of really cold weather would restore the demand in full. Egg coal is plenty and premiums on independent anthracite are down to 75c. on chestnut and $1 on stove.

COLUMBUS, OHIO

With high temperatures prevailing lately, weakness has developed in the domestic trade and prices are much lower than in months; in fact the past week saw the first real easing off in quotations for five months. Domestic lump and ¾-in. are particularly heavy, and the other grades have declined in sympathy with these. Retailers have unusually large stocks on hands, and as a result are not in the market at this time.

Steam business is still the strongest point in the trade. Manufacturing establishments, especially those engaged in the iron and steel industries, and the railroads are taking a large tonnage, while prices are being fairly well maintained. Renewing of fuel contracts is slow as few of them expire at this time.

The car supply is now about all that could be desired. Output in the various mining districts has been curtailed, not by a lack of cars, but rather because of a slack demand. Eastern Ohio is about the only section that reports any trouble over the supply of equipment. The Hocking Valley is well fixed and as a result, production in that district has been about 75 per cent. of normal. Eastern Ohio has produced about 65 per cent., but Pomeroy Bend's output was curtailed by the high waters which flooded a number of mines in that section. West Virginia competition was shut off, a portion of the past week, by the high waters. Both the C. & O. and the K. & M. were unable to run trains from the West Virginia fields to the Ohio side.

While the weather has been unfavorable to an active coal trade in Ohio, still the movement has been good in most lines and prices remain fairly strong. The worst feature of the trade is the growing softness in the domestic lines. This is due to the mild weather which has been prevailing and makes the retail trade rather quiet. The car supply is slightly improved and this aids the operators and jobbers to move cargoes more promptly

This softening, however, has not gone far enough to cause any decline in quotations, excepting the usual shading which is done at all times. The circular which has been in effect since Dec. 1 is pretty well maintained and complaints of price cutting are few and unimportant.

Quotations in Ohio fields are as follows:

	Hocking	Pittsburgh	Pomeroy	Kanawha
Domestic lump	$1 85	...	$2 00	$1 65
¾-inch	1 65	$1 30	1 75	1 40
Nut	1 35		1 75	
Mine-run	1 35	1 15	1 25	1 25
Nut, pea and slack	1 15	...	1 25	1 10
Coarse slack	1 05	1 15	1 10	1 00

CLEVELAND, OHIO

The situation in the coal trade here is largely a weather proposition. Producers and shippers are convinced that consumers have purchased coal in excess of their requirements for the past 60 days. Buyers are fairly well fortified against a scarcity of fuel and in many cases have suspended shipments temporarily. Slack which is the ruling factor on the Cleveland market has weakened to the extent of 10c. a ton.

Quotations per net ton f.o.b. mines are as follows:

District	Freight Rate	¾-in.	Mine Run	Slack
Youghiogheny	$1 00	$1 35	$1 25	$1 05
Pittsburgh No. 8	0 90	1 20	1 10	1 05
Goshen No. 6	0 70	1 35	1 25	1 20
Coshocton	0 70	1 75	1 50	1 10

Hocking Lump which was sold at $2 in the early fall has dropped to $1.60 at the mines. Pocahontas lump and egg is quoted at $2.50, run-of-mine, $1.35, and slack, 90c. Massillon lump is going $2.50 at the mines. Prices on coke are steady at about $3.50 f.o.b. ovens for contract and $4 for spot furnace with about 50c. added for foundry grades. Production in Jefferson and Belmont Counties is at an abnormally low ebb, the high water in the rivers and tributary streams having lessened the output of the mines and tied up railroad traffic.

It will be late in the season before the Lake fleet can get coal to the docks if the mines shut down for any length of time in April, 1914. Dock companies expect to be prepared for a suspension then by carrying the maximum capacity of coal on upper lake docks at the close of 1913 season. To accomplish this a large volume of bituminous and anthracite will be shipped via the Great Lakes this year.

The following letter, signed by C. W. Galloway, general manager of the Baltimore & Ohio R.R. was mailed to all mine operators recently: "The movement of freight tonnage throughout the United States is the heaviest known. On account of the extreme car shortage it is necessary that greater efficiency than ever before be secured from freight equipment. Careful checks of cars received from mines underloaded with coal, have shown that equipment is not being loaded to its full physical carrying capacity. Will you not kindly coöperate with us by loading cars to full limit. Every ten cars so loaded means a car saved."

HAMPTON ROADS, VA.

Prices of New River-Pocahontas coal have had a downward tendency during the past week owing to the warm weather, the unexpectedly heavy loading at the mines and partly to the diversion of considerable Kanawha gas and splint coals from the West to tidewater. This latter was due to the interruption to westbound traffic by the collapse of a bridge over the Guyandotte River, on the Chesapeake & Ohio Ry., near Huntington, West Virginia.

The New England market seems to be taking no coal except for contract requirements and but few spot sales have been made. $3.15@3.25 f.o.b Hampton Roads, is about the ruling price at present and sales have been made at both those figures. A cargo (5000 tons) of Kanawha coal was sold for New England at $3, but this grade is now offered at $2.82.

The car supply at the mines has been somewhat better than during the past ten days, which may be ascribed naturally to the light loading during the holidays and also to the better movement by the railroads The Virginian Ry. has been doing exceptionally well in this respect; on Jan. 10, some 410 cars were loaded, the heaviest day's loading they have ever had.

A new harmony movement was started by this road last week when all representatives of coal sales agencies at Norfolk, were invited to luncheon by the company to discuss various questions of handling their coal at tidewater. It is proposed to have similar meetings once every month, a plan that might advantageously be followed by the other railroads.

The United States Navy has recently closed contracts for the next six months' supplies of New River-Pocahontas coals at $3 per gross ton f.o.b. Hampton Roads, an advance of 30c. over last year's price. The export and bunkering business continues fairly heavy, the respective tonnages for the week being 58,832 and 9929 tons.

LOUISVILLE, KY.

The unusually mild weather which is again prevailing, is another cause for the present slow market. While this factor does not enter to a great extent into the demand for steam grades, it is responsible for a rapid movement, which would be impossible even in normal winter weather. Heavy rains and resulting floods throughout the state have done some damage to mining equipment, bridges and the like, and if they become such as to interfere seriously with operations the market will doubtless show a stiffer trend.

Altogether, the mines are practically at a standstill for lack of domestic orders, and while the steam demand is fairly good, the market on those grades has also dropped off to a noticeable degree. Some mines are face to face with the proposition of selling their coal at unduly low prices, or going on short time. In the absence of a season of real wintry weather, which has been almost totally lacking so far, the only thing which will operate to restrain this tendency from working a still further demoralization of the market is the closing down of some mines by the floods.

BIRMINGHAM, ALA.

There is no material change in the situation since our report of last week. There seems to be plenty of demand and good prices rule on all grades of coal. The volume of business in all lines in the South was never as large as it is at present. Recent statistics show that a smaller percentage of Alabama iron is being shipped out of the state than at any time in the history of the iron business.

The market for both foundry and furnace coke is firm. There has been considerable inquiry from the West for smelter coke, and although none of the ovens have large tonnages for nearby shipment, some business was placed with the local manufacturers.

We can quote standard furnace coke at $3.50@3.75, and foundry coke from $4@4.25, f.o.b. local ovens. Nut, domestic coke can be had in small shipments at from $2.75@3 Birmingham district.

CHICAGO

As a result of the unusual weather conditions, the Chicago coal market, in almost all branches, is weak and retail dealers are ordering little coal.

According to reports from various sources, their storage capacity is taxed to the limit on account of slack business; excepting coke, there is not a branch of the domestic trade that is not suffering from lack of business. A great deal of anthracite still remains in the hands of the dealers, many of whom are cancelling orders previously placed. On this account, the market has eased off to a considerable extent. There is practically no demand in Chicago at the present time for Hocking and splint coal. Hocking domestic lump is selling at $1.50 a ton, f.o.b. the mines, when up to car service in Chicago, with shipments in transit being quoted at $1.75.

The car supply has been much better than was expected. Shipments to market, as a rule, are free and scarcely any complaints are being registered against the railroads. The steam trade continues to be satisfactory.

Prevailing prices in Chicago are:

	Sullivan Co.	Springfield	Clinton	W Va.
4-in. lump	$2 62	...	...	...
Domestic lump	...	$2 32	$2 27	...
Egg	2 52	...	...	$3 80 @ 4 05
Steam lump	...	2 12	2 17	...
Mine-run	2 07 @ 2 17	1 97	1 97	3 55 @ 3.65
Screenings	1 72 @ 1 77	1 57 @ 1 62	1 57 @ 1.62	...

Coke—Connellsville, $6.50@6.75; byproduct, egg, stove and nut, $5.75@6; gas house, $6.

DETROIT, MICH.

Bituminous—The market here is controlled entirely by the weather conditions. Prices are gradually dropping and unless there is colder weather, there will be a lot of demurrage collected for track coal that cannot be moved. The car supply is unusually good. Contract fuel is coming along more readily now so that spot coal is not monopolizing the cars; steam coal is not in much demand on the larger sizes. Slack holds very firm, although the demand is not as great as it has been. There is no demand whatever for domestic coal; all the dealers seem to be loaded to their utmost capacity and in a few cases on demurrage, it has been offered

or the freight, but was promptly refused. Every operator selling as much as possible, for almost any price that can be secured.

The following are local quotations, f.o.b. mines:

	W.Va. Splint	Gas	Hocking	Pitts. No. 8	Jackson Hill	Pocahontas
omestic lump	$1.40		$1.40		$2.00	$2.00
gg	1.40		1.40		2.00	2.00
ut	1.30		1.30			
lump	1.15	$1.15	1.10	$1.10		
ine-run	1.00	1.00	0.90	0.90		1.25
ack	1.10	1.10	1.00	1.00		1.05

Anthracite—Anthracite is coming in in large quantities, but there is still a light demand for it. However, prices remain firm and it is being quoted about 50c. per ton above circular on all sizes.

Coke—This product has taken a decided slump and there is little or no demand for it. Connellsville is being quoted at $4.25; Semet Solvay, $4.25, and gas house at $4 f.o.b. oven.

ST. LOUIS, MO.

Prices hit the bottom of the market the past week, on account of the failure of winter to put in its appearance, as had been promised. Practically every coal got down to summer prices again, with the exception of the finer grades for steam; as the domestic sizes eased off the steam grades went also.

The present week will no doubt see slightly better quotations, as weather conditions are inclined to be more favorable, and it is likely that, for the balance of the month coal will continue to gradually increase.

The demand for anthracite chestnut still exceeds the supply, and coke is very scarce, while smokeless, though strongly in demand, is very little heard of, account of the shippers not being able to furnish enough cars. All kinds of coal is moving very slowly, especially when connection has to be made to some delivering line.

The prevailing market has been:

	Carterville and Franklin Co.	Trenton and Big Muddy	Mt. Olive	Standard
n. lump				$0.95 @ 1.00
n. lump			$1.30	
n. lump	$1.30 @ 1.40		1.50	1.15 @ 1.20
mp and egg	1.40 @ 1.55	$2.00		
o. 1 nut	1.15 @ 1.25			
reenings	0.80 @ 0.90			0.55 @ 0.60
ne-run	1.10 @ 1.15			0.90 @ 1.00
o. 1 washed nut	1.50			
o. 2 washed nut	1.50			
o. 3 washed nut	1.40			
o. 4 washed nut	1.20			
o. 5 washed nut	0.85			

MINNEAPOLIS—ST. PAUL

A number of the smaller operators in this field were forced to cut prices in order to pay wages and other expenses or go under. This condition has been quite discouraging to Illinois men to say the least, as the break in Franklin County coal, which is the leader, has had a tendency to weaken all other Western coals. Carterville district is bringing from $1.50@1.75 for the best domestic grades, although some has been sold as low as $1.40. Springfield coal is selling for from $1.35@1.50 lump.

SPOKANE, WASH.

Cold weather prevailing in Spokane has caused a heavy run on the coal stocks of the city, but there is not any danger of a famine. Shipments from the east and west are being delayed by landslides, and washouts, but Canada coal is coming in and is meeting all demands. No raise in price is anticipated for some time.

	Crows Nest	Wyoming Northern	Wyoming Southern	Utah	Montana	Roslyn
mp		$6.45	$7.20	$7.20		
mp and egg					$6.35	
rnace	$6.00					
g		5.95	6.85	6.85		
ne-run	5.00					$5.00
ek	4.50					
ened domestic						6.25

PRODUCTION AND TRANSPORTATION STATISTICS

VIRGINIA RAILWAY

Total shipments of coal over this road for November of 12 were 316,504 net tons, as compared with 338,518 for the onth previous.

CONSOLIDATION COAL CO.

Production of the Consolidation company for the year to Jan. 1 last, was 10,342,000 tons, as compared with 9,210,000 for 1911, showing a gain of 1,132,000 tons. With the heavy tonnage now being obtained in the Elkhorn field, production for the current year will show a still more rapid increase.

THE CAR SITUATION

For the first time since Aug. 15 of last year the American Railway Association again reported a surplus of coal equipment on Dec. 31, the following being a comparative summary of the last six reports:

Date	Number idle (net)	Decrease	Including Box	Flat	Coal
Dec. 31, 1912	17,058	51,450	†11,018	1,330	8,087
Dec. 14	†34,392	2,009	†30,818	†816	†8,801
Nov. 30	†36,401	14,711	†33,241	†1,463	†5,179
Nov. 21	†51,112	57	†38,465	†3,217	†12,005
Nov. 7	†15,169	*1,188	†43,831	†3,613	†7,599
Oct. 24	†49,981	*18,402	†38,177	†3,837	†13,253

* Increase † Net shortage.

CONNELLSVILLE COKE

The "Courier" reports production and shipments in the Connellsville region for the week ended Jan. 18, as follows:

Production (tons)	Week	3 weeks	*Shipments (cars)*	Week	3 weeks
			Pittsburgh	4,582	13,019
Connellsville	237,289	773,735	W. of Pittsburgh	7,151	20,231
Lower Connellsv'le	192,539	549,761	E. of Region	929	2,743
Total	429,828	1,323,496	Total	12,662	35,993
Same period 1912	395,185	1,018,523		11,271	29,707

SOUTHWESTERN TONNAGE

The following is a comparative statement of the Southwestern production for July and August, 1911 and 1912:

State	July 1911	July 1912	Change	August 1911	August 1912	Change
Missouri	173,809	176,125	+2,316	186,852	213,603	+26,751
Kansas	374,137	337,367	—36,770	400,820	408,947	+8,127
Arkansas	120,790	126,224	+15,434	139,762	172,090	+32,328
Oklahoma	157,633	201,959	+44,326	257,773	232,768	—25,005
Totals	826,369	841,675	+15,306	985,207	1,027,408	+42,201

FOREIGN MARKETS

GREAT BRITAIN

Jan. 10—At present there is a strong demand for all qualities of large and small. Tonnage arrivals are substantial, and chartering is very active. Quotations are as follows (approximately):

Best Welsh steam	$4 56	Best Monmouthshires	$4 20
Best seconds	4 38	Seconds	4 08
Seconds	4 26	Best Cardiff smalls	3 48
Best dry coals	4 38	Seconds	3 12

The prices for Cardiff coals are f.o.b. Cardiff, Penarth, or Barry, while those for Monmouthshire descriptions are f.o.b. Newport; both exclusive of wharfage, and for cash in 30 days —less 2½%.

ORIENTAL MARKETS

Japan, Nov. 28 1912—A fair amount of business has been done on this market during the past fortnight and some contracts of considerable importance have been settled on private terms, whilst there is still a certain amount of enquiry going on amongst native dealers for forward business for next year.

The coal-market in Japan is very firm and prices are ruling about 20 sen higher all round; Stocks of all grades have sunk very low at Japan shipping ports. Stocks on the spot are up to the average and prices are firm at quotations.

Manchuria—Quite a brisk business has been done and in spite of the daily output having reached 5000 tons it is all being consumed on the spot or has been contracted for export.

Kaiia—Although there is a certain amount of enquiry not much actual business has been done; contractors are still holding off on the chance of a decline of freights but these appear to be as strong as ever. Stocks remain small.

Quotations remain unchanged as follows: Lump, $2.75; nut, $2.25; mine-run, $1.85; slack, $1.

SPANISH IMPORTS

Spanish imports of coal for 10 months to Oct. 31, 1912, were 1,866,627 tons, as compared with 1,724,107 tons in 1911. Coke imports for the same periods were: 287,700 and 269,842 tons, respectively.

FINANCIAL DEPARTMENT

The Pacific Coast Co.

Besides controlling the Pacific Coast Steamship Co. and several railroad companies, this corporation owns all the securities of the Pacific Coast Coal Co. This latter concern owns the Franklin mines, aggregating 3850 acres at Franklin, Wash.; the Black Diamond mine with 4670 acres at Black Diamond, Wash.; the Newcastle mine with 2520 acres at Newcastle, Wash.; and the South Prairie mine, with 1140 acres at Burnett, Wash. Company also owns coal-handling plants at Seattle, Tacoma, San Francisco, Portland, Juneau and Nome, Alaska.

During the last two years the company has paid 6% dividends on both the common and second preferred stock and 5% on the first preferred. The report for the fiscal year ending June 30, 1912, showed: Gross from steamships and colliers, $4,181,147, and net, $143,389; railroads, gross, $761,775, and net, $554,254; coal department and miscellaneous, gross, $2,553,990, and net, $388,868.

The gross earnings of all departments were $7,496,912; operating expenses and taxes, $6,410,401, making net earnings $1,086,511, to which are added $28,579 other income, bringing the total net up to $1,115,090. Interest on bonds amounted to $250,000; depreciation special reserve, $103,430; dividend on first preferred (5%), $76,250; dividend on second preferred (6%), $240,000; dividend on common (6%), $420,000. This leaves a balance surplus for the year of $25,410.

Gross earnings of the coal department amounted to $316,731; operating expenses, $214,198, making the net earnings $102,533; all these accounts show a decrease during the year. The total output of the mines was 709,262 tons, including 16,116 tons from mines under development; this shows a decrease of 28,493 tons over that of the previous year. The amount of coal sold at all depots was: From company's mines, 671,290 tons; other domestic coal, 12,129 tons, foreign coal, 68,616 tons, making a total of 752,035 tons, or a decrease of 81,769 tons below last year.

The decreased output and sales is ascribed partly to depressed business conditions and partly to the competition of California fuel oil which has been selling quite cheaply during the past year. A large number of steamers have been converted into oil burners and a number of railroads are now using fuel oil on their Pacific Coast divisions.

The Lehigh Valley Coal Co.

President E. B. Thomas, of this company, has the following remarks to make regarding the year's operations, ended June 30, 1912:

The suspension of mining operations for practically both the months of April and May, during which time the company was deprived of any revenue from its property, naturally made a serious reduction in the year's income. The agreement with the mine workers expired by limitation on the 31st day of March, and, while negotiations for a new agreement were in progress, the mines remained idle. An agreement was finally reached in the latter part of the month, which gave to the mine workers a substantial increase in wages and mining was, therefore, promptly resumed.

The total net income of the company from all sources, after deducting charges for royalties, sinking funds, improvements to the property and interest on the funded debt, amounted to $1,162,241, a decrease of $350,603, as compared with the previous year.

The total production of anthracite coal from the lands owned, leased and controlled by the Lehigh Valley Coal Co. and affiliated companies, including that mined by tenants, was 8,224,317 gross tons, a decrease of 796,889 tons, or 8.83%, as compared with the preceding year.

The percentage of sizes above pea produced by the mining operations of the company was 67.67%, an increase of 2.10%.

The bituminous coal mined from the Snow Shoe lands amounted to 280,084 gross tons, an increase of 43,154 tons.

To offset in some measure the constantly increasing cost of mining, which is every year becoming more serious, owing to the greater depth and extension of the underground workings, with the attendant increase in the length of the underground haul, heavier expense for pumping and ventilation and legislation adding directly to the cost of operation, it has been necessary to continue making substantial expenditures for improvements and betterments to the property. Expenditures for such purposes during the year, deducted from income, amounted to $487,456, an increase of $42,779 over the preceding 12 months.

By appropriate court proceedings the Locust Mountain Coal & Iron Co. has been dissolved, the charter surrendered and its capital stock, all of which was owned by your company, canceled, thus obviating the necessity of maintaining that separate corporation with its attendant expense. Prior to its dissolution, the real estate of that company, consisting of certain coal lands in Columbia, Schuylkill and Northumberland Counties, Pennsylvania, from which your company has been mining under lease for many years, together with all its personal property of every description, was conveyed to the Lehigh Valley Coal Co. for a nominal consideration.

On March 1, 1912, this company redeemed and canceled the $10,537,000 certificates of indebtedness issued in 1905 to the Lehigh Valley R.R. Co. for moneys advanced to it by that company for capital expenditures; $3,037,000 of the said certificates of indebtedness were paid off in cash and the balance, $7,500,000, was taken up by the issuance in lieu thereof to the Lehigh Valley R.R. Co. of a similar amount of 50-year debenture obligations, maturing March 1, 1962, and bearing interest at the rate of 4% per annum, payable on March 1 and Sept. 1 of each year. At the time this transaction was consummated the arrearages of interest on the certificates of indebtedness were paid to the Lehigh Valley R.R. Co. at the rate of 4% per annum. That amount of the interest which accrued prior to the present fiscal year was charged to profit and loss and the balance deducted from this year's income. In addition, the income account of this fiscal year has also been charged with the accrued interest on the debenture obligations.

There were outstanding at the close of the previous fiscal year $1,292,500 short term notes given for the acquisition of property; $200,000 of these notes have been paid off during the year, leaving $1,092,500 of such obligations outstanding at this time.

COAL SECURITIES

The following table gives the range of various active coal securities and dividends paid during the week ending Jan. 18:

Company	High	Low	Last
American Coal Products	94	94	94
American Coal Products Pref.	109½	109½	109½
Colorado Fuel & Iron	33½	31	32
Consolidation Coal of Maryland	103⅞	103½	103⅝
Island Creek Coal Pref.	87½	87½	87½
Lehigh Valley Coal Sales	240	204	204
Pittsburgh Coal	22	21½	22⅛
Pittsburgh Coal Pref.	92⅞	87	89
Pond Creek	26	24½	25½
Reading	167	160⅞	162⅜
Reading 1st Pref.	90⅜	90	90
Reading 2nd Pref.	91½	91	91½
Virginia Iron, Coal & Coke	53	52	52

Bonds Company	Closing Bid	Asked	Week's Range or Last Sale		Year's Range	
Colo. F. & I. gen. s f g 5s	98	102	98	98	97	100⅜
Colo. F. & I. gen. 6s			107½	June '12	107½	107½
Col. Ind. 1st & coll. 5s. gu	83½	Sale	83½	84	72½	85½
Coos. Iod. Coal Mc. 1s 5s		84½	85	June '11		
Coos. Coal 1st and ref. 5s		94	93	Oct. '12	93	94
Gr. Riv. Coal & C. 1st g 6s	95		102⅜	Apr. '06		
K. & H. C. & C. 1st s f g 5s			98	Dec. '12	97½	98⅛
Pocah. Con. Coll. 1st s f 5s	87	88⅛	87½	87½	81½	89½
St. L. Rky. Mt. & Pac. 1st 5s	77½	78⅜	78⅛	78⅛	79½	84⅛
Tenn. Coal gen. 5s	102⅛	Sale	102⅛	103	101⅛	103⅞
Birm. Div. 1st consol. 6s	102½	103	102½	Dec. '12	102⅜	104½
Tenn. Div. 1st g 6s	101⅛	103⅜	101⅛	Dec. '12	101⅛	104
Cah. C. M. Co. 1st g 6s	103⅛	...	110	Jan. '09	....	....
Utah Fuel 1st g 5s	....	....	....	....	....	....
Victor Fuel 1st s f 5s	....	83	85½	Oct. '12	85½	86
Va. I. Coal & Coke 1st g 5s	96½	97	97	97	94½	98½

Reading Co.—Regular quarterly dividend of 1% on first preferred, payable Mar. 13, to holders of record Jan. 27.

Consolidation Coal Co.—Regular quarterly of 1½%, payable Jan. 31, to holders of record Jan. 23.

Monongahela Cons. C. & C. Co.—Dividend of $3.50 on the preferred, payable Jan. 25.

COAL AGE

Vol. 3 NEW YORK, FEBRUARY 1, 1913 No. 5

Power at Coal Mines

IN the past there seems to have been a more or less general opinion that the cost of power generated and used at a colliery was so low as to be unworthy of serious consideration. This condition of affairs was probably due to the fact that the coal used for generating the steam was considered to have little or no value, because it was taken direct from the mine, and further, it is likely in many instances, that no accurate records were kept of the amount of fuel used, or the actual cost of steam generation. If it had been necessary to purchase the coal, the value of the power used would probably have been considered from an entirely different point of view.

The Delaware, Lackawanna and Western Railroad Co. is a leader in the matter of economy at colliery power plants. The modernization of the D. L. & W. stations, and the high efficiency to which this company's equipment has been brought, are due principally to the engineering skill of its electrical expert, H. M. Warren. We, therefore, commend this foreword, written for us by Mr. Warren, to every COAL AGE reader who is interested in the important problem of "Power at Coal Mines"—*Editor.*

In later years however, conditions have changed. The various costs of mining and preparing coal have, for well-known reasons, constantly increased, and as a result the value of the fuel has followed along the same lines. It is not at all surprising, therefore, that in the endeavor to check, so far as possible, the increasing cost of operation, the cost of power generation should receive its due consideration.

When the cost of steam generation is not considered of any great importance, it follows that the economy of the engines or other apparatus using steam as a motive power, can hardly be given serious consideration. As a result of this line of thought, the first cost of the equipment for generating and using steam would naturally be considered the most important item.

The old equipment, therefore, consisted of the simplest type of boilers, namely, the well-known "cylinder boiler;" steam pipe lines either bare or inadequately covered, simple engines, and pumps of the slide-valve type. This combination gave first, an extremely inefficient generating plant; second, an inefficient transmission, and third, an inefficient steam-driven equipment. The line of procedure along which improvements have been made, is approximately as follows:-

The old boilers have been eliminated, and in their place we now see modern plants containing water-tube boilers, designed with special reference to the conditions under which they must operate. The chief considerations in this connection are (1) the type and size of furnace, and (2) the selection of grates, which latter should burn the desired fuel efficiently and at a high rate of combustion. The first, in order that the water evaporated per pound of coal may be high; the second, that the capacity of the boiler may be increased as much as possible, in order to keep down the fixed charges on the equipment.

As a means of increasing the rate of combustion, it is customary to use some of the various schemes of producing forced draft, the particular method used depending upon conditions. Open type feed-water heaters raise the temperature of the feed water to approximately 210 deg., and, in some instances, economizers are used to effect a further saving, and increase the feed-water temperature to a still higher point.

In the more recent installations steam turbine-driven centrifugal boiler-feed pumps have taken the place of the feed pump of the customary direct-acting type. This change is due to the simplicity and low cost of maintenance of the centrifugal equipment, as well as

the elimination of the pulsating water pressure that may occur with a direct-acting outfit. Some few plants are provided, and others are being equipped with superheaters, as a means of increasing the economy of the steam-driven equipment, and the elimination of a large amount of condensation that is bound to occur in the various steam lines. I believe that the use of superheaters designed for a moderate degree of superheat, will receive more serious consideration for boiler plants of this kind in the future, than they have in the past.

Thus we have the generating outfit designed and installed with particular reference to the conditions under which it is to operate.

The steam lines used to transmit power are of improved construction, and particularly well protected by some good heat-insulating material. The steam-driven power equipment purchased during recent years has been of a more or less improved type, such as compound, and in some instances, triple expansion pumps and engines of the Corliss or non-releasing four-valve type, simple or compound as might be desired. The pumps and engines, where conditions warrant, are operated condensing.

For the generation of electric power, it has now become quite customary to use steam turbine-driven generators, operating condensing where possible. In a few instances exhaust steam turbine-driven generators are in use. These units generate the power from exhaust steam, which had formerly been wasted by being allowed to blow directly to the atmosphere. Where the supply of exhaust steam is intermittent, such as the exhaust of hoisting engines, some form of heat accumulator or regenerator is necessary to absorb heat, while the engines are operating, and give it up while they are at rest, acting as a sort of heat "fly-wheel." The use of this type of equipment will increase rapidly in the future.

Electric power is transmitted various distances, and used for several purposes, for which steam was formerly employed, and in addition, furnishes power for lighting and portable equipment, such as electric locomotives, coal-cutting machines, and also electrically-operated coal and rock drills.

As the object of installing efficient equipment is to produce economical results, the mere installation of such an equipment is not sufficient. It is equally important that it be kept in such condition continually as to produce the highest practical economy, and in addition, no power should be wasted. Therefore the organization should be such, and it should be someone's duty to see, that the equipment is kept up and operated in such a manner as to insure the best results. It is entirely practicable to do this, but the situation must be handled in some systematic manner, and accurate records must be kept to show the actual operating costs, including all charges, from month to month.

The boiler plant records should show the amount of water evaporated, and the coal burned per month, the cost of labor and material for operation, also the same items for maintenance. It is likewise advisable to have a constant record of the boiler feed-water temperature, and the steam pressure. The record of the water pumped into the boilers may be kept by a Venturi or some other type of recording instrument. The coal may be either weighed, or measured by passing through a coal meter.

To maintain efficiency, careful attention must be paid to the method of firing. The amount of coal in the ash must be kept at a minimum. Gas analyses and stack temperatures should be made, to see that proper combustion is taking place, and that an excessive amount of air is not entering through the boiler settings; also that the baffles of the boilers are in good shape, and do not permit the short circuiting of the gases.

Waste of steam through leaky joints or drains should be avoided, and the steam-using equipment should be kept in efficient condition. There should be a frequent inspection to see that everything is in good order, and that losses are not occurring through open drains. The equipment should be indicated to insure proper setting of the valves.

Probably one of the best, if not the best method of discovering the use of excessive amounts of steam in various equipment, is to install a steam meter in the steam line, and take indicator cards of the equipment at the same time. This will give the rate of steam combustion per indicated horse power per hour, which in a great many instances will be surprising.

Take for example, a steam line leading down a shaft. The steam meter is placed in this line, and a record obtained for 24 hours. During this period the various equipment taking steam from this line is indicated, and the number of hours of operation recorded; thus the steam consumption per i.hp. used during the 24 hours, may be obtained. Such information is more valuable than any data that can be obtained by the use of indicator cards only. With this data available, it is a comparatively easy matter to determine what should be done in order to improve conditions.

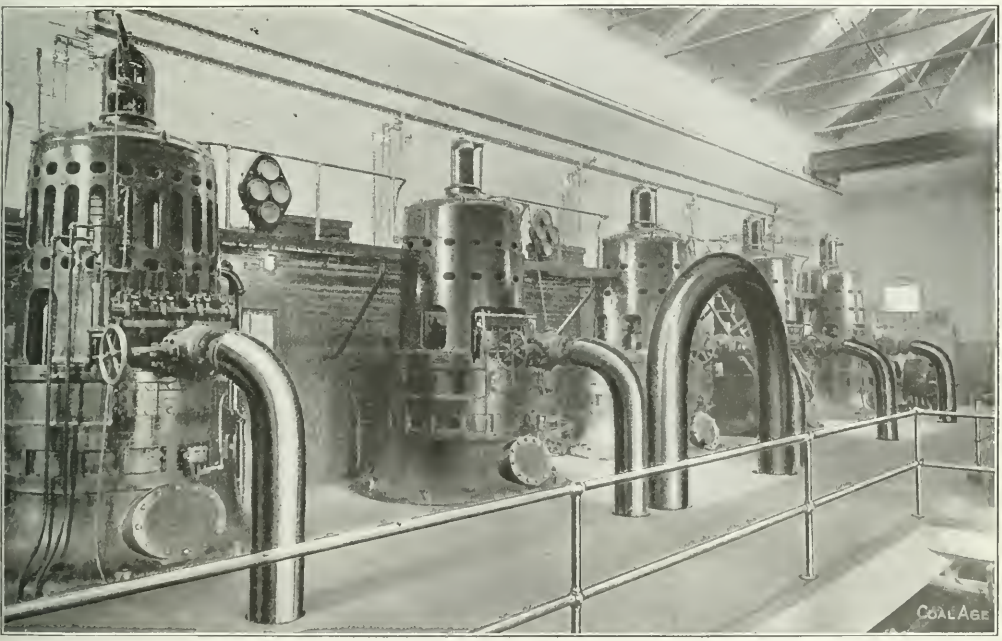
In conclusion, "Power at Collieries" is an important subject, and as such, should receive careful consideration. All equipment should be designed for the purpose intended, and each installation should be maintained so as to operate at as high an efficiency as is practicable.

A Large Anthracite Power Plant

By Frank H. Kneeland

SYNOPSIS—A plant which is neat in external appearance and efficient in operation. The boilers are all of the water-tube type, fed by centrifugal turbine-driven pumps. The prime movers of all the generating units are steam turbines operating condensing, mine water being utilized for this purpose.

In coal mining, as in many other industrial activities, two general types of power plants appear to exist. These are, first, the plant which is designed and constructed in its entirety at once, and, second, the plant which is started with few or small units, and which from time to time has been augmented and added onto until the final result is perhaps many times the magnitude of the original installation.



Interior of Power House, Showing the Vertical Turbo-generators Also Electrically Driven Exciter

Of these two, the former is usually the more efficient. In such installations the end may be clearly perceived from the beginning, and the amount of necessary material, together with the desired head room, side clearance and other circumstances conducive to the greatest possible convenience, may be readily foreseen and calculated to a nicety.

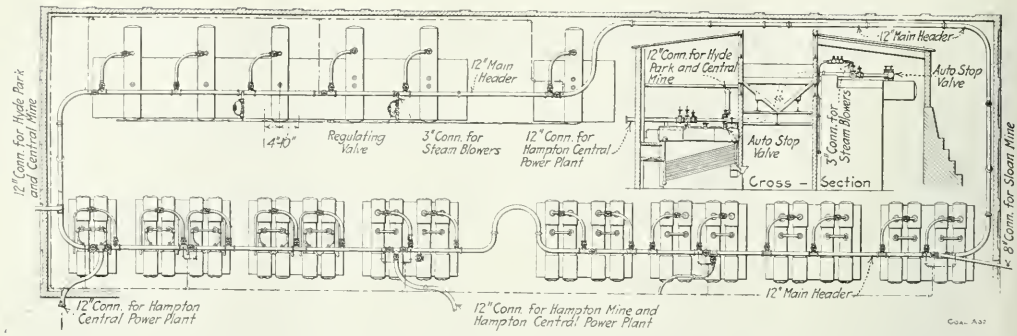
Unfortunately, however, such plants as these are the exception rather than the rule, particularly where power is strongly centralized and generated in large quantities. The ever-increasing demand for fuel, and the constantly growing applications of power to mining purposes, has rendered it difficult to accurately predict the ultimate requirements of any colliery or group of collieries. The result has been that plants which were at first deemed adequate for all possible requirements have been first overloaded, then added onto, again overloaded and again added to, until, in their final shape, they greatly exceed the magnitude with which they started.

In such cases, no matter how efficient the plant may be thermodynamically, it is seldom arranged for the greatest possible accessibility and convenience, and both the first cost and the attendance are usually higher than when the ultimate magnitude of the entire installation may be foreseen from its first inception.

There are, however, some notable exceptions to the general rule. Some instances exist wherein a plant, even though it be composed of a series of additions to the original equipment, presents not only an efficient whole, but also a neat and convenient appearance. The Hampton plant of the Coal Department of the D. L. & W. R.R. Co., near Scranton, Penn., may be justly regarded as a good example of such an installation. Although several additions to the equipment have been made from time to time, the plant as it exists today is both convenient and efficient.

Size and Arrangement of Boiler Plant

Exclusive of the main flues and economizers, the boiler house at this plant is 241 ft. 10 in. long by 75 ft. 7 in. wide. It is constructed of brick with steel roof trusses


12" Conn. for Hyde Park and Central Mine
12" Main Header
14"x10"
Regulating Valve
3" Conn. for Steam Blowers
12" Conn. for Hampton Central Power Plant
12" Conn. for Hyde Park and Central Mine
Auto Stop Valve
3" Conn. for Steam Blowers
Cross - Section
12" Main Header
8" Conn. for Sloan Mine
12" Conn. for Hampton Central Power Plant
12" Conn. for Hampton Mine and Hampton Central Power Plant
12" Main Header

INTERNAL ARRANGEMENT OF BOILER HOUSE, EXCLUSIVE OF FLUES, ECONOMIZERS, FANS, PUMPS AND OTHER AUXILIARIES

and concrete floors. The building contains 15 Babcock & Wilcox boilers of 313 rated hp. each. One of these is set singly and the balance in seven batteries of two boilers each. There are also six 2-drum Stirling boilers of 630 hp. each placed in battery.

The two types of boilers are arranged facing each other on opposite sides of a single firing alley of ample width to allow easy manipulation of slice bars, hoes and other firing tools.

It should be noted also that placing the 2-drum Stirling boilers in battery not only decreases the cost of the boiler settings, but also diminishes the heat radiation losses to a minimum.

Nos. 1 and 2 barley coal is used as fuel. This is first dumped from railroad cars into a pocket outside of the building. From here it is elevated and transported to an overhead bunker above the firing alley by means of a belt conveyor provided with an automatic tripper. Suitable downcomer pipes lead from the bunker to the Parsons distributors, with which each boiler is provided. Another series of these pipes also carries the coal to the floor in the middle of the firing alley, so that a supply for stoking the boilers by hand is always convenient.

The Parsons spreaders above mentioned handle about 70% of the fuel requisite for operation. The balance, or 30%, is hand fired.

A draught pressure of about 2 in. of water is maintained under the grates by means of two forced draught fans 16 ft. in diameter and 5 ft. wide, direct-connected to steam engines operating at approximately 200 r.p.m. On the Stirling boilers, Parsons steam blowers are used in place of the forced-draught fans. After leaving the Babcock & Wilcox boilers the flue gases are passed through Green fuel economizers. For this purpose two induced-draught fans, 18 ft. in diameter by 7 ft. long, direct-connected to steam engines and driven at approximately 140 r.p.m., are employed. The suction at the intake of these fans is about 2½ in. of water.

Ash Disposal and Water Feed

The ashes are flushed from the pits below the grates into the old workings of the mine through a borehole. Feed water is supplied to the boilers by two 5-in., 4-stage centrifugal pumps, each having a capacity of 500 gal. per minute. These are direct-connected to and driven by steam turbines. A 12x24-in. reciprocating plunger pump is also provided and held as a spare.

Feed-water regulators are used on all boilers, and automatic governors are provided for the turbines, maintaining a difference of pressure between pump and boilers of about 30 lb. This apparently large difference is probably necessitated, in part at least, by the interposition of the small number of economizers, through which the water for all the boilers must be forced in order to enter them.

EXTERNAL VIEW OF BOILER AND ENGINE HOUSE, SHOWING A PORTION OF THE LAWN

Regulating devices are also placed upon the engines driving the draft fans. By these means a boiler pressure of 150 lb. is maintained at practically a constant value.

The feed water used is drawn from the hot well of a surface condenser. It passes first into a 6000-hp. Cochrane feed-water heater, which it enters at a temperature of from 60 to 100° F., varying according to the season of the year and the conditions of operation. The water leaves the heater at a temperature slightly in excess of 200° F., passes through the pump, and enters the economizers. It normally leaves the latter at a temperature of about 240° F.

It should be borne in mind in connection with this latter temperature of the water that the supply for all of the boilers is forced through the economizers, which are subjected only to the gases from the Babcock and Wilcox boilers. This adequately accounts for the comparatively low final temperature of the water.

By means of a venturi meter all the water entering the boilers is measured and permanent records of its amount kept.

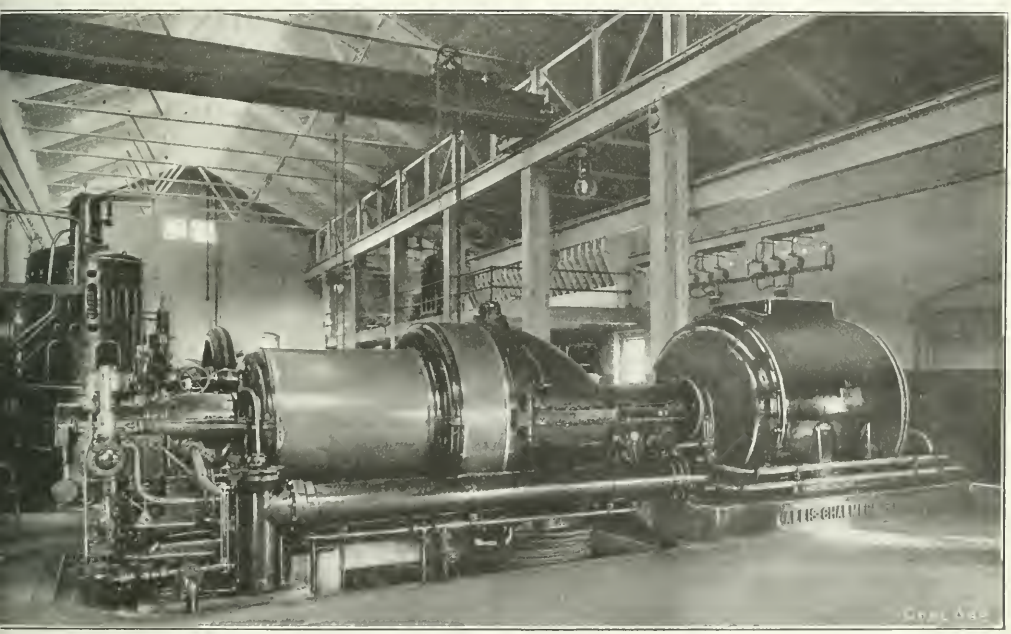
Four steam lines, ranging from 8 in. to 12 in. in diameter, and from 1200 ft. to 3800 ft. in length, radiate from the boiler house to the various collieries supplied from it. A double steam line also leads to the power plant. A Dodge steam-flow meter is installed in the boiler-house office, and connected to each of these lines in such a way that the quantity of steam in any of them may be continuously measured.

All of these steam lines are extra heavy, including all fittings and bends. In the lines which have been installed more recently, 40-ft. lengths of wrought-steel pipe have been employed, which are provided with Vanstone joints. These pipelines are carried upon supports composed of old steel T-rails. All are carefully covered and painted. The water piping, with the exception of the necessary expansion joints, is extra heavy cast iron.

The Generating Equipment

At this plant the generating units are located in a building distinct from the boiler house. The two are separated by a distance short enough to be convenient, but long enough to avoid the dust and dirt existing in the boiler room.

The power house proper contains five vertical, Curtis turbo-generators of 500 kw. capacity each, operating at a voltage of 2300 and a frequency of 60 cycles. There are also two Allis-Chalmers 2000-kw., 2300-volt, 60-cycle, horizontal turbo-generators in the same room. Four of the vertical turbines and the two horizontal machines use



Another View of Power-house Interior, Showing Horizontal Turbines, Traveling Crane, Etc.

barometric condensers. The other turbine exhausts into a surface condenser.

Mine water is employed for cooling purposes in the former machines, and as this is strongly acid, all pipes, as well as the condensers themselves, are wood-lined. In the surface condenser fresh water is used, which is then fed to the boiler plant.

The five Curtis turbines have two dry vacuum pumps so connected to the condensers as to be available for either or all of these machines. Each of the 2000-kw. turbines has its own dry vacuum pump, but these are cross-connected, so that either pump will serve either turbine, or rather its condense

The large machines are also provided with home-made automatic vacuum breakers to prevent water from backing up into the machines, should the condensing equipment by any mischance be flooded.

One engine-driven exciter is provided for starting up

and for emergency, while a motor generator set is employed for ordinary or continuous excitation.

A 10-ton electric crane spans the main part of the building, and serves all machines both on the main floor and basement (where the dry vacuum and condenser circulating pumps are located), except the outboard bearings of the large units. For these a smaller crane is provided.

The switchboard is located on the main engine-room floor, and is both compact and convenient. Transmission is accomplished at 2300 volts in all lines except that to the D. L. & W. shops, where 4600 volts are employed.

This plant is frequently called upon to develop 12,000 hp. It supplies current to 15 mines for lights, locomotives, pumps, rock crushers, breakers, drag lines, etc. It also furnishes current to a water shaft and approximately 1000 kw. to the D. L. & W. shops, yards, offices, etc.

The Pleasant Surroundings

It requires more than good equipment to make an efficient plant. The human element enters into power generation to a degree not ordinarily recognized by coal operators. To obtain satisfactory results, not only must the equipment be of the best, but good morale must exist within the operating organization.

Much has been done around this plant to render pleasant the environment of the men employed. Most conspicuous are the well kept lawns and flower beds, with which the buildings are surrounded. Of course, grass and flowers have no direct connection with the combustion of fuel or the generation of energy, but a little care and pains expended upon the grounds around almost any power station is practically certain to find a reflection in the increased care and pride the workmen take in the daily operation of the machinery intrusted to their keeping.

Hydraulic Stowage in Westphalia

From a British consular report it appears that hydraulic stowage of wastes in Westphalian coal mines is increasing from year to year, and that in the near future the majority of the coal mines may be compelled to adopt this system. In the old days the plan was to produce as much coal as possible at the least expense. In recent years, however, surface damages and claims for compensation are getting more frequent as the value of coal land rises. As a result, a system of hydraulic stowing has been adopted to support the surface, prevent buildings from cracking and railways from subsiding.

The ideal material is sand. In Westphalia this is not available. Instead a mixture of pit waste, blast-furnace slag and ashes is ground down and well mixed, and then flushed down the pipes with water. In many instances the pillars of coal which formerly had to be left to support railways and buildings have been dispensed with. In fact, there are places where the coal is being worked from under the town by this system with no dangerous results.

The pipes used for hydraulic stowing are items of considerable expense. They consist of an outer shell of steel or wrought iron with a cast-iron lining. The diameter is usually about 7 in.

Where sand can be used hydraulic stowage is cheap and is said not to amount to more than 12c. per ton, but in cases where more expensive material has to be mixed and ground down before use the cost of stowage rises to 24c. per ton of coal. It is maintained that with hydraulic stowage the expenses for pit-timber are reduced and the total coal output per annum increased.

Song of the Coal Miner

(Written expressly for Coal Age.)

By Berton Braley

Down in the hole where it's dark as pitch,
An' wetter'n we care to say,
We cut an' shoot to make 'em rich—
The fellers that pay our pay;
They drops us down in a rattlin' cage
A thousand feet er so,
An' there we work in the dust an' murk
Makin' the profits grow.

What if we do "take five"*
What if we do "take ten"*
The men that didn't ain't alive,
They're part uv the "might-uv-been."
We aim to do what's fair,
We think we do what's right,
But we'd rather be LIVE lazy men
Then under a tombstone white.

We gotta look out when the "cap" turns blue,
We gotta "shoot down the back."
'Er while we're drillin' a hole er two
The roof uv the room may crack,
An' then it's "Dig the poor devil out
An' take him up to the top."
Fer the wife may sigh an' the children cry,
But the Mine—the Mine can't stop.

Down in the deep black hole
There's allus the chance to take,
Uv a "missed hole" found er a "fall uv ground"
Er a ladder that will break.
So what if we do "take five"
An' what if we do "take ten,"
We'd rather be lazy an' alive
Than dead as we "might-uv-been."

We puts in timbers an' takes 'em out
In crossent, entry er raise;
Soldierin' sometimes, there's no doubt
But them is natural ways.
We takes our lives in our hands each shift
For never a guy can tell,
But what he will pick in a powder stick
That'll blow him all to hell.

So what if we do "take five"
An' what if we do "take ten,"
We're here today, alive,
Not part uv the "might-uv-been."
There's better men than us
That tried to outwork a mule,
But we'd rather be LIVE in a coal mine here
Than dead in a graveyard cool.

*"To take five" or "take ten" means to rest for five or ten minutes

Barometric Condenser Installation

SYNOPSIS—In the barometric condenser, the condensing water and condensate flow out of the cooling chamber without being pumped. A vacuum of 25 in. can be obtained without the use of an air pump as the air is entrained by the falling water in the condenser, but a pump must be used if as complete a vacuum as 28 in. is desired. Too much water should not be used in high-vacuum work or the condenser will be choked and the air and water to be handled will be increased without corresponding advantage.

One of the largest mining central stations in this country is located at Homer City, Indiana County, Penn., about 45 miles from Pittsburgh. The power station is one of a number of plants throughout western Pennsylvania, owned and operated by the Rochester & Pittsburg Coal & Iron Co., and is a fair example of the modern tendency of generating power at one mine and distributing it through high-tension lines to other operations.

Convenience for Obtaining Coal Locates Plant

In building the plant, due consideration was given to alternative locations. The installation could be placed near the coal supply or convenient to water. As it was necessary to install pumps for the cooling water, regardless of the site chosen, and a pipeline was the only additional equipment rendered necessary by a choice of a location convenient to the coal supply, the plant was located at the mine shaft. This greatly reduced the cost of handling the coal. The loaded cars, on being brought to the ground level, are run directly into the boiler room and emptied into the coal bunkers.

Description of Power Plant

The power house is built of brick with concrete foundation and occupies a space of 100x150 ft. It is an imposing building and the twelve steel stacks and three condenser exhausts can be seen for miles.

The prime movers consist of two General Electric Co. 3000-kw. horizontal turbo-generators, and an Ingersoll-Rand two-stage air compressor. Space has been reserved for a third turbo-generator of 3000 kw. The exhaust of the two turbines is condensed by two Wheeler barometric condensers, with 48-in. exhaust elbows, vacuum

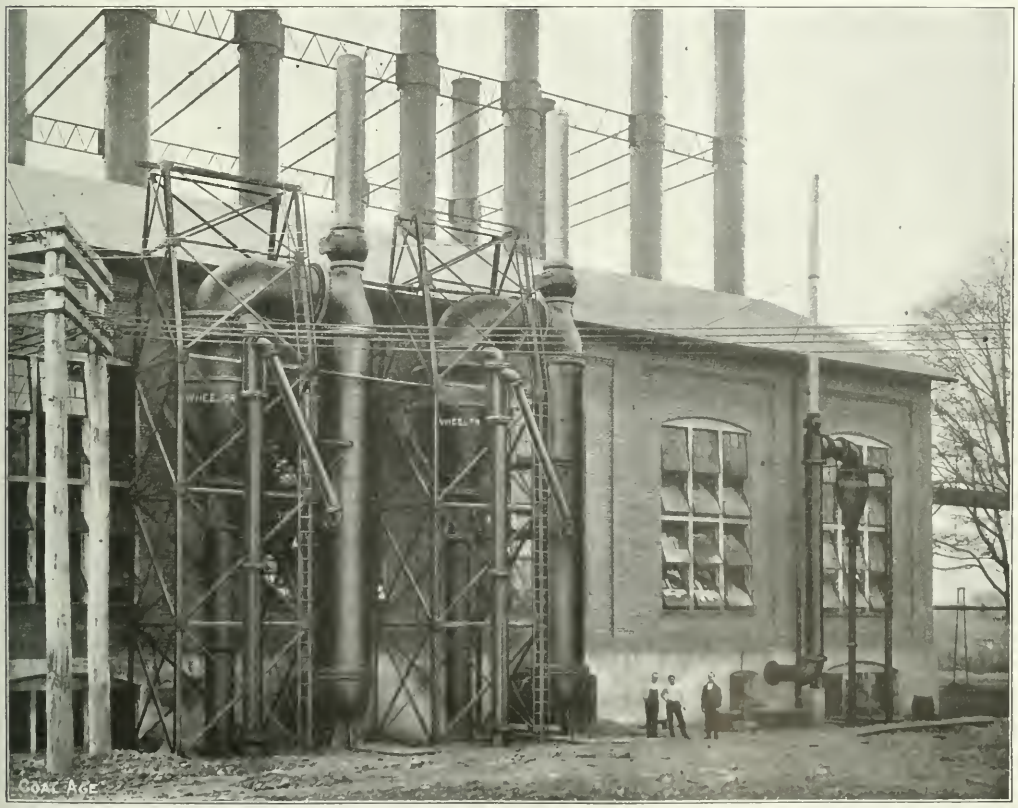


Fig. 1. Three Wheeler Condensers at the Luzerne Plant of the Rochester & Pittsburgh Coal & Iron Co., at Homer City, Penn. The Large Outfits on the Left Condense Steam from Two Turbines; that on the Right Forms the Vacuum for the Steam End of an Air Compressor

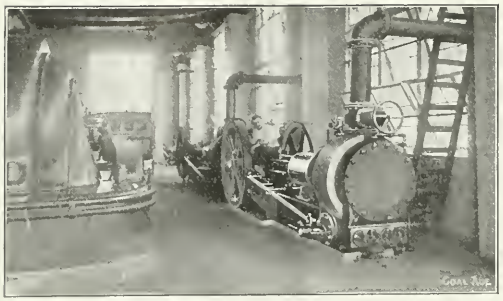


Fig. 2. A Dry-vacuum Pump Removing Air from the Exhaust Steam and the Condensing Water

breakers and 24-in. automatic exhaust relief valves. The two large turbine condensers may be seen at the left in Fig. 1.

A Wheeler rotative dry-vacuum pump of the tandem type removes the air and uncondensed gases from each condenser, even with high cooling-water temperature. The exhaust piping is of riveted steel, which is quite unsuitable for high-vacuum service and it is probable that if this could have been kept perfectly air-tight, unusual results might have been obtained.

Excessive Use of Water in Barometric Condensing

However detrimental this leakage was to the maintenance of a high vacuum, the loss was undoubtedly small compared to that resulting from the undue excess of injection water which was fed to the condensers at all times. Barometric condensers will not operate at their best with more than a minimum amount of water, yet in nearly every case where the initial operation of the condenser has been left to the engineer of a plant, the mistake has been made of using too much water, with the result that the throat of the condenser is constantly choked.

Formerly, for engine work and reasonably cold water, the amount of injection water used was rarely considered. But with large high-vacuum condensers for warm water, the quantity used is very important; first, because of the cost of pumping and second, on account of the quantity

WORK OF CONDENSERS ROCHESTER AND PITTSBURGH COAL AND IRON CO.

	Unit No. 1		May 25, 1911				Unit No. 2		May 27,1911			
Time	Temperature of Cooling Water F	Temperature of Discharge F	Load in Kilowatts	Vacuum Observed Inches of Mercury	Barometer Inches of Mercury	Vacuum Corrected Inches of Mercury	Temperature of Cooling Water F	Temperature of Discharge F	Load in Kilowatts	Vacuum Observed Inches of Mercury	Barometer Inches of Mercury	Vacuum Corrected Inches of Mercury
9:00	76	84	1800	27 25	29 08	28 17	73	84	1200	27 15	28 98	28 17
9:30	77	84	1750	27 20	29 08	28 12	74	84	1250	26 08	28 98	27 92
10:00	77	84	1750	27 25	29 08	28 17	74	84	1300	27 10	28 98	28 12
10:30	78	87	1800	27 20	29 08	28 12	74	84	1150	27 10	28 98	28 12
11:00	78	87	1800	27 20	29 08	28 12	74	84	1200	27 12	28 98	28 14
12:00	78	87	1600	27 15	29 08	28 07	74	84	1250	27 12	28 98	28 14
1:30	78 5	86 5	1950	27 00	29 08	27 92	74 5	84	1200	27 10	28 98	28 12
2:00	80	86	1650	27 15	29 08	28 07	74	84	1300	27 15	28 98	28 17
2:30	80	86 5	1850	27 10	29 08	28 02	74	83 5	1250	27 10	28 98	28 12
3:00	81	87	1700	27 15	29 08	28 07	74	83 5	1200	27 10	28 98	28 12
3:30	81	86 5	2000	27 25	29 08	28 17	74	85	1350	27 05	28 98	28 07
4:00	80	86	1950	27 25	29 08	28 17	74	85	1200	27 10	28 98	28 12
Average	78 7	85 9	1800	27 18	29 08	28 10	74	84 1	1238	27 09	28 98	28 11

condenser. This may be seen in Fig. 2. At the bottom of the exhaust pipe, near each turbine, a 5½x8x7-in. direct-acting suction valveless hotwell pump and hotwell, handles the condensate not carried by the exhaust into the condenser.

A 28-inch Vacuum Obtained

Each outfit was designed for 54,000 lb. of steam per hour and to give a vacuum of 28 in. using 4340 gal. of water per min. at 70 deg. F. With 25 per cent. less water and without the air pump, the same amount of steam can be handled and a 26-in. vacuum provided. The official test proved that a much better vacuum than this could be continuously maintained.

A Wheeler condenser with elbow, vacuum breaker, 10-in. relief valve, 7x16x14-in. tandem rotative dry-vacuum pump, and 5½x8x7-in. hotwell pump, furnishes vacuum to the air compressor. This unit is designed for 10,000-lb. steam, a 27-in. vacuum receiving water at 70 deg. F., and may be seen at the extreme right of Fig. 1.

Two motor-driven DeLaval pumps of 5000-gal.-per-min. capacity are installed at the cooling-water supply, which is about 1200 ft. from the plant.

In order to start up the condensers one of the main turbines must be run noncondensing for a time to furnish power to the pumps.

The table gives a number of test readings on units Nos. 1 and 2. A glance at the vacuum readings shows what favorable results may be obtained from this type of of air to be handled, a large part of which comes from the cooling water.

The Operation of the Condenser

Fig. 3 is a sectional view of the Wheeler barometric condenser, showing the water distribution and how the steam and water are mingled. The condenser is a pear-shaped shell with a large opening at the top for exhaust steam and an opening at the side for cooling water, while at the bottom connection is made to the barometric column which discharges the water to the atmosphere without a tail pump.

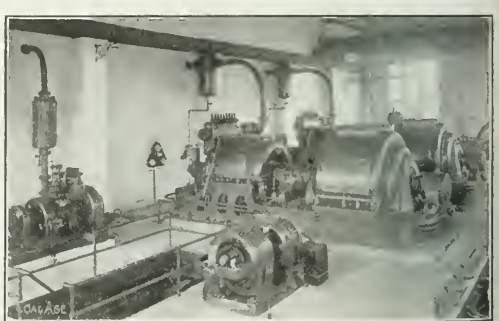


Fig. 3. Interior of the Luzerne Power House, Showing Turbo-generators and Turbo-exciters

The water entering near the top flows into the annular reservoir with vertical slots in its inner wall, through which the water falls in a large number of streams in the direct path of the steam, causing partial condensation and heating of the water. The water is then collected upon the tray immediately beneath, from which it splashes upward to some extent, causing further condensation, and heating of the water. Finally the stream flows through the multitude of small holes in this collecting tray, falling in a rain to the bottom of the condenser, and condensing the remainder of the steam.

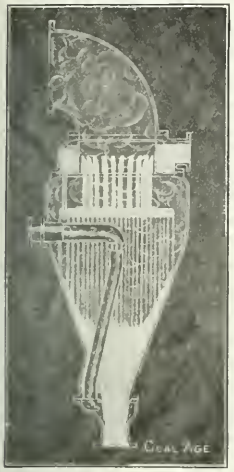


FIG. 4. SECTION SHOWING CONDENSER AT WORK, EJECTING AIR AND CONDENSING STEAM

CONDENSER ITSELF EJECTS AIR FROM "VACUUM"

For high-vacuum work the air is withdrawn by a vacuum pump (see Fig. 2) which is connected to the air-outlet nozzle at the left center of Fig. 4. The arrangement of the air intake within the condenser may be plainly seen.

For moderate vacuums an air pump is unnecessary, since the water falling down the condenser shell entraps air and carries it out by ejector action. Air is also supplied to the neck of the ejector by the air pipe shown.

Several times during the initial run of the outfits at Homer City, the condensers were operated without the air pumps and in all cases, fair working vacuums of 25 in. and 26 in. were recorded. The average vacuum obtained is 27.75 in., which corrected, is 28.75 inches.

⁂

Low Pressure Turbines

The term "low-pressure turbine" refers to machines which utilize exhaust steam at about atmospheric pressure by expanding it to a lower pressure maintained by means of a condenser.

The only costs chargeable against the low-pressure turbine are interest depreciation and maintenance of the turbine and condensing apparatus. They, therefore, furnish the most economical method of increasing plant capacity where the main engines are operated noncondensing, or, for furnishing power for live rolls or lighting in rolling mills and mines where exhaust steam from rolling mill or hoisting engines is available.

Where the exhaust steam from a single engine running intermittently, such as in hoisting, is to be used for operating a low-pressure turbine, continuous operation of the latter is made possible by use of a steam regenerator, or heat-storage reservoir which consists of a plain cylindrical tank partly filled with water, which condenses the excess exhaust steam not used by the turbine when the engine is running, and re-evaporates it, owing to a slight drop in pressure in the regenerator when the supply of engine steam is deficient.

In large plants having a number of noncondensing engines, the installation of a central low-pressure turbine plant with the exhaust lines from the isolated engines, all discharging into a single header in the station, the average flow will be sufficiently uniform so that the heat storage in the exhaust mains may be adequate, thus rendering a regenerator unnecessary.

When sufficient exhaust steam is constantly available for operating the low-pressure turbine, the simple design without a governor is preferable.

⁂

A New Mechanical Stoker

The Sanford Riley Stoker Co., Ltd., Worcester, Mass., is placing on the market a new automatic stoker which, in many ways, is an improvement over all its predecessors. It is of the underfeed type, with self-dumping features, and is the only underfeed stoker that has such a mechanical movement of the fuel-bearing surfaces, that the movement of the fuel and ash down the slight incline results in a continuous rather than a periodic cleaning.

For a year the Riley stoker has been tested out in a large electric-light plant, with conspicuous success. It has been operated under the severest conditions of actual service, and has been subjected to numerous tests to determine its efficiency and capacity. As a result of these tests, final improvements have been introduced and parts standardized.

Like all other underfeed stokers, the Riley is smokeless, even when forced to far beyond the normal capacity of the boiler. Unlike other types, however, it is without dead plates, the entire surface within the furnace being live fire surface. The makers claim that this stoker takes up less room than other types. It has been made thoroughly rugged in every part, but at the same time protected by shearing pins, so that serious obstruction in the fuel can cause no damage to the mechanism.

⁂

West Virginia Examinations

There were 41 persons who were successful in passing the state examination for mine foreman and firebosses, held at Clarksburg, W. Va., Dec. 17 and 18, 1912. The names of the successful candidates are as follows:

First grade—Elkin Reed, Simpson; O. C. Straight, Clarksburg; Roscoe Summers, Gypsy; John M. Matheney, Mt. Clare; L. K. Richard, Lewis; Jno. Oldroyd, Clarksburg; Scott Sturm, Worthington; James Cummings, Reynoldsville; S. D. Conner, Gypsy; Jno. A. Rutter, Gypsy; Clyde Van Pelt, Wilsonburg.

Second grade—Homer Yates, Grafton; M. L. Gett, Enterprise; W. H. Folf, Hutchinson, P. J. Smallridge, Weaver; Jesse M Lutman, Forbes Road; Linnie H. Harvey, Clarksburg; Thomas McCormick, Clarksburg, Marvin S. Miller, Fairmont; Frank Trader, Everson; P. O. Satterfield, Hutchinson; J. B. McCloud, Gypsy; J. H. Yoder, Shinnston; Howard Conner, Clarksburg; J. W. Bernard, Clarksburg; Allen Watson, Monongah; Richard Adcock Reynoldsville; Guy Russell, Interstate; A. J. Powell, O'Neil, John Charry, Viropa Ira Ernest Bales, Barrackville; John J. McElroy, Fairmont; J. B. Greynolds, Raynesville; E. W. Freeman, Enterprise; Dave Malone, Morgantown; W. D. Walker, Blaine; Thomas L. Price, Mt. Clare; Peter McCormick, Clarksburg; H. C. Saunders, Everson.

Firebosses—Wm. Leeper, Farmington, Matthew Conners, Grant Town.

⁂

Lignites may be profitably used in: (1) Gas producers. (2) Specially constructed boilers. (3) Briquettes. The U. S. Reclamation Service has a boiler at Williston, N. D., which burns lignite untreated, shortly after it is taken from the mine. When lignite is to be used for briquetting it should be thoroughly crushed, then dried until it contains not more than from 5 to 10 per cent. of moisture, then compressed while still warm

Central Station of Clinchfield Company

By W. H. Easton*

SYNOPSIS—The Clinchfield Coal Corporation, of Dante, Va., has gone through the evolutionary process common to many large coal producers. The company has abandoned its small power plants and replaced them by one central station and five substations, some of which are situated over eight miles from the point at which the power is produced. Thus the water problem has been met and the cost of generation and transmission reduced. The business of producing power and of extracting coal are thus kept distinct and both are in charge of men best fitted to handle them.

The mines of the Clinchfield Coal Corporation, with headquarters at Dante, Va., are interesting for many reasons but are especially noteworthy because of their system of developing and transmitting power.

In starting the earlier development, each operation had its own power plant which was situated as advantageously as possible to the water supply. These plants supplied direct current and operated with as high an efficiency as is possible for this type of installation.

Replacement of Scattered Units by Central Power Plant

The management never questioned the advantages of the use of electricity. The superiority of electric power for operating locomotives, pumps, fans, hoists and other mine machinery was regarded as sufficiently demonstrated. When, however, the development work was well under way and broader plans were formulated for the company, it became evident that great economy could be secured by doing away with the isolated power plants, efficient as they were as compared with ordinary steam plants, and operating all the company's mines from one central power station.

One of the most important considerations that led to the change was the question of water supply. Fig. 1 shows the character of the country in which the company's operations are located. It is typical coal country, where, as every miner knows, the water supply is usually not satisfactory. The rains drain off very rapidly and the rivers vacillate between conditions of flood and low water. Moreover, as much of the coal first developed lay high in the hills, it was difficult to locate the power houses immediately adjacent to the operations, which is necessary in order to secure good economy with a direct-current plant.

The Advantages of Having Only One Plant Which Can Be Placed in Charge of Competent Men

Another consideration of great importance was that of greater reliability. At a central power plant there is nothing to be done but to keep power on the lines. At the mines all thought of power is eliminated; there is nothing to interfere with the getting out of coal. Consequently, there is practically no loss of time because of the failure of the power, and the coal-mining operations can be carried on with greater effectiveness. The result is greater and cheaper production.

Proper boiler water was also hard to obtain at some of the mines, and bad boiler water meant heavy repair expenses and, what is even more serious, occasional shutdowns. In fact, all maintenance expenses could be greatly reduced by centralizing the power supply, as all machinery can be given better attention and kept constantly in the best operating shape.

For these reasons, the Clinchfield corporation established a central power station at Slemp, Va., on Dumps Creek. The generating equipment consists of two 1250-

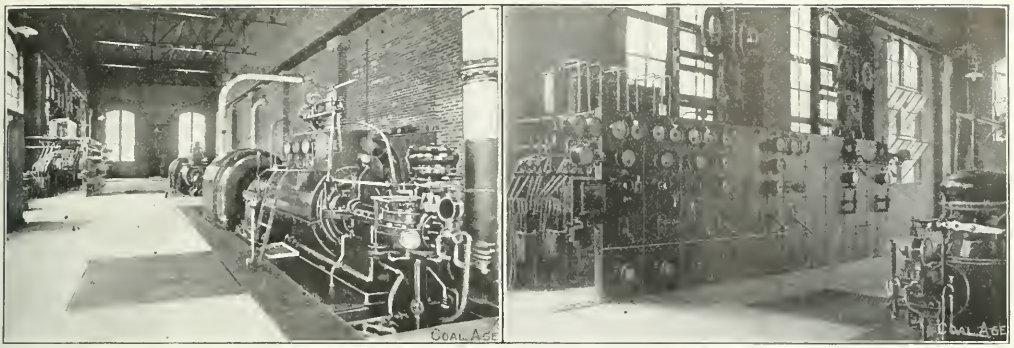
Fig. 1. View, Typical of the Country in Which the Clinchfield Coal Corporation Is Operating. Inclined Plane of One of the Laurel Mines in Foreground

kv.-a. Westinghouse turbo-generators, which develop three-phase, 60-cycle power at 6600 volts and have an overload capacity of 1560 kv.-a. each. Fig. 2 shows the interior of this plant. Fig. 3 shows the switchboard.

Substations at Slemp, Laurel and Dante

The power is transmitted at present to five substations, one near the power house at Slemp, one at Laurel, some three miles distant, and the other three are located on the Dante group of operations, eight miles away. Thus all the power required for the Dante and Laurel operations is supplied from a single power house. The addition of two more substations is contemplated and the apparatus for them was included in the original contract with the Westinghouse Electric & Manufacturing Co.

*Pittsburgh, Penn.



FIGS. 2 AND 3. CENTRAL POWER PLANT OF CLINCHFIELD COAL CORPORATION, AT SLEMP, VA. FIG. 2 SHOWS TWO WESTINGHOUSE TURBO-GENERATORS, 1250 KV.-A., 6600 VOLT, 3 PHASE, 60 CYCLE. FIG. 3. ILLUSTRATES THE SWITCHBOARD

This scheme of power distribution lends itself readily to expansion and it is probable that the future development will justify the addition of a 2000- or 3000-kv.-a. unit for distribution at either 6600 volts or some higher voltage, such as 23,000 or 33,000. This higher voltage will enable power to be transmitted economically to more remote Clinchfield properties as they are developed for an increased tonnage.

The substations are comparatively simple installations. Fig. 4 shows the end of the Laurel substation, Fig. 5 the exterior. They can be placed almost anywhere and are independent of water. The main feature of their equipment is a motor-generator set, the one at Slemp being shown clearly in Fig. 6.

Each set consists of a 6600-volt alternating-current Westinghouse motor which drives a 300-hp. Westinghouse generator delivering direct current at 275 volts. Thus the high-voltage alternating current transmitted from the power house is transformed into low-voltage direct current, suitable for driving locomotives, pumps, fan motors, lights, etc., at the mine.

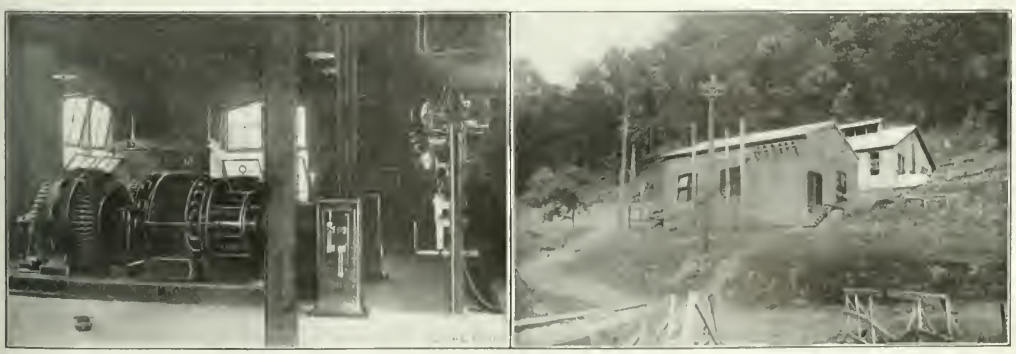
The substation requires little attention. The motor-generator set runs practically continuously and an attendant is needed only to see if everything is running properly. If power is not wanted the motor is stopped and all expense for current ceases; starting up is simply a matter of throwing a switch and full power is immediately available.

THE ADVANTAGES OF PURCHASED POWER

This system of power distribution is unquestionably the most advantageous for companies in the position of the Clinchfield corporation. Companies operating single or widely separated mines can secure its most important advantages by purchasing power from power-supply companies if such are operating in the vicinity.

It is often difficult for a mine operator to see that he can in many cases actually buy power cheaper than he can make it himself when apparently he is getting his fuel for nothing. But his fuel should be figured at the cost which it would bring if sold.

Furthermore, while he is making his own power, his attention is centered on the power house because trouble there means shutdowns and loss of production; but with central-station power, he transfers this responsibility to those whose whole business it is to carry it, leaving him to the uninterrupted business of mining coal. Records go to prove that central-station power is more reliable than that from private plants. The operator substitutes his power house with its engineers and firemen and its need for good and abundant water, for a small substation that requires minimum attendance and no water supply.



FIGS. 4 AND 5. INTERIOR AND EXTERIOR OF LAUREL SUBSTATION OF THE CLINCHFIELD COAL CORPORATION

He can shut down his plant with little expense and start up instantly, as far as power is concerned. He can obtain increased power quickly and at less cost than is involved in building additions to his power plant. His power is at all times ample so that production does not lag. If his operations become so extensive that the voltage drop in the direct-current lines becomes too great, he

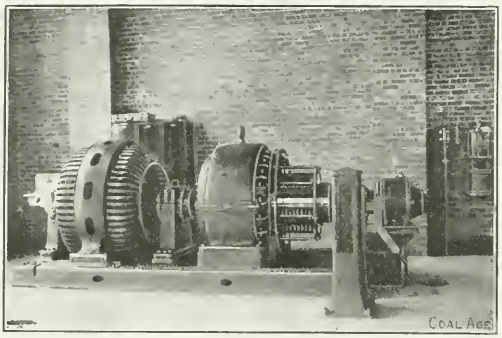


FIG. 6. WESTINGHOUSE MOTOR-GENERATOR AT SLEMP SUBSTATION, 300 KW., 275 VOLT, D. C. GENERATOR, DRIVEN BY 6600-VOLT SYNCHRONOUS MOTOR

is easily able to run high-tension lines to the proper points and install other substations, in the mine if need be.

In any case, it is well worth while for every mine situated to obtain centralized power to estimate its present costs and those of operation with purchased power, thus obtaining assurance that it is on the most economical basis possible.

An Automatic Feed Regulator in Coal Cutting

It is admittedly true that the coal cutter is a difficult portion of electrical mine equipment to keep in proper repair. This is due to the hard work which it has to perform, and frequently to the class of attendant in whose care it is placed.

The ordinary machine runner is more concerned with the amount of coal secured than with technical considerations as to overloads on electrical equipment. Hence the coal cutter is not infrequently worked at a rate which imposes, even under normal cutting conditions, a severe test as to its continuous reliability.

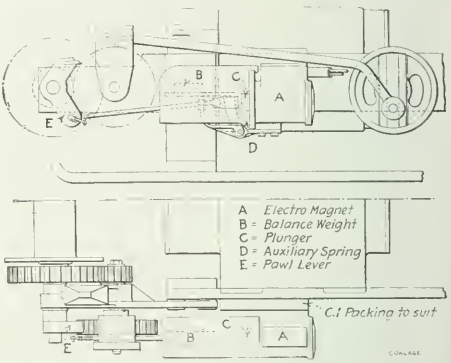
When, in addition to this, it is remembered that it is the rule rather than the exception to find the face varying as regards the nature of the material to be cut, it is evident that a very serious additional strain is thrown on the cutter from time to time, which, unless the speed of the cutting is regulated in accordance with the excess demand, is very liable to work serious results.

The inevitable consequence is frequent and excessive overloads, which culminate in exasperating trouble, both electrical and mechanical. Under the severe conditions frequently met with, breakdowns and stoppages are numerous and the constant burning out of fuses or the tripping of cut-outs is annoying and sometimes positively dangerous.

It is interesting, therefore, to note that an automatic feed regulator has been successfully introduced by the British firm known as the Diamond Coal Cutter Co., of Wakefield. This contrivance is illustrated herewith. The regulator consists of an electro-magnetic device which, the moment that an excess of current is taken by the motor, stops the forward travel of the machine by lifting a pawl from its ratchet wheel. This does not stop the cutting action, but automatically adjusts the rate of travel to suit the conditions, allowing the cutter to advance the moment it has overcome the difficulty.

It will be seen that overloads, such as have been mentioned, may be caused by some extra hard material being met with in cutting, by the picks becoming blunt, by the men attempting to make the machine travel at too fast a speed, or by neglecting to use the shovel. Overloads due to any of these causes are automatically corrected if this feed regulator is employed.

In actual practice it has been found that under the most unfavorable conditions of working the armature breakdowns have been reduced by fully 70% and the output of the machine has been considerably increased, due to the longer total cutting time, resulting from the avoid-



DIRECT-CURRENT REGULATOR APPLIED TO DIAMOND MACHINE

ance of stoppages. Moreover, the gate-end fuses, which formerly blew frequently during every shift, were renewed only at intervals of several weeks.

The figure shows a direct-current regulator applied to a Diamond two-motor machine. The solenoid *A* is in series with the armature circuit, and at a predetermined current value draws in the plunger *C* against the weight *B* and the auxiliary spring *D*. The working current can be adjusted by moving *B* along the bar. When the plunger is drawn into the solenoid, the pawl attached to *E* is lifted and the machine ceases to travel forward until the current falls again to normal, when the plunger is released, the pawl once more drops into place and the machine is again put in motion.

For alternating-current machines the principle is the same, although the arrangement is slightly different. A shunt relay across one phase is employed, which interrupts the main circuit. The instrument is especially valuable for machines of this type, since the starting current involved brings the regulator into operation and allows the motor to start comparatively light.

It will readily be perceived, therefore, that a valuable addition has been made to this important portion of mine equipment.

Economy in Colliery Power Plants

By Sydney F. Walker*

SYNOPSIS—Description of a peculiarly effective electrical installation in Great Britain. Accumulators are used for storing the surplus power when running the electric plant under a light load, and by means of a novel arrangement, a similar conservation of steam is obtained. The plant presents a striking combination of the old and new.

With the increased cost of the working of collieries in the United Kingdom, owing partly to the increased depths of the seams, and largely to the greater cost of labor, colliery managers have found it necessary to look into all possible means of saving money. Owners in the United Kingdom are notoriously conservative; they move slowly in the adoption of a new plant, regardless of how large a saving it promises to effect, but when one pioneer has successfully carried out some improvement, every colliery of any standing generally follows suit. Thirty years ago, boilers at collieries generated steam at 30 lb. pressure; a little later they ventured to 50 lb., then to 80 lb., and now 150 lb. is quite common, while pressures of 200 lb., with water-tube boilers, may be found at many collieries. While the demand for steam is constantly increasing, and the boilers are at the same time gradually approaching the point where they have to be replaced, considerable economy is effected by doing away with the low-pressure type and installing others generating steam at 150 pounds.

There have been cases, however, where the low-pressure boilers were still in good condition, and where the management hardly felt justified in facing the expense of installing others of the higher-pressure type. The economy in a great many cases would hardly pay for the cost of making the change. One such case, on a large scale, was that of two collieries at Hucknall Torkard, in Nottinghamshire, England. These were about two miles apart, and each had its battery of boilers carrying steam at 30 lb. pressure. Those at the one colliery were dismantled, and the whole of the work at both plants is now performed by the one battery at the other colliery.

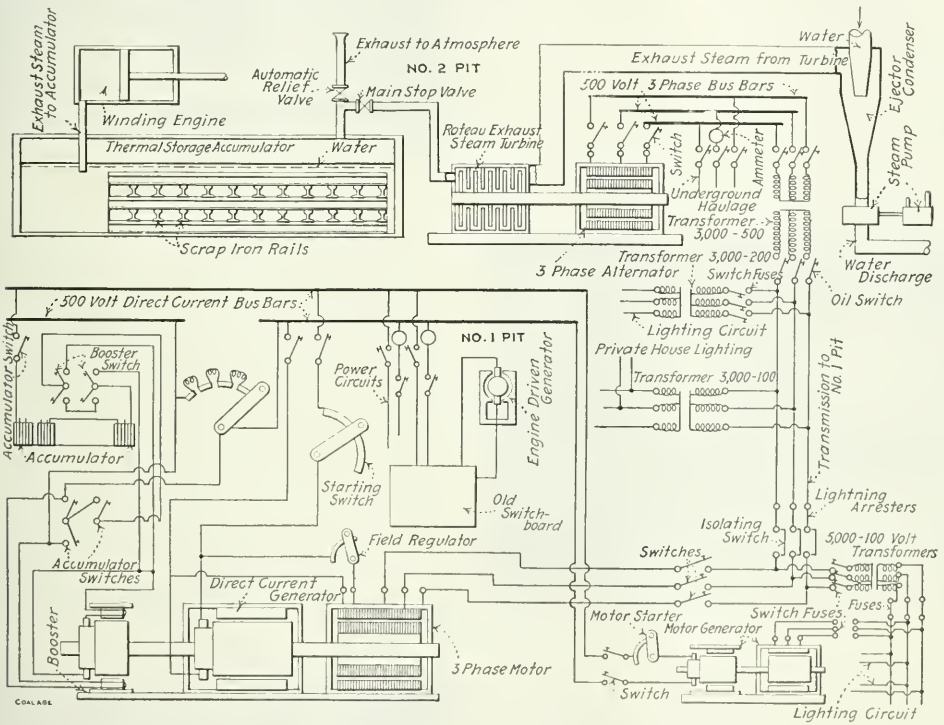


Fig. 1. General Plan, Showing Layout at Hucknall Collieries

Inefficiency of the Old Plants

In the early days, and up till quite recently, the steam used by the winding engine was considerable. Until 15 years ago, little thought was expended upon the steam consumption of the engines, at a colliery or, for the matter of that, at industrial works of any kind. The one thing needful was that the engine should work, and if more steam was required, more boilers had to be provided. With the increased cost of working the collieries referred to, the competition that has arisen in all industries, and perhaps more than all, with the general im-

*Bloomfield Crescent, Bath, England

provement which has taken place in engineering work during the last 30 years, the question of steam consumption by engines came up for examination.

It will be remembered that feed pumps of boilers were found to be exceedingly wasteful, using the equivalent of 10, and sometimes 15 lb. of coal per horsepower-hour. As to the steam used by hoists, it was found that they were even more wasteful, 11 lb. of coal per horsepower-hour being quite a common consumption. And that did not tell the whole tale. The hoisting engine was frequently supplied by its own set of boilers, placed as close as possible to the engine house. As is well known, however, it only works for from 8 to 10 hr. a day, under the recent Eight Hours Act, with an occasional hoist for men, timber or supplies during the remaining 16 hours.

At the Hucknall collieries, what was previously a loss, has been turned into a source of economy. The exhaust steam from the engine is employed to supply a Rateau exhaust-steam turbine, which drives a three-phase generator. The current developed is employed for working the machinery at the colliery, and the whole of the plant, including the hoist at the other colliery, by the aid of currents transformed to 3000 volts, and transmitted on overhead wires from the one colliery to the other. There is a railway between the two collieries, and the pole transmission line, carrying three copper wires, insulated

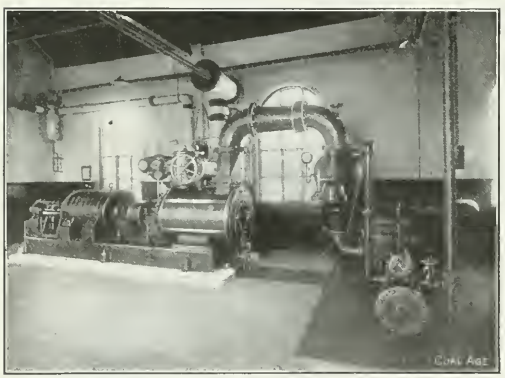


FIG. 2. THE EXHAUST TURBO-GENERATOR AND EJECTOR

with ordinary telegraph insulators, is fixed by the side of the road.

THE ARRANGEMENT OF THE POWER STATION

The installation is at what may be termed the power station, or the lower colliery, known as No. 2; the other mine is 1¼ miles up hill. There is, firstly, a thermal storage reservoir consisting of an old boiler, half filled with old iron rails, located outside of the engine house in which the turbine runs; the exhaust steam from the is about half full of water, the remainder of the steam is condensed to water, the boiler gradually becoming partially filled, and the old iron rails heated. When the boiler is about half full of water, the remainder of the steam is sometimes condensed to water, and sometimes merely delivered into the steam space between the water and the top of the boiler. It may be mentioned that the old iron boiler is merely a shell, and it is only exposed to a pressure of 2 lb. above the atmosphere or, say, 16.7 lb. absolute.

FIG. 3. EXTRA HEIGHT, THREE-PHASE TRANSMISSION LINE

The turbine takes steam from this old boiler, as long as there is any there to supply it, and when this fails, as when the hoist has been standing for some little time, live steam is fed to the turbine, through a reducing valve. Fig. 1 shows diagrammatically the arrangement of the thermal reservoir, the delivery of steam to it from the engine, from it to the turbine, and from the boiler to the turbine, when the supply of exhaust steam fails; it also shows the electrical system at the No. 2, and at the No. 1 pit.

When the engine is hoisting rapidly, and the quantity of steam going into the thermal reservoir is large, the storage capacity of the water and the old iron rails comes into play. The water is raised to a higher temperature, together with the old iron rails, while the pressure of the steam slightly increases. When the steam is not coming so fast, the rails, and the water, give up a portion of the heat which they have stored, and the pressure within the steam space being lowered, evaporation takes place on the surface of the water, steam being

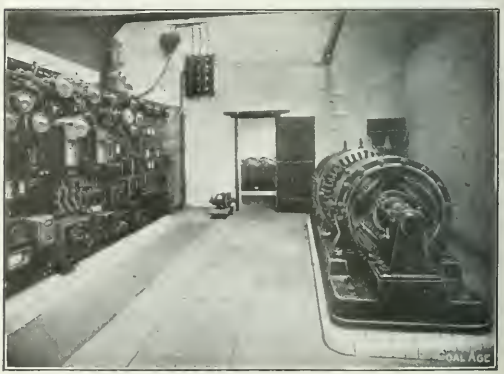


FIG. 4. VIEW OF SUBSTATION AT THE NO. 1 PIT

ormed, and thus furnishing the supply required by the rbine.

The hoisting engine usually is shut down at about 11 m., the fires under the boilers being banked, and the rbine and turbo-generator also shut down. The cur-

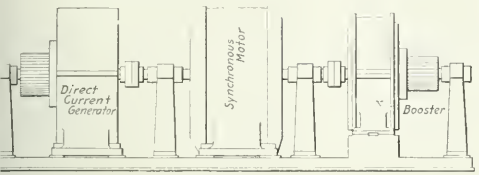


Fig. 5. Motor-generator and Booster at No. 4 Pit

nt required for work during the night, at both col-eries, and at the electric-light system, is supplied from battery of electrical accumulators fixed at the other lliery.

The Electrical System

The arrangement of the electrical system is shown Fig. 1. In the first place the steam turbine drives a ree-phase turbo-alternator, furnishing current at 500 lts. Fig. 2 shows the turbo-engine house at the No. 2 , and Fig. 3 the overhead transmission line between two pits. As mentioned before, the current at 500 lts is employed for lighting, pumping and haulage, at the mine where the turbine is fixed. For the power required at the upper colliery, where the boilers have been taken out, and where the only power is electricity, the 500-volt three-phase current is transformed to 3000 volts, three-phase, and carried by the transmission wires mentioned above, to the upper colliery. There the surplus energy, of the exhaust steam from the hoisting engine at the lower olliery, is stored in an electrical accumulator. It will be remembered that alternating currents cannot be employed to charge accumulators, and therefore the three-phase current has to be converted to continuous current, before the accumulators can be charged.

This is accomplished by the aid of what is called a synchronous three-phase motor, taking the 3000-volt system from the overhead transmission wires and converting it into mechanical power, the axle of the alternating-current motor being connected to the axle of a 500-volt continuous-current generator. The power from the continuous-current generator is employed to charge a storage battery fixed in a room close to the transformer house. Fig. 5 shows the arrangement of the motor generator and booster and Fig. 4 is a view of the substation in which the motor generator is housed, and of the accumulator house adjoining. But there was another problem to be solved. The continuous current from the motor generator is employed at the upper colliery for various work, such as driving mining machines, haulage, pumping, workshop motors of various kinds, together with electric lights for the surface, offices, etc. The cur-

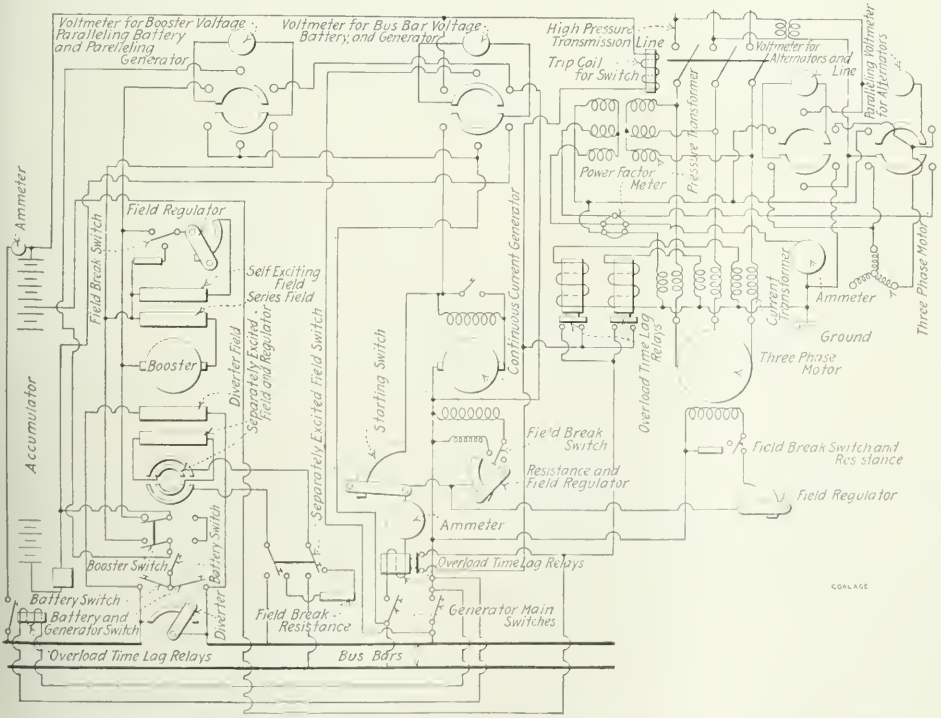


Fig. 6. Diagram Showing Arrangement of Accumulator, Three-phase Motor, Continuous-current Generator and Booster, with Connections and Measuring Instruments

rent from the generator side of the motor-generator is taken primarily to work the motors about the colliery, and any surplus energy that comes to the upper colliery from the thermal storage at the lower one, is stored in the electrical accumulator.

But, in all cases where there is a varying demand for energy, and where storage is attempted, there must be some arrangement for give and take. The thermal storage reservoir at the lower colliery, it will be remembered, takes up all the exhaust steam that is delivered to it, pass-

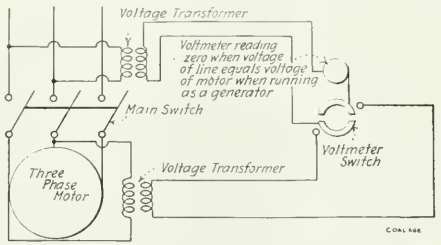

Voltage Transformer
Voltmeter reading zero when voltage of line equals voltage of motor when running as a generator
Main Switch
Voltmeter Switch
Three Phase Motor
Voltage Transformer
COAL AGE

Fig. 7. Method of Connecting Three-phase Motor at Night

ing on the surplus energy to the overhead transmission wires. It also gives up stored energy when the exhaust steam is short.

The "Reversible Booster" System

In the electrical storage battery a similar arrangement holds. The problem at the upper colliery is similar to that at electric generating stations for small towns. No matter how carefully the number of engines and generators are regulated to the load, there was always some surplus energy wasted before the adoption of the method to be described. There were also always times when, unless the plant was running con-

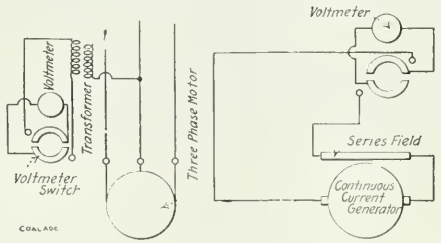


Fig. 8

Fig. 9

siderably over the average requirements, that there would be a shortage of power.

What is called the "reversible booster" system met the difficulty. The "reversible booster" takes the surplus current from the generators, or rather from the "busbars," converts it to the pressure required for charging the accumulator, and on the other hand when the demand for current is above that which the generators running can supply, the "reversible booster" delivers the current required to make up the difference, from the accumulator, re-converting it to the "busbar" pressure in the process.

A little explanation again is here necessary. When charging electrical accumulators, a pressure of about 30 per cent. above that which the accumulator itself will deliver when discharging, is required. The individual lead accumulator cell furnishes, when discharging, a pressure of from two volts downward, the pressure decreasing as the discharge proceeds. While being charged, gases are generated by electrolysis, in the dilute sulphuric acid in which the lead plates are immersed, and the presence of these gases increases the pressure between the plates of the accumulator to 2½ volts per cell. In addition, each accumulator offers a certain electrical resistance to the passage of the charging current.

When a current is passed through the accumulators to charge them, it must be of sufficient pressure to overcome this back pressure, which the accumulator itself is furnishing, and also to overcome the resistance of each individual cell. This leads to the 30 per cent. or so, increased pressure required by the charging current. If an accumulator is charged, and allowed to stand for a few minutes after the charging current is cut off, it commences to deliver current at about 2 volts. When, however, current is taken from it during the process of charging, it would be at the pressure of 2½ volts, and therefore would be unsuitable for performing the work that is being done by the current delivered by the generators themselves.

The difficulty is met by the "reversible booster" reconverting the 2½ volts to 2 volts, and delivering it at that pressure to the busbars. The accumulator then acts as another generator connected in parallel with those running. In practice, there is a variable see-saw between the accumulator and the generators. At certain times of the day the accumulators are receiving a large quantity of current, and at others they are receiving only a little; again at times they are discharging small quantities, but at others, when lighting and power are required together, comparatively heavy discharges are taken from the accumulator.

System at the Hucknall Collieries

At the Hucknall collieries, a reversible booster is fixed with its axle forming part of a mechanical system in

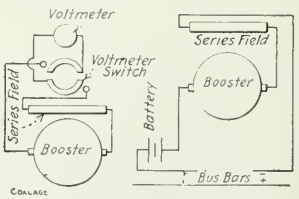


Fig. 10

Fig. 11

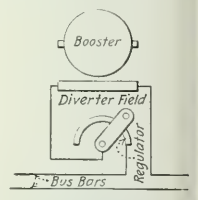


Fig. 12

which are arranged the synchronous motor and the continuous-current generator. Fig. 5 shows this, and Fig. 6 the arrangement for charging the accumulators.

All surplus steam, up to a certain point, is converted, at the lower colliery, into electricity, and transmitted to the upper colliery. This electricity furnishes all the power that is required at the upper colliery and any surplus that remains is delivered to the accumulator. The accumulator itself helps to make up any deficiency of power at the lower colliery. It was mentioned above, that the boiler and hoisting engine at the lower colliery is shut down at about 11 p.m. and a certain amount of power was required after that time. After the boiler and hoisting engine are shut down at the lower colliery, the

current from the accumulators at the upper colliery is transmitted to the lower one, being first transformed through the motor generator, and through the reversible booster, into three-phase alternating currents at 3000 volts.

It will be remembered that every continuous-current generator also acts as a motor, if required, and a synchronous alternating-current motor will act as a generator if required; consequently when current is no longer coming from the lower colliery to the synchronous motor, power is delivered from the electrical accumulator to the continuous-current generator, driving it as a motor, assisted by the reversible booster. The synchronous motor then becomes a three-phase generator, and delivers an alternating current at 3000 volts to the overhead transmission line. At the lower colliery, the 3000-volt, three-phase currents are transformed down to the 500 volts at which the colliery service is worked. The lights for the houses are supplied by special transformers, arranged for the purpose, furnishing current at 100 volts. These lighting transformers take power from the three-phase generator at the lower colliery while it is running, and from the synchronous motor, working as a generator, at the upper colliery, when the generator at the lower one is standing. Figs. 7 to 16 are parts of the diagram given in Fig. 6. They represent the details of the arrangement.

The Haulage System at the Lower Colliery

The working of the haulage system at the lower colliery, where the exhaust-steam turbo-electrical generating station is, will probably be interesting, inasmuch as it is a conversion from a steam drive to an electric. The colliery where the plant is installed is an old one, having been working something like half a century. The haulage underground is worked by two endless ropes, which were driven, before the installation of the exhaust-steam plant, by a pair of simple cylinder horizontal engines, furnishing together about 80 hp., and supplied with steam by a boiler near the pit, working at low pressure. At the time this plant was put in, it was the common practice to take steam underground. In the North of England, in the counties of Durham and Northumberland, where the most advanced practice was usually to be found, it was a common thing for steam to be taken considerable distances in-bye, and the working of a haulage plant by steam engines, near the pit bottom, exhausting into the upcast shaft, was also quite common.

At the Hucknall colliery, the haulage extended about 1½ miles on one side of the pit bottom, and for about half a mile on the other side. There was also a small rope arranged to haul the trams round the shaft bottom. The engine and boilers were taken out, and the 60-hp., three-phase, induction motor installed; this motor was guaranteed to be capable of giving 100 hp. for four hours without undue heating. The two endless ropes were driven from a single shaft, by the aid of clutches in the usual way, the driving shaft taking power from the motor by means of a series of belts.

Some careful tests were made of the power required to work the haulage plant, and it was found, as in other cases, to be less than the sum of the two powers required for the two ropes working separately. The smaller quantity of power required, and the reason, is perhaps best seen by taking the case of a large engineering works, with a number of machine tools. Going through the works, it will be found that perhaps one machine is standing, while the man looking after it is setting a tool; another machine perhaps will be taking only a light cut; a third may be taking its full cut, and so on, the result being that only the smaller quantity of power mentioned above is required.

The running costs of the plant at Hucknall are quite low indeed, so low, in fact, that the manager of the colliery stated that he would not like it to be known for business reasons.

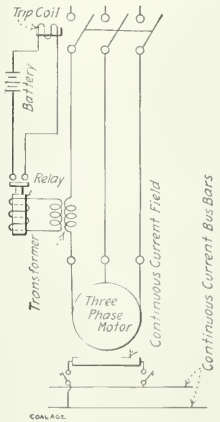


Fig. 15

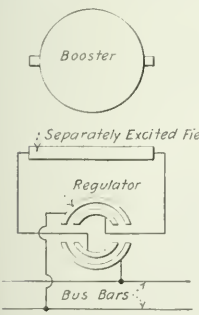


Fig. 13

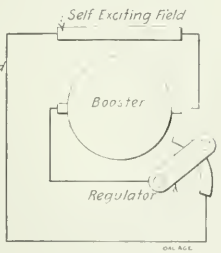


Fig. 14

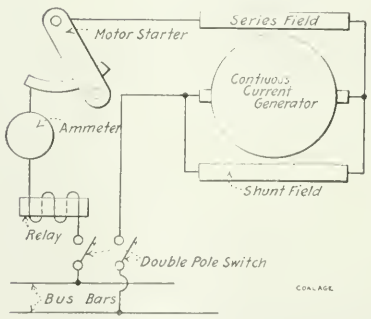


Fig. 16. Trip Coil on Continuous-current Generator

SNAP SHOTS IN COAL MINING

1—Tipple at mine No. 2, West Kentucky Coal Co., Sturgis, Ky.

2—Main shaft and general surface plant No. 2 mine, Dominion Coal Co., Glace Bay, N. S.

3—Primitive charcoal burning, La Paz, Coahuila, Mex.

4—Mary-Lee seam in the Warrior field, Warrior-Pratt Coal Co., Porter, Ala.

5—Plant at the Lady Wellington mine of the American Coal Co., Spiketon, Wash.

6—A hoisting shaft, 1000 ft. deep at No. 2 mine, Dominion Coal Co., Glace Bay, N. S.

7—A gravity-screen tipple at the Patrick-McKay mine, Roslyn-Cascade Fuel Co., Roslyn, Wash.

8—Electric slope hoist at Lincoln colliery, Philadelphia & Reading Coal & Iron Co.; 110 hp., 220 volts, 385 r.p.m.

9—Transmission towers of the United States Coal & Coke Co., Gary, W. Va.; 75 ft. high.

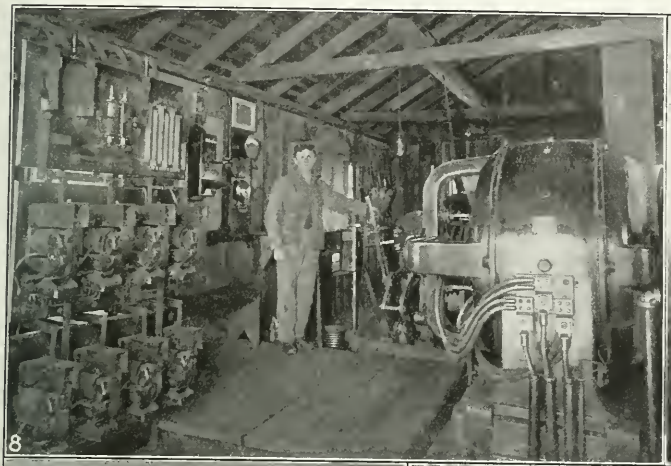
10—Fan motor of Turkey-Run colliery, Philadelphia & Reading Coal & Iron Co., Shenandoah, Penn.; 50 hp., 230 volts, 200-400 r.p.m.

11—Alternator with belted exciter, at Bear Valley colliery, Philadelphia & Reading Coal & Iron Co., Shamokin, Penn.; 400 kw., 2300 volt, 3 phase, 60 cycle.

12—Air compressor at the Luzerne substation of the Rochester & Pittsburg Coal & Iron Co. Each is direct-driven by a 450-kv.-a., 6000-volt, 125-r.p.m. synchronous motor.

13—A 75-hp., 220-volt, 430-1075-r.p.m., shunt-wound motor, driving 18-ft. fan through countershafting at North Franklin colliery, Philadelphia & Reading Coal & Iron Co., Treverton, Penn.

Some General Electric Power Installations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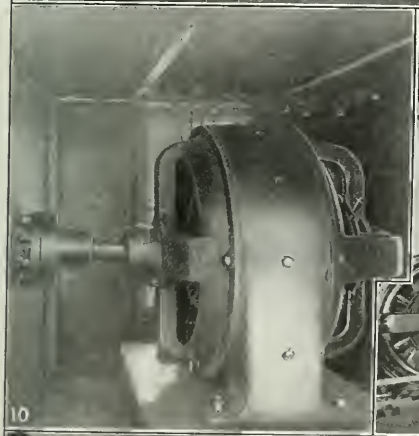
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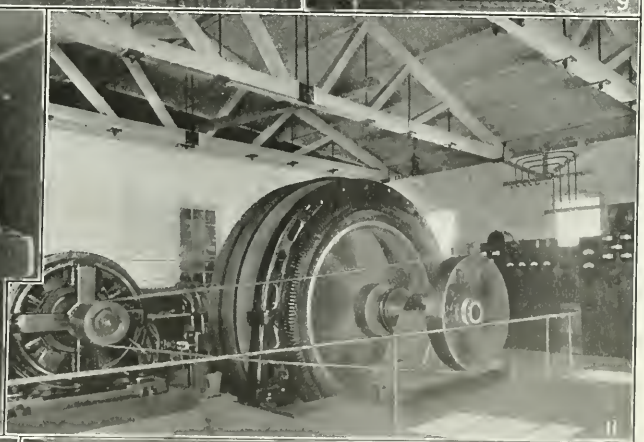
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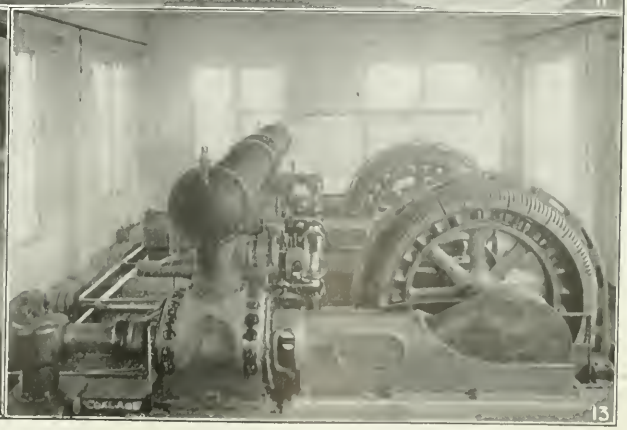
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Feed Water Purification at Mines

Special Correspondence

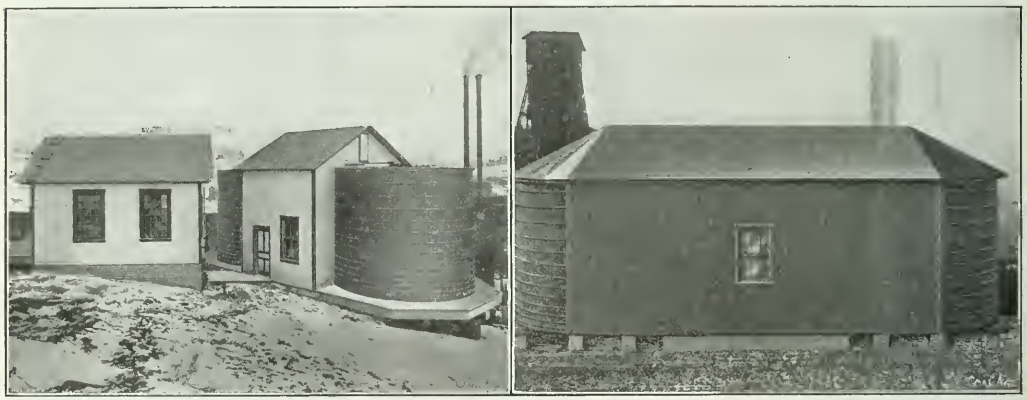
SYNOPSIS—The feed waters encountered in mining regions are frequently both scaling and corroding in their nature. If used in their raw or untreated state, even though heated to a considerable extent before being forced into the boilers, much trouble and expense is liable to be incurred. A system of water softening and purification is here described which has been successfully installed at many mines.

In many steam power plants in coal-mining regions, particularly those which draw their boiler-feed water from sources which have been contaminated with mine drainage, considerable difficulty has been experienced from either scale or corrosion, or both. The fear of the expense and danger arising from these causes is strongly evidenced by the large number of boiler compounds, purifying devices, skimmers, filters, etc., which are upon the market.

scale-forming material as to be extremely undesirable for boiler-feeding purposes; likewise a stream which near its source shows good analysis, and not enough foreign matter to cause any trouble in a boiler, at points lower down, due to contamination from outside sources, may show both scaling and corroding properties to a marked degree.

To decide on the suitability of a water for boiler-feeding purposes, an accurate analysis is essential. This should be complete and be carefully made by a chemist who, if possible, is a specialist on boiler-feed waters.

An analysis of the scale in the boiler is of practically no value in determining the character of the water from which the scale was deposited. This is due to the fact that incrustation is a precipitation resulting from reaction between some of the substances in solution, as well as to the heat and concentration, so that the original character of the impurities and their amount in the water in question is not always apparent from the scale.



Feed-water Purification Plants at Burgettstown, Penn. (at the Left) and at De Lancy, Penn. (on the Right)

The Origin of Scale

Incrustation and corrosion can nearly always be traced to the iron, lime and magnesia salts in solution in the water, or in some cases to the free acid which it carries. The physical character of the scale depends upon the acids combined with the iron, lime and magnesia, upon the type of boiler in use and the rate, temperature and pressure at which it is operated.

To overcome the waste and expense due to the operation of boilers with water containing one or more of these impurities, many methods and devices are in use, nearly all of them depending upon sound mechanical or chemical theory. But many of these devices fail to perform in the fullest measure what is expected of them, or are at best only partially successful due to improper application or to the fact that effort is directed against the effect rather than the cause.

A water, which to the eye seems to be absolutely clear, one which is known to be perfectly good and safe for drinking purposes, may contain so great a proportion of

Objectionable Sources of Supply

Mine waters, creeks and streams fed with mine drainage are objectionable on account of the free sulphuric acid and corrosive sulphate of iron and alumina as well as the other scale-forming substances which they carry in suspension.

The sulphates of iron and alumina in such supplies act in the boiler exactly like sulphuric acid, inasmuch as they are dissociated by heat, the acid being thus set free, and the iron and alumina precipated as sludge or scale.

The sulphuric acid liberated as well as that introduced in the free state with the feed water immediately attacks the metal of the boiler, forming iron sulphate, which the heat decomposes, freeing the acid and forming iron hydrate, which gives the water the characteristic color of iron rust.

The acid liberated by the reaction due to heat is constantly repeating its destructive action upon the metal. Sulphuric acid is nonvolatile; consequently its amount in the contents of the boiler is constantly being increased

by the quantity introduced with the feed, either as free acid or that combined with the iron or alumina. The destruction of the metal of the boiler may be said to be almost in direct ratio with the concentration of the acid which is contained therein.

Other corrosive acids and substances are often present in boiler supplies. Water which drains through swamps or marshes wherein there is much decayed vegetable matter often contains enough organic acid to cause severe and dangerous pitting. But in the mining regions sulphuric acid is the most common, and is also the most destructive to the piping, heaters, boilers, etc.

Scale Shortens a Boiler's Life

The effect of scale on the heating surface tends to shorten the life of any boiler. That over heating results from scale is certain. As a rule, the metal is not of such a quality as to stand continued overheating, and portions of the tubes eventually show the characteristics of cast iron in their structure. This condition is not uniform throughout the entire boiler, but is more evident in those parts which are exposed to the greatest heat.

The actual thickness of incrustation seems to have less to do with crystalization than the nature of the scale and the furnace temperature, which in turn is dependent on the rate at which the boiler is operated.

The second condition, the failure of tubes by blisters or blowouts, is more common in some types of boilers than in others, and as a rule is chargeable to the insulating effect of irregular deposits of scale, sludge or oil from which local overheating results. This condition is, of course, aggravated by the furnace gases impinging more directly on certain parts of the tubes than others, thus bringing about unequal heating and a tendency to drive the water away from the tube walls.

That scale and corrosion affect the life of the entire steam plant, as well as increase the maintenance cost, is self-evident. The full efficiency of the various devices installed to increase the economy of the steam plant, as well as that of the individual boiler, will not be reached therefore as long as any scale is allowed to form, or any boiler is permitted to be fouled with oil or sludge.

The attempt to prevent scale in the boiler by having it deposited in some auxiliary, such as a feed-water heater and purifier, is one of the most common methods of attacking the feed-water problem. It is a known fact that raising the temperature of water reduces the solubility of some of the substances in solution; but this does not justify this method of precipitation for purifying all boiler feeds.

Any attempt to make the open feed-water heater perform two separate functions, savors of a make-shift, since as its efficiency as a purifier increases, its efficiency as a heater diminishes. The mere fact that scale is deposited upon its walls or pans does not justify it being called a purifier any more than to call a boiler by the same name, for the reason that scale is deposited upon its walls or tubes.

The large number of nostrums and mechanical devices put into use indicates that the steam users realize how irrational it is to expect an economical purification of feed water to be accomplished in either boiler attachments or auxiliaries, or in the boiler itself by making use of various compounds.

Conditions of Greatest Efficiency

The condition under which the most economical and efficient boiler operation can be obtained is with the use of clear, soft, noncorroding, nonscaling feed water. The problem, therefore, before the mine operator who has at his command only a supply of objectionable water is that of purifying and softening the boiler feed before it enters either the heater or boiler.

The process of softening and purifying water deals with the problem in the manner perscribed by the chemist, by the use of proper reagents which neutralize corrosive acids and change the soluble salts of lime, magnesia and iron into insoluble precipatates which can be removed by sedimentation and filtration. These can easily be accomplished in apparatus designed with all the chemical and mechanical requirements kept constantly in view.

The impurities in a water of average hardness (say 20 grains per gallon) only represents about $^1/_{100}$ of 1 per cent. by weight. This being the case, it becomes of vital importance that an exact weight of the reagent be mingled with a measured volume of the water in order to produce complete chemical reaction (in which time is also a factor). The use of sludge from previous softening to aid sedimentation, and perfect clarification by filtration are also important features which must be considered in order to obtain results that will compare favorably with a natural soft water.

The operation of a softening and purifying system requires only the exercise of common sense and ordinary care.

It is possible with a properly designed and operated system of this kind to eliminate or neutralize any acids, to completely remove all permanent hardness, to reduce the remaining scale-forming substances to less than three grains per U. S. gallon, and to produce a clear effluent.

Any water-softening system that fails to give these results is either faulty in design or improperly operated.

The cost of water purification will, of course, depend upon the amount of the reagents required, and these in turn upon the quantity and kind of impurities. It is readily understood that it costs more to remove 25 grains of carbonate of lime than it does to remove 10 grains, not because the method is any different, but because a greater quantity of reagent is required to bring about the precipitation.

Two Types of Water Softeners

There are two types of water-softening and purifying apparatus in use, the continuous and intermittent. With the continuous system the introduction of the reagents depends upon a proportional feeding device, and hence adjustment must be made in the quantity of the chemicals introduced to meet every variation or change in the water. This being the case, an error must necessarily occur, whenever the quality or quantity of the water varies.

On the other hand, in the intermittent type, measured amounts of water are treated, and the exact quantity of reagent is determined by weight. It is possible, therefore, to accurately treat any water, no matter how it may vary in quality or in quantity.

No automatic arrangement to adjust the quantity of reagents to the impurities of various kinds in water has yet been invented, nor is it probable that one will ever be devised. Therefore, this vital function of the process

must be performed by the operator, and the care and intelligence with which it is done practically determines the efficiency of the system when there are no faults in design.

Any softening effect will improve a bad boiler feed, but to obtain the best results, accurate treatment, which means careful attention, is absolutely essential.

The water-softening and purifying apparatus manufactured by William B. Scaife & Sons Co., and known as the We-Fu-Go system, may be considered as a typical example of the intermittent purification process. Such a device renders its owner independent of uncertain weather conditions or surface supply, as water from any source can be utilized.

The Essential Elements of the System

This system consists essentially of two or more treating and settling tanks, equipped with mechanical stirring devices operated by power, a small reagent or chemical-mixing tank with mechanical stirring device and a jet or other pump for introducing the reagents into the treating tanks, and a filter.

The treating or reaction tanks are filled alternately with water. While a tank is filling, the reagents are introduced and thoroughly mixed with the incoming water by means of the mechanical stirring device consisting of a specially designed paddle revolved by power from an available line shaft, an engine or a motor.

The paddle not only mixes the reagents with the water, but at the same time stirs up from the bottom the sludge of preceding purifications. This sludge held in suspension in the water, hastens the chemical reaction and causes the new finely divided precipitates to form large wooly flakes, heavy enough to settle quickly as soon as the water stops moving.

The mixing device is the simplest and most efficient that can be constructed. With reasonable care it will not get out of order. It does not have to be frequently cleaned to keep it in working condition, and requires but very little power.

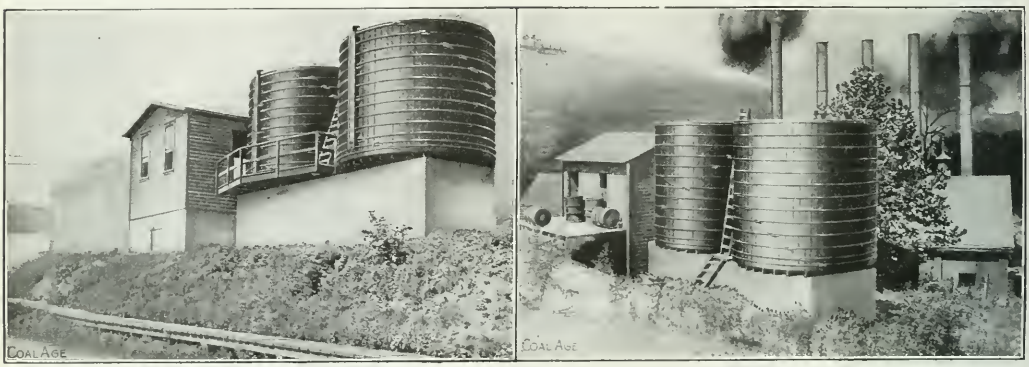
After a tank is filled the stirring device is stopped, and the water permitted to stand, in order to allow the precipitates to settle to the bottom. The softened water is removed by means of a hinged floating outlet pipe, arranged to rise and fall with the level of the water, so that the latter is always drawn from the top.

The water near the surface being the cleanest, carries the least amount of floating sludge through the outlet pipe to the filter bed. Therefore, the latter can be run the longest possible time without being cleaned. The rate of flow through the filters is automatically controlled, so that they are supplied with water as fast as it is drawn from them. Either pressure or gravity filters may be used.

While one tank is being filled, treated and settled, the other is supplying pure water; and by the time it is emptied the first tank is ready for use. In this way a constant supply of accurately treated, clear water is always available.

Pipe Connections Located in Tank Bottom

Pipe connections through which the tanks are filled, and also those which carry away the sludge are placed in the bottom. The washing of the settling tanks needs only be done once a week, or when the sludge becomes deep enough to interfere with the rotation of the paddles.



Two We-Fu-Go Feed-water Purification Systems. The One on the Left is Located at Oakdale, Penn., and that at the Right at Noblestown, Penn.

To clean out these tanks it is only necessary to open the valves to the sewer and start the stirring device which mixes up the sludge, this being soft enough to go through the pipe into the sewer.

The results accomplished with this apparatus are the following:

Accurate chemical treatment, thorough mixture of the reagents with the water, accelerated and complete chemical reaction, rapid sedimentation and perfect clarification.

With a properly softened water there will be no scale formed in heaters, pumps, pipelines or other auxiliaries, because the salts of lime and magnesia will have been removed to a point below their normal solubility. So that at the higher temperature that may be obtained without concentration, no accumulation of scale will occur.

Neither will such a water form scale or cause corrosion in the boiler. Incrustation cannot take place even with indefinite concentration, for the small amount of lime and magnesia salts left in the water are of such a character that when precipitated as a result of concentration in the boiler, only a slight sludge is formed.

WHO'S WHO—IN COAL MINING

Edwin Ludlow was born at Oakdale, Long Island, N. Y., and graduated from the Columbia School of Mines in 1879. In order to put the test of practical usage, on his long years of theoretical training, he engaged with the United States Engineer Corps under his brother, the late General William Ludlow. This early work included the surveying of various rivers and harbors on the New Jersey coast from Shrewsburg south, and on the Delaware River from the city of Trenton to Delaware Bay.

At the end of two years, young Ludlow found himself in charge of the hydrographic work of the department, the highest position in the service open to civilians at that time. While casting about for a new field with greater possibilities, he was offered a position in Mexico, which appealed to the adventurous side of the man, and he accepted. Accordingly, the year of 1881 found him, in company with two other engineers, one servant and one pack animal, engaged on the reconnaissance of the Mexican National R.R. from Laredo, Tex., to Mexico City. Some eight months were consumed in covering this eight hundred miles of mesquite- and tarantular-infested country, and our modern engineer, accustomed to elaborate camp equipments, will appreciate the hardships entailed by such a meager outfit. Added to this, the party ultimately arrived at their destination, only to find that the company was in financial straits, which necessitated the discontinuance of all further activities for the time being.

Edwin Ludlow

Returning to the States, Mr. Ludlow made his *debût* in the coal industry as assistant superintendent of the Mineral Railroad & Mining Co., one of the anthracite subsidiaries of the Pennsylvania R.R. Co., with headquarters at Shamokin, Penn. Being a novice at this new vocation and obsessed with an insatiable desire for first-hand knowledge of the real practical issues, he spent much of his time, dinner pail in hand, underground. At the end of two years, young Ludlow was appointed superintendent of the Union Coal Co., which concern had just leased two of the Mineral Co.'s collieries and, in 1885 when Major Stearns was made general manager of all the coal properties of the Pennsylvania R.R. Co., Ludlow was promoted to the superintendency of the Mineral Co. During his four years' incumbency of this position he was actively engaged in carrying out an extensive development propaganda, under the direction of Major Stearns, and incidentally he installed the first water-tube boilers and chain conveyors used in the anthracite regions.

In 1889, Mr. Ludlow was asked to take charge of the development of what was then a virgin coal field in the Indian Territory, now Oklahoma. Preliminary geological studies of the district had been made by H. M. Chance and Ludlow's instructions were to extend the known areas of workable coals, see that the line of the Choctaw Coal & Ry. Co., then being constructed, was located in the most advantageous position for working same, and develop mines to provide a large tonnage for the road. The field was some eighty miles in length and during the early constructive period Mr. Ludlow made a buckboard his headquarters, spending only sufficient time at the office to place orders for the supplies required at the rapidly-building camps. To step into another man's shoes and follow out tried and approved methods of procedure requires a certain ability sometimes, but to tackle the many problems incident to developing a new field on a large scale, and at the same time build up a working organization from the ground, requires an executive ability and a capacity for original thinking that probably few engineers possess. The present-day importance of the district he opened stands as a monument to the success which attended his efforts.

After ten years at the Oklahoma mines, Mr. Ludlow was again called upon for pioneer work, this time in Mexico. At the head of an American concern he was the original operator in the now well known Sabinas field in northern Coahuila, and in three years transformed a bare desert into a thriving and attractive mining camp, incidentally putting his company on an earning basis of six hundred thousand dollars per annum. Handicapped by unfavorable mining conditions, a meager supply of trained assistants, and forced to draw his labor from an inexperienced race of people, accustomed to the intermittent work of ranch life, the ability of the man was put to a severe test. Nor were his problems confined entirely to the operating end. New markets had to be created, steam consumers prevailed upon to install fireboxes suitable for using the inferior local product and today an important railroad system and many large industries rely exclusively upon this district for their fuel.

The evident success of the American company attracted new capital to the field, and other mines were rapidly opened up which ultimately developed into important competitors of Mr. Ludlow's company. His mining problems were, at the same time, becoming more complex at the increased depths, and in order to effect greater economies, and provide funds for sinking a 900-

ft. shaft (the deepest coal shaft in Mexico) he installed what is today the most modern battery of Koppers waste-gas ovens on the American continent.

Ability such as Mr. Ludlow's was, obviously, too rare to be confined to the relatively small operations on the frontiers of civilization and it was inevitable that he must eventually gravitate to the large mining districts of the East. In 1910 he was chosen vice-president and general manager of the New River Collieries Co., and, although only with that concern about one year, his work in this field was particularly effective and brought the results which the company had been seeking for a number of years.

In March of last year Mr. Ludlow accepted a position with the Lehigh Coal & Navigation Co. as vice-president, in charge of the mines. At the time of his appointment to this position the late W. A. Lathrop said of him: "Mr. Ludlow brings to his new situation a long experience with mining problems and management and the company is to be congratulated upon having secured his services." A more tangible tribute to his ability, however, was made by William C. Potter, vice-president of the Guaranty Trust Co., who said: "He has that rare combination of technical and executive ability which is in such great demand today."

Edwin Ludlow is essentially a man of contradictions. Debonair, blasé, almost Chesterfieldian in manners, a member of New York's most exclusive clubs, and an epicurean of no mean discernment, he is none the less at home in the mines, will answer to the call of "grub-pile" in a cow-camp, with the avidity of the normal "puncher" and then show the latter a few of the fine points in throwing a "diamond-hitch." He is by all instincts and training an Eastern man, while a handsome loving cup, presented him in the West, speaks eloquently of his popularity there. No more princely host or thorough disciplinarian exists. A man of quick decisions, tempered however, by a full appreciation of human failings, he has invariably won a loyalty and an *esprit de corps* among his men that is all too rare. Incisive in his orders, he inspires an immediate confidence that has stood him in good stead during the inevitable mine disasters, when directing his men at the face, where he prefers to be.

A Modern Power Plant

The Lehigh Coal & Navigation Co. is building a power house at Hauto, seven miles above Mauch Chunk, which will transmit current at 110,000 volts anywhere within a radius of 175 miles. The power house is being built of brick, the operating room being 180 ft. long, and the boiler room 385 ft. long and 70 ft. wide. The dam will be 1700 ft. long, and the height of its embankment 31 ft. The width at the base is 150 ft., and 15 ft. at the top. Broad Mountain and Nesquehoning Mountain form the sides for the new reservoir, which, when completed, will entirely cover the old L. C. & N. dam.

The boilers are of the water-tube type, having a capacity of 1000 hp. each. The water will be taken from the reservoir and, after passing through the turbines, it is to be condensed and returned through an open canal to a point midway in the new reservoir. The water will circulate through the reservoir until it again reaches the intake tunnel, when it will go into the plant to be used again.

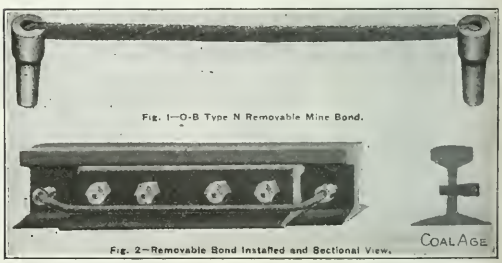
Three turbo-generators of 1000 kw. each are to be installed at the beginning. A three-phase current will be generated at a voltage of 11,000 volts, which will pass through step-up transformers until it has reached the transmitting voltage of 110,000 volts. Galvanized steel towers will be used for supporting the cables of the transmission line. The towers will be 78 ft. 6 in. high, and will be spaced about 600 ft. apart.

A New Bond for Butt Entries

In coal mines, the haulage tracks in cross headings or butt entries are used for only a comparatively short time before they are taken up and removed to new workings. In order to meet this condition, the Ohio Brass Co. recently designed their type N removable mine bond for the exclusive purpose of bonding temporary tracks.

This bond differs from compressed terminal bonds, in that it may be readily removed without injury when the temporary tracks are taken up and it can be used over and over again.

Before putting the type N removable mine bond on the market, the makers placed a number in actual service in mines and kept a careful record of their performance and have proved conclusively that they are much



Improved Type of Bond for Use in Coal Mines

more efficient than channel pins, which have hitherto been largely used for bonding temporary work.

Briefly, this bond consists of two tapered steel terminals joined together by a flexible copper cable (Fig. 1). This cable is headed and soldered into the terminals, which are tinned all over. The taper has been carefully worked out so that when the bonds are first installed they need only be driven in a short distance. The next time they are used they are driven in a little further, and so on.

Application is extremely rapid, as the bonds are simply driven into holes drilled in the rails by a few taps of a hammer, no special tools being required.

A standard $\frac{5}{8}$-in. drill is used to bore the hole in the web of the rail, and the bond terminals broach this hole so that it conforms to the taper of the bond.

The design of the bond is such that it will go around the fish plate (Fig. 2), thereby making it unnecessary to remove the generally rusted fish-plate bolts in order to install the bond. This feature makes inspection or removal much easier.

As previously stated, this bond is designed exclusively for temporary tracks, while on main-line haulages the compressed terminal type of bond should be used.

EDITORIALS

High Fan Efficiency

A great majority of the fans and blowers used in the ventilation of coal mines are sold under guarantees of performance. Unfortunately, however, it is seldom that the means and methods to be employed in the acceptance tests are mentioned in the contract. Almost invariably, if properly set up, in accordance with the instructions of the builders, these machines measure up to their specifications.

It is not at all uncommon to read of ventilating fans, even of the disk type, having an efficiency of 70 to 80 per cent., or even higher, while some manufacturers appear to have no hesitancy whatever in guaranteeing such high performances.

Almost invariably, also, the acceptance trials are conducted with the aid of an anemometer, the shortcomings of which are well known. So unsatisfactory and inaccurate may these instruments become, particularly when used in strong air currents, that it is believed by some engineers that results obtained from their use are, or rather may be, quite as unreliable as a guess.

In an article appearing in *Engineering News*, Vol. 65, p. 558, A. H. Anderson says: "A simple centrifugal blower with six radial vanes has an efficiency of about 40 per cent. A later type having a large number of narrow vanes has an efficiency of about 60 per cent." These figures closely corroborate determinations made by Prof. R. C. Carpenter.

W. G. Walker, in experiments on disk fans of uniform size and speed, but varying shape and angle of blades, found efficiencies ranging from 4.7 per cent. to 43 per cent. All of the above, it should be remembered, were laboratory tests conducted in a most careful and scientific manner.

If approximately 60 per cent. is the best that can be obtained from a centrifugal blower when on the testing floor under the most favorable conditions, it is hardly natural to expect better results when in operation at the mine. The careful mine owner or engineer may well look askance therefore, at the extremely high efficiencies guaranteed by some fan builders.

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The Strength of Law

The strength of law is in the approval of the citizens. Never was an act passed which served its purpose, if the people were opposed to its execution. The law must be accompanied by the right sentiment or it will be only a job for the public printer.

When a man is killed, the common cry is, "Lynch the murderer," but in more civilized communities it is changed to "Apply the law." Everyone who saw the crime gives evidence; the whole community hopes that the criminal will not escape.

If such a sentiment backed the mining law, if the thought of everyone was to let the law be enforced, we would not have so many accidents. It would be dangerous to violate the mining code. The inspector would find witnesses at hand to testify against the violator. He would not have them slip away and leave him with a weak case when the matter came to court.

The change is coming. It will be before long as easy to put men in jail for neglecting to take precautions as to incarcerate them for "stealing cars" or appropriating picks. An act, which puts in danger a mine full of men, has not as great a justification as can be brought forward for changing checks or sawing the mark off a pick handle.

No man who committed such a petty theft would have his fine paid by the union, although at present there are those who claim that the penalty which is imposed for a violation of the mining law, is often paid from union funds. This is an evil feature in the attitude of labor. It is not what is known as "solidarity of the working classes." It permits the criminal to injure his brother man. Surely men are not banded together for the purpose of having the careless injure others who are innocent of wrongdoing.

In fact, we should not be satisfied with the law alone. The man who steals cars has to move away from the place where he committed the act; the disapprobation of the community makes the journey necessary, and the man who jeopardizes a mine should find it best to leave, and in fact, as mining is essentially an occupation where the careless usually injure more than themselves, the man should be compelled by some provision of the law to enter a life work where his folly and dishonesty of purpose could no longer constitute an offence against his fellow men.

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The Central Power Station Idea

During a a comparatively recent period of time, the idea of the central power station has been rapidly gaining headway. It has been found that power losses, even over transmission lines of considerable length, are less costly than are fuel freight rates for the same distance.

Already we have hydro-electric developments supplying current to large coal-producing areas, and steam- or gas-power stations projected in the heart of coal-mining regions, where the fuel as taken from the ground possesses, as an article of commerce, its first and least value.

In the present state of power engineering, it is idle to hope that unit efficiency or even any approximation hereto, can ever be attained in any thermo-mechanical or thermo-electric plant, as a certain amount of heat energy is invariably wasted in any process involving fuel consumption. But, since heat losses are inevitable, it would appear to be the part of wisdom to permit these losses to take place only at the point where the fuel involved represents the least possible outlay in actual time and money.

A Fan Question

We publish, in the Discussion department this week, a criticism of our answer to a recent examination question, by one of our readers, at his special request. The criticism is an honest one, although as we have tried to show, in a brief editorial note following the criticism, the correspondent misjudges the conditions involved in the question.

When a criticism or other contribution is evidently in error we do not publish the same except upon the special request of the correspondent; and then only when the question involved is an all-too-common mistake, which we hope to correct, in a measure, by a free and open discussion.

In the present case, the point of issue is the reduction of the air volume caused by an increase of water gage, for the same speed of the fan. Our correspondent says the air volume is always "proportional to the speed of the fan, irrespective of the water gage."

The point to be impressed, here, is that the water gage, in mine ventilation, may be increased in two ways:

1. By increasing the speed of the fan.
2. By increasing the mine resistance.

In this question, the increase of gage, *for same speed of fan*, can only be due to an increase in the resisting power of the mine, which means a less air volume, less work lost in fan, slightly greater fan efficiency and less power required to produce the same speed of fan.

Slack

The problem furnished by the absence of demand for slack is likely to be severe so long as such a large number of coal corporations still burn run-of-mine coal. It would pay the mining companies to get together and engage a capable canvasser who would watch new installations in the cities and urge the introduction of uptodate slack-burning and self-feeding boilers. We believe that an energetic campaign might be made which would double the demand for slack and make the price such that the extreme care in preparation and mining might be relaxed.

However, the man who undertook to press the claims of slack on the attention of the smaller consumer would have to keep silent about the conditions at many of the mines which he represented. He would not be able to fortify his claim by showing how much his companies were saving by their use of small sizes and the reduction of stoking labor.

The Harger Plan

We think the Harger plan, as originally laid out, was sufficiently discredited by the public before Mr. Burrell made his address at Parkersburg, W. Va. Nevertheless, we do believe that it may ultimately be found available in connection with shotfiring from the surface. When no one is in the mine, it will be possible to fill the workings with carbon dioxide and oxygen-depleted air, so that the only things which are likely to burn will be explosives which contain their own oxygen. In this way both mine fires and explosions will be prevented.

When the mine is entirely depopulated, its atmosphere can be made so foul as to be destructive to life. The short time during which this condition will be maintained will involve less cost than 10 hr. of lesser air pollution.

Electricity in Coal Mining

It is probable that in no branch of human activity does the power of electricity meet with a more diversified field of usefulness than in coal mining. Although all of the applications of this form of energy to mining processes may be divided into four great classes or divisions, viz.: the production of light, the distribution of power, the transmission of intelligence and the initiation of chemical reactions, the number and variety of the operations performed by its aid are scarcely less than legion.

Let us consider for a moment what manipulations in the mining and preparation of coal are, or rather may be, accomplished by means of this power. First the coal is undercut by electrically operated machines. Next the shot holes are bored by electrically driven augers. After the powder charges have been properly placed and made ready they are fired by electric detonators.

The coal is then loaded into mine cars by electric-shoveling machines. The cars are hauled to the shaft bottom by electric locomotives, controlled by an electric signal system, where an electrically operated cager counts them off and places them upon the cage.

The attendant then presses an electric button and the engineer on the surface receives the signal to start the electric hoist.

During the upward travel of the cage an electric tachograph makes a permanent record of the time, duration and rapidity of the hoist and warns the engineer by a visible or audible sign if the safe speed limit is being exceeded.

Upon arrival at the pit bank an electric ram pushes the loaded car off and an empty one upon the waiting cage. After removal from the mine car through the medium of an electrically driven dump, the coal passes first to electric shaker or revolving screens and thence to electrically impelled picking tables and loading booms.

Finally, after the mine product has been safely deposited in the railroad car, by means perhaps of an electrically driven box-car loader, the tipple foreman calls up the superintendent over the telephone and informs him that a certain railroad car of a certain number has been properly loaded with such and such a grade and is ready to be turned over to the transportation company for delivery.

In the above, only the processes wherein the coal is directly involved have been considered. No mention whatever has been made of the very common and important, although perhaps somewhat subsidiary uses for electricity, such as lighting, ventilation and drainage, to say nothing of the employment of electric head- or safety-lamps by the individual miners.

We can only view the future in the light of past experience. So rapid has been the progress of electricity in the ten or twenty years which are immediately behind us that its ultimate future utility is difficult even to conjecture. Yet, the basic principles underlying all electrical achievements and inventions are extremely simple—so much so, in fact, that we are often deceived and misled by their lack of complexity.

The wise operator, therefore, will rather encourage than discourage an inquiring spirit and a tendency to experiment with things electrical on the part of his employees, even though to him the experiments in question may appear to be crude, puerile or even silly.

Resolution

Upon the recent retirement of Richard Newsam, as irman of the Illinois State Mining Commission, the owing resolution was unanimously adopted and made art of the records of the commission. The resolu- but feebly expresses the high esteem in which Mr. vsam, familiarly known as "Uncle Dick," was held very mining man in the state

The honored chairman of this Commission, Mr. Richard vsam, having announced that on account of his nearly e score and ten years, and the need of conserving his ewhat impaired health, he has felt it his duty to re- from this body, we, the members of the Mining In- igation Commission of the State of Illinois, do hereby e on record our appreciation of his services to the min- mine owners and mining interests of this state.

t is his honor that in the early years of mining in this e, when the methods of mining were crude and primi- , and when scientific knowledge of mining was rare and e valued, he, with a public spirit unusual in those days, lied himself to the betterment of mining conditions and increase of scientific knowledge, and made of himself of the most important factors in the subsequent mining gress in the state.

As chairman of the State Mining Board, he labored to e the standard of technical mining knowledge among ectors, mine managers, examiners and others connected the operation of mines, with the result that the stand- of efficiency in Illinois from being among the lowest is among the highest in the civilized world.

As chairman of the State Mining Investigation Commis- , created in the shadow of a great mining disaster, he e freely of his time, his knowledge, his ripe experience in ing matters, and his rare personal qualities in the guid- e and direction of a deliberative body, with such purpose the labors of the Board resulted in the production of t has been pronounced to be the best code of mining s ever formulated in any state or country.

And all this he was able to do without advantage of demic or collegiate training. An English miner, inured he use of the pick from early years, having entered the es at the age of eight years, a man whose school was pit, and whose university was contact with great minds ough the printed page by candle light, he was yet able qualify himself to be the leader in the application of nce to the mining industry, and make of himself an nority in that science.

Most of all, he is to be honored for his devotion to public rice, and the unstinted giving of time and energy to its rest, at a time when most other men were mainly con- ed with making money. For many years, especially in latter years of his busy life as a coal operator, he has ndrawn his working power from a business where it d have been coined into dollars and given it freely to service of his fellow men, especially in making min- conditions in this state healthier and safer to life and for those who must earn their livelihood in the bowels he earth.

The state needs such men. The patriotism of the future s for heroes who will serve their country in the strife stress of industry rather than on the field of battle and age. Because Richard Newsam has been a pioneer ng such modern patriots, this Commission honors him as of the great leaders of the mining industry in the State Illinois and places on record this public testimony of its rd and esteem.

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New Coal Operation in Kentucky

Special Correspondence

ork has begun on the entry of the first large coal ation in Perry County, and is being pushed ahead the object of driving a double heading during the er months, while outside work is impracticable. The olidation Coal Co. has had work under way for more a year in Letcher County, which lies to the east of y, and on the head of the North Fork of the Ken- River, but this is the first active step toward de- ing the resources of Perry County.

It is being installed by the Kentucky Jewel Coal Co., and the plant will be located about one mile east of Hazard. It is the purpose of the company to put in a plant with a capacity of 800 to 1000 tons daily. As soon as spring opens, work will commence on the branch railroad, tipple, incline and attendant buildings, and it is the expectation of the management to be shipping coal by midsummer. The seam to be operated is known as No. 7 in the correlation of the Kentucky Geological Survey, and contains 5 ft. of a high grade of splint coal.

The Slemp Coal Co., which is headed by C. V. Slemp, J. C. C. Mayo and J. N. Camden, is lessor to the Kentucky Jewel Coal Co. The officers of the latter are Dr. Samuel Bennett, of Middlesboro, president; J. C. Smith, of Chicago, Ill., vice-president; Dr. D. O. Foley, of Jellico, Tenn., secretary and treasurer, and H. E. Bulloch, of Pineville, general manager. Mr. Bulloch is moving his family to Hazard this week, and will have personal charge of the operation.

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Rocky Mountain Coal Mining Institute

A chapter was organized in Walsenburg, Colo., Jan. 13, 1913. Joseph Ball was chosen temporary chairman, and Lewis Hufty, temporary secretary. Others present were D. A. Stout, Charles H. Pete, John Shaw and John Neish. Permanent officers will be elected at the first regular meeting, Jan. 25.

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Power Factor Conditions

A fact not always appreciated is that the demands upon a generator increase as the power factor decreases. The power factor, of course, is determined solely by the load and not by generator conditions. Machines are rated in kilovolt-amperes, this rating being the product of the current and voltage output.

The prime mover driving the generator has its energy expressed in either horsepower or kilowatts. In order to successfully match generators and prime movers, it is necessary to know the maximum outputs of both, and the operating power factor, so that a generator, the limiting capacity of which matches the limiting capacity of the engine, can be chosen. The kilowatt capacity of a generator is equal to the kilovolt-ampere capacity only when the machine operates at 100 per cent. power factor, a condition which practically never exists with present-day commercial loads.

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Direct Current Turbo Generators

A small line of direct-current generators arranged for direct connection to steam turbines, the complete outfit, entirely self-contained, is made in capacities ranging from 25 kw. to 150 kw. The compactness, absence of reciprocating parts, simplicity and reliability, make these sets desirable for many applications where a small direct-current machine is required. For exciter sets in large central stations, or for small isolated plants, they prove exceedingly desirable.

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When installing a spray locate it in the center of the roadway near the roof and in such a way that the water will be discharged in the direction in which the air travels. One spray box is sufficient for each 5000 cu.ft. of air supplied per minute. A pressure of from 15 to 20 lb. per sq.in. is necessary to run a spray.

DISCUSSION BY READERS

Reducing Ventilation When Firing

Letter No. 6—The coal-dust problem has been discussed from time to time by good authorities, and much valuable information deduced, relative to the presence of this dangerous element in mines. Coal dust is now quite generally recognized as one of the important factors in propagating an explosion. Likewise, a few exponents of the practice of reducing the ventilation in mines, at shotfiring time, have urged this as a means of preventing mine explosions; but, in most cases have failed to give good reasons for their opinions. These advocates have been, for the most part, content with recounting their personal experiences, as proof of their contention.

I have been waiting patiently for someone to ascribe the danger of explosion to the explosibility of powder smoke when mixed with air; but so far no one seems to have made any allusion to this important phase of the question. On account of the close connection between the two subjects, I am compelled now to discuss both the explosibility of powder smoke and reduction of ventilation during shotfiring, at the same time.

The idea seems to be prevalent, in many minds, that black powder and dynamite do not give off explosive gas when used in blasting. While powder manufacturers admit that this is not true, they generally claim that the explosive gases generated are due to the incomplete combustion of the powder. However this may be, any miner of several years' experience when doing his own shotfiring, or any shotfirer who has used squibs instead of fuse will tell you of many instances where they "fired the powder smoke" in going back too soon after shots had exploded. With this suggestion any thinking man can readily realize the danger that may exist in a mine filled with powder smoke, provided a sufficient amount of oxygen is introduced into the smoke to make an explosive mixture.

During the past year it has been the writer's unpleasant experience to have investigated five explosions in mines. In each case the investigation showed that it took at least two shots to start the trouble. We invariably found that a bad or windy shot produced a dangerous atmosphere for the shots following. In one instance, our examination showed that a heavy dynamite shot, laid about four feet on the solid, had been fired in the place adjoining that in which the explosion started. This shot did not do its work, but blew the tamping; and the force of the wind was very apparent where it had traveled out through the crosscut into the adjoining place. The shot that had been fired in this place was a good shot, charged with black powder, and did its work nicely. Although this shot had no appearance of being overcharged yet it was here that the fire started.

Some may say that the first shot stirred up the dust, which the second shot ignited. This, however, was almost impossible, as after the heat of the explosion had passed over it we found the dust and fine coal still wet enough to squeeze into a ball, in the hand. No gas of any kind had been encountered, in either place, before the explosion; and none was found after the explosion; although, by reason of the stoppings being blown out, the circulation in these places was practically stopped. Our conclusion was that the second shot ignited the gas produced by the blownout shot; and, as the fire traveled only about 300 ft., we decided that this gas furnished practically all the material for the explosion. Had the mine not been in good condition an extensive and violent explosion would likely have resulted.

As stated previously, I believe the volume of air in circulation to be closely concerned in the explosibility of powder smoke. Another instance of a violent explosion that came under my observation, gave sufficient evidence that, here also, powder smoke was the sole explosive agent. The mine was an unusually wet one; the entries were muddy their entire length, and considerable trouble was experienced in keeping the rooms dry enough to allow the men to work. The ribs in both the entries and rooms were always wet, which puts dust out of the question, for there was none. The coal seam was near the surface, the shaft being only 40 ft. deep. Not a trace of explosive gas had ever been found in any of the workings, or in any of the neighboring mines.

The mine foreman, in this mine, was a staunch advocate of reducing ventilation at firing time. He had instructed the engineer how fast to run the fan, which was just fast enough to hold the smoke back sufficiently to allow the shot firers to keep ahead of it. However, on the evening of the explosion the shotfirers had been firing about 30 min. when they came out of the mine and asked the engineer to speed up the fan, as the smoke was bothering them. He refused to do so, as he would not disobey the instructions of the mine foreman. He suggested that the men wait a short time and allow the smoke to clear up. They did not do this but went over to the fan house and opened up the throttle, giving the fan full speed. They then returned to their firing and in a few minutes the explosion occurred killing them both. The mine was badly wrecked and there was considerable evidence of flame. The speeding up of the fan increased the supply of oxygen, which rendered the powder smoke explosive and a shot ignited the mixture.

At another time, when opening a new mine, we had for some time a number of light explosions, which, at times, were strong enough to damage the tipple. We tried shutting down the fan and had no further trouble. This was nine years ago and, from that time to the present, the mine has worked steadily, but the fan is always stopped at firing time. Some of the workings are now over a mile from the shaft. It might be argued that sufficient air was kept circulating to keep the mine free from smoke there would be no danger from that source, but this could not be done in this mine.

To those who have observed the action of shots underground, when at close range, the ideas I am advancing will appear very reasonable. I once had an opportunity to watch the explosion of a black-powder shot in a room

he fire extended from the face about 75 ft. and seemed fill the entire room. Upon examination, it was found ie shot had worked nicely. It was not thought to have en overcharged. It occurred to me that, after so much re in the room, there could not be much oxygen left in ie air; and the question was suggested: If an explosion ould originate in an adjoining room, what would be ie result, by reason of this atmosphere from which ractically all of the oxygen must have been burned. ven, supposing that the room was full of fine-coal dust, ould an explosion be propagated through it, in the abnce of oxygen?

The argument is that the reduction of air supply is aid in the prevention of an explosion, because of the ck of sufficient air to form an explosive mixture. The ason that this is harder to control in winter than in mmer is because the natural ventilation in a mine, in inter, makes it almost impossible to limit the supply oxygen unless all intake openings are closed.

I realize that these remarks will meet with some severe iticism; but if they arouse a lively discussion on the bject they will have served their purpose. It may be aimed that the reduction in the percentage of oxygen in e mine atmosphere, by the flame from shots, would not ake any appreciable difference in the explosive mixtures used by blasting. In answer to such a claim, hower, I would ask that careful investigation be made as the necessary reduction in the percentage of oxygen in der to render the most explosive mixtures harmless.

C. W. Waterman,
Genl. Supt., The Fleming Coal Co.

Pittsburg, Kan.

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Letter No. 7—Referring to the matter of reducing ventation by slowing down the fan at firing time, allow me say that my experience of 35 years in the mines, in ery capacity from trapper to superintendent, has taught that this is a dangerous practice. Mr. McAllister, in several letters, has described practices that every good ining man must condemn as unreasonable. I would ither try such methods myself nor recommend them to iers. The operators in Indiana think more of their operty than to allow such a method to be adopted and e shotfirers here would not risk their lives in the mines, they knew that the fan was not in good condition and nning at its normal speed.

It is the general practice, in our district, to speed up the n before beginning to fire shots. Suppose, for example, 20-ft. fan is run commonly at a speed of 40 r.p.m. dur the day. At firing time, its speed would probably be creased to 60 r.p.m., especially in mines where gas is nerated in any quantity. It appears to me unreasonable at mining men of experience should recommend firing om 100 to 300 shots, in a mine without any air in circlation. Our doctrine is that the fan should be run conuously for 24 hours of the day, with an increase in veity of, say 25 per cent, while shotfirers are at work. At the present time, I am firebossing at the Wizard ne, and I am certain not one of our shotfirers would go o the mine to perform this work, if the fan were to be t down. Not only this, but the superintendent would allow such a practice. We believe in good ventilan; air-tight stoppings and overcasts; withdrawing the n from the mine in case the fan is stopped or in case of explosion; keeping on hand a good supply of safety lamps; and the examining of every shot before firing.

I always advise our miners never to leave a shot to be fired that they would not like to shoot themselves. My advise to shotfirers is to make a personal examination themselves and be sure that the fan is running at its proper speed before going into the mine to fire shots.

John Sutton.

West Terre Haute, Ind.

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Letter No. 8—Referring to the criticism of Mr. McAllister's article on "Reducing Ventilation When Firing," Coal Age, Jan. 4, p. 24, by R. Z. Virgin, Jan. 18, p. 111, it seems to me that both of these men are in error. Mr. Virgin's criticism is seemingly based wholly on the assumption that the ventilation was merely reduced in quantity; while Mr. McAllister, it seems to me, has sought to make it plain that he advocates closing the mine tight and thus completely shutting off the ventilation.

Assuming that Mr. McAllister's article refers to the complete stoppage of ventilation when firing, it should be headed "Stopping" instead of "Reducing Ventilation When Firing." Taking that meaning, it is obvious that this will produce or establish a condition in the mine that will be unfavorable to explosion. When oxidation continues in still air, the percentage of oxygen in the air is decreased while the percentage of carbon dioxide is increased, which produces an atmosphere that will exert a retarding influence on any explosion that might be started. As the oxygen in the air is reduced, the nitrogen remaining is in excess; and this excess of nitrogen will likewise act to still further retard explosion. Admitting these facts, one can readily see that there is something, in the narration by Mr. McAllister that is worthy of consideration.

Mr. Virgin divides his argument under three heads. His first point, which seems to me to be absurd, states:

> Percentages of gas that are not previously explosive become explosive in proportion as the volume of air is decreased.

According to this argument, the *minimum* volume of air will produce a *maximum* explosive mixture, which, it seems to me, is contrary to all teaching.

His second point states:

> Percentages of gas that are not previously explosive become explosive under the pressure of heavy blasting in a confined space where the air is dead.

Now, "dead air" is, as I understand it, air devoid of the life-sustaining element, oxygen. In such air, certainly there could be no explosion.

The third point states: "The reduced air current will carry a large percentage of dust, etc." But still air will carry no dust. Water is said to carry a weight of material in proportion to the sixth power of its velocity. Applying the same principle to air, a reduced velocity would carry much less dust than a current of high velocity.

John Rae.

Hanna, Wyo.

[Referring to the above, if the firedamp mixture contains an excess of air, a reduction of the air volume, for the same flow of gas in the mine, would cause the mixture to approach the maximum explosive point, which is evidently Mr. Virgin's meaning.

"Dead air" in ventilation generally relates to a stagnation of the air current in the mine, it does not refer to any deficiency of oxygen in the air.

The third point stated by Mr Virgin contemplates the dust being raised by the force of the blast, and in this case a greater weight of dust will permeate a given volume of air.—Editor.]

Yield of Fan under Increased Gage

Referring to COAL AGE, Jan. 11, 1913, p. 77, the question is asked: What quantity of air will a fan produce, at a constant speed, when the water gage is increased from 0.4 to 0.8 in., the original volume of air being 35,000 cu.ft. per min., under the lower gage? In answer to this question, it is stated that the volume of air is reduced to one-half of the original amount, or 17,500 cu.ft. per minute.

I beg to say that my experience in making many air measurements has proved that the same speed and efficiency of the fan gives the same quantity of air, regardless of the water gage against which the fan is operating. The yield of a fan is so much per revolution, up to a reasonable speed. The yield of the fan for a speed of 80 r.p.m. given in this question, is 35,000 ÷ 80 = say, 440 cu.ft. per revolution. The fan certainly will not produce less air per revolution because it is harder to turn; but it may take more power to produce the same speed under the increased gage.

In my experience, I have found that the quantity of air a fan will produce, at a normal tip speed, say a mile a minute, is proportional to the number of revolutions per minute. Thus, in this case, taking 440 cu.ft. per revolution as a base of calculation, this fan would yield as follows:

At 40	r.p.m.	17,600 cu.ft.
At 60	r.p.m.	26,400 cu.ft.
At 80	r.p.m.	35,200 cu.ft.
At 100	r.p.m.	44,000 cu.ft.

I know you will gladly correct this if the answer is in error.

JOSEPH VIRGIN.

Bancroft, W. Va.

[The experience of our correspondent is at variance with that of most fan engineers. By the terms of the question the water gage is increased and the speed of the fan remains unchanged. There are two ways in which the water gage in a mine may be increased; namely, by increasing the speed of the fan, or by an increase in the resisting power of the mine. Since the speed of the fan, in this case, is unchanged, the increase of water gage here must be due to an increase in the resisting power of the mine.

In practice, any increase in water gage due to an increase in the resisting power of the mine reduces the quantity of air in circulation in the mine and passing through the fan, for the same power on the air, according to the equation $U = Qp$.

As the pressure per square foot is increased, in the mine, as indicated by the water gage being increased from 0.4 to 0.8 in., or doubled, the quantity of air circulated by the same power is only one-half of the original quantity.

There is, however, under these conditions, a slight increase of efficiency in the fan. The quantity of air passing through the fan being less, the work lost in the fan is less, which increases its efficiency; and the effective power or the power exerted to turn the fan is increased, which makes the fan run faster, under the increased water gage. To maintain the same speed of fan, under these conditions, it will be necessary to reduce the power applied to the fan shaft.

Therefore, a slightly less power is required to produce the same speed of fan when, owing to the increased resisting power of the mine, the quantity of air in circulation is reduced. The ventilator, under these conditions, is more efficient; that is to say, a larger proportion of the power is made effective on the air. This is not to say, a larger volume of air is circulated per unit of power. The volume of air circulated per unit of power depends solely on the resisting power of the mine, which is independent of the ventilator, but controls the quantity of air circulated and the water gage.

The condition that our correspondent evidently has in mind is the increase of air volume due to an increase in the speed of fan, for the same conditions in the mine. In that case, it is true, approximately, that the volume of air is in proportion to the speed of the fan. Practically, the fourth power of the speed ratio is equal to the fifth power of the quantity ratio. In other words, the quantity increases in a slightly less ratio than the speed increases.—EDITOR.]

The Miner's Certificate Law

I was pleased to see, in last week's editorial pages, the suggestion of Col. R. A. Phillips that the requirement of the present anthracite-mine law, demanding a two-years' citizenship of all miners before they could receive a miner's certificate, be dropped from the new law.

This requirement of the old law has debarred the better class of miners, from the soft-coal regions and the West, as well as from Wales, England and Scotland, from settling in the anthracite region. The result is that these men go West or South, or find their way into Canada, often reaching British Columbia. Others give up mining and go to farming. The anthracite-mine law, in this regard, has stopped the immigration into the anthracite field, of practically all the English-speaking miners, whose numbers are growing less and less, here, year by year.

Does any person of judgment think that any of these English-speaking miners from the old world are less qualified to receive a miner's certificate; or that an old experienced miner from the West or from the soft-coal regions, in any state, is not rightly entitled to stand an examination in the anthracite field of Pennsylvania, and, if successful, to receive a miner's certificate?

The conditions in the anthracite field, at the present time, call for a change in this law; so that any miner who has worked from two to ten years in any coal mine and gives his affidavit to this effect would be eligible for examination, and, if successful in passing the examination, should receive a miner's certificate, giving him the right to mine coal in the anthracite mines of Pennsylvania.

One of the baneful effects of the present law has been to almost depopulate some small towns and mining districts, and to close many English schools and churches. The English-speaking miners will not generally swear to an untruth, preferring rather to go back to where they came from than to labor for two years for men who probably know less of coal mining than themselves. I hope the commission appointed to revise the anthracite mining law will carry out Col. Phillips' suggestion and change the law in this respect. I was glad to know that the Wilkes-Barre Mining Institute recently voted unanimously in favor of the repeal of this portion of the law.

D. W. EVANS.

Wilkes-Barre, Penn.

INQUIRIES OF GENERAL INTEREST

Mule Haulage in Mines

For some time past the driver bosses and firebosses, in our mine, have been discussing the question: Why is it that a mule or an electric locomotive cannot pull as great a load when attached to the car by a long chain or rope, say 10 or 20 ft. long, as when a shorter chain, say from 2 to 4 ft. in length, is used? We have agreed to submit this question to COAL AGE for their explanation.

CHARTER SUBSCRIBER.

Scranton, Penn.

Before attempting to answer a question of this kind, it is well to consider some of the conditions affecting problems of a similar nature. It is a matter of common observation that a mule, haulage engine or locomotive is able to haul a greater load, once started, than what the same power is able to start. It is well known that a trip of loaded cars is more easily started when loose chain or link couplings are used between the cars than when stiff couplings are employed. The obvious reason for this is that, in the first case, the load is started in sections or one car at a time, and it is necessary to overcome the inertia of a single car only; while, in the second case, the inertia of the entire loaded trip is opposed to the moving force, at the start.

A haulage engine often takes advantage of the slack in the haulage rope to start a heavy trip, which it can easily handle when once started, but the inertia of which is too great for the maximum steady pull the engine can exert. Experience has proved that a belt-driven fan runs smoother than one direct-connected, owing to the sag of the belt compensating largely for the irregularities of the engine and the load. For a similar reason, an air chamber is attached to a pump. The compression of the air in the chamber assists the action of the pump by maintaining a continuous flow of water in the discharge pipe, during the period when the pump is reversing its stroke. By this means, the pump is relieved of the burden of overcoming the inertia of the water column, at the beginning of each stroke; and water-hammer, in the pipe, due to the sudden arrest of the water, is avoided.

We have mentioned the foregoing conditions more for the sake of information and because of their indirect bearing on the question in hand. We understand the question asked by our correspondent relates to the ability of a mule to haul a greater load with a short chain than with a longer chain, after the load has been started. There are two conditions affecting the answer to this question: 1. The sag and swing of a long rope interferes with the steady pull necessary for the movement of the load and is annoying to the mule. 2. A short chain exerts a downward pull on the mule that enables him to maintain a firmer foothold on the road. When a short chain is used, the driver usually stands with one foot on the car and one foot on the chain, supporting himself by placing one hand on the mule and holding to the car with the other hand. In this position, the weight of the driver, on the chain, exerts a compensating influence on the irregularities of motion between the mule and the car, which is similar to the effect produced in the operation of a belt-driven fan.

In reply to the question, therefore, we would suggest that the most important factor, in the use of a short chain, is the downward pull exerted on the mule, which enables him to maintain a better footing on the road and the compensating connection between the mule and the car, afforded by the driver standing with one foot on the short chain. The short chain also acts to steady and control the motion of the car. Moreover, the weight of the driver on the chain destroys the tendency of the pull to lift the car from the track.

Extracting the Fifth Root

Will you kindly extract the fifth roots of 3 and 9, respectively, according to the method explained in COAL AGE, Sept. 7, 1912, p. 333.

ASSISTANT FOREMAN.

California, Penn.

Find two numbers whose fifth powers include the given number; the fifth power of the one being greater and that of the other less than that number. Thus, to extract the fifth root of 3, proceed as follows:

$$2^5 = 2 \times 2 \times 2 \times 2 \times 2 = 32 \text{ (high)}$$
$$1^5 = 1 \times 1 \times 1 \times 1 \times 1 = 1 \text{ (low)}$$

Since the given number, 3, lies between 1 and 32, its fifth root will lie between 1 and 2. Therefore, the required root is 1 plus a decimal.

To find the first decimal figure, proceed as follows:

$$2 \times 2 \times 2 \times 2 \times 1 = 16 \text{ (high)}$$
$$2 \times 2 \times 2 \times 1 \times 1 = 8 \text{ (high)}$$
$$2 \times 2 \times 1 \times 1 \times 1 = 4 \text{ (high)}$$
$$2 \times 1 \times 1 \times 1 \times 1 = 2 \text{ (low)}$$

The last product being less than the given number, add the several factors together and divide by 5. Thus,

$$\frac{2 + 1 + 1 + 1 + 1}{5} = \frac{6}{5} = 1.2$$

Therefore, the fifth root of the given number is 1.2, which is correct to the first decimal.

To find the second decimal figure, proceed as follows: Divide the given number by the fourth power of the root thus far found, and add the quotient to four times the said root, and divide the sum by 5. The quotient will be the fifth root of the given number, to two decimal places. Thus,

$$\frac{3}{1.2^4} = \frac{3}{2.0736} = 1.447$$

$$\frac{(4 \times 1.2) + 1.447}{5} = 1.24$$

Therefore, $\sqrt[5]{3} = 1.24+$, which is correct to two decimal places.

The fifth root of 9 is found, in the same manner, and is $\sqrt[5]{9} = 1.37$.

EXAMINATION QUESTIONS

Power in Mining

Ques.—Define the term *power*, as used in mining.

Ans.—As used in mining, the term *power* relates to the rate at which mechanical energy is exerted. Power is exemplified by a given force acting through a given distance in a given time; or a given force moving at a given rate of speed or velocity. The expression of power, therefore, depends on three elements or factors; namely, force, distance and time.

Ques.—What is a horsepower?

Ans.—A horsepower is an adopted standard for the measure of power. It is the power exerted when a weight of 33,000 lb. is lifted through a vertical distance of one foot in one minute. This power is expressed as 33,000 ft.-lb. per min. The same power (one horsepower) is exerted when a weight of 330 lb. is lifted through a vertical distance of 100 ft. in one minute, or 10 ft. in six seconds; or a weight of 55 lb. lifted 10 ft. in one second. The same rate of work is performed, per unit of time, and the same power exerted, in each case.

Ques.—Explain the difference between work and power.

Ans.—Work is performed when a force is exerted through a given distance, irrespective of time or velocity. Power is exerted when that work is performed in a given time. Power is work performed per unit of time. Work is expressed in foot-pounds, while power is expressed in foot-pounds per minute or per second.

For example, 100 lb. lifted through a vertical distance of 10 ft.; or 10 lb. through a distance of 100 ft.; or 1 lb. through a distance of 1000 ft.; represents a certain work performed, which is expressed by *1000 ft.-lb.* To perform this work in one minute will require ten times the power necessary to perform it in 10 min.; thus it requires a greater power to perform the same work in less time, the power varying inversely as the time.

Ques.—Disregarding friction, what power is required to hoist 100 tons of coal per hour, from a shaft 500 ft. deep?

Ans.—The work performed, in this case, is

$$100 \times 2000 \times 500 = 100{,}000{,}000 \text{ ft.-lb.}$$

This work is performed in one hour. The work performed per minute, or the power exerted, is, therefore,

$$\frac{100{,}000{,}000}{60} = 1{,}666{,}666+ \text{ ft.-lb. per min.}$$

This corresponds to a horsepower of

$$\frac{1{,}666{,}666}{33{,}000} = 50.5 \text{ hp.}$$

Ques.—Disregarding friction, what horsepower will be required to pump 300 gal. of water per minute, from a shaft 400 ft. deep?

Ans.—The weight of 1 gal. of water is practically 8⅓ lb. The weight of water lifted is, therefore, in this case,

$$300 \times 8\tfrac{1}{3} = 2500 \text{ lb. per min.}$$

The work performed in raising this water 400 ft. is then

$$2500 \times 400 = 1{,}000{,}000 \text{ ft.-lb.}$$

Since this work is performed each minute, the required effective horsepower is

$$\frac{1{,}000{,}000}{33{,}000} = 30.3 \text{ hp.}$$

Ques.—A boiler is to be run under a pressure of 100 lb. to the square inch; to what hydrostatic pressure should this boiler be subjected in order to test its safety?

Ans.—The hydrostatic test is not applied to boilers to determine the degree of safety. It is applied for the purpose of showing any leaky joints or revealing other structural defects in the workmanship. For this purpose it is customary to subject a new boiler to a hydrostatic pressure 50 per cent. in excess of the proposed working pressure. For a working pressure of 100 lb. per sq.in., a new boiler should be subjected to a hydrostatic test of, say, 150 lb. per sq.in.

To determine the safety of a boiler it must be subjected to a rigid inspection by a competent man, and must fulfil the requirements determined by a computation based on the strength of the material and manner of construction of the boiler. To subject a boiler to a hydrostatic test exceeding 50 per cent. of the proposed working pressure would, generally, strain the parts of the boiler and weaken its condition. The hydrostatic test is regarded as a test of workmanship, rather than a test for safety.

Ques.—Explain the advantage of a duplex over a single hoisting engine, in mining.

Ans.—A duplex engine is one having two cylinders. In such an engine, the cranks on the main shaft are set at right angles to each other, so that the engine has no "dead center." This is an important feature in a hoisting engine, in mining, where it is necessary that the engine shall be able to start promptly and pick up its load without difficulty. This cannot be done with a single engine if the crank happens to be on dead center, or near that point. In hoisting practice, it is customary to calculate the size of the engine required to perform a certain work, on the basis of a single cylinder. This always gives an excess of power, which is important in hoisting.

Ques.—For what reason should a boiler have a good water circulation?

Ans.—The principal reason for this requirement is to provide an even distribution of the heat throughout the bulk of the water, in the boiler, and thus accomplish a more uniform generation of steam and avoid likewise any unnecessary strain on the parts of the boiler due to alternate expansion and contraction arising from a change in temperature. In other words, a good water circulation maintains a uniform condition in all parts of the boiler.

Ques.—What weight of coal, per horsepower per hour, will be required in operating a tubular boiler, in common coal-mining practice?

Ans.—In mining practice, an ordinary tubular boiler will require from four to six pounds of anthracite, or from five to seven pounds of bituminous coal, per horsepower per hour, depending on the quality of the coal and the manner of firing.

COAL AND COKE NEWS

Washington, D. C.

The Senate has passed a bill extending the time for the survey, classification and appraisement of the surface of the segregated coal and asphalt lands of the Choctaw and Chickasaw Nations in Oklahoma, which contains the following provisions among others:

That the act of Feb. 19, 1912 (Thirty-seventh Statutes at Large, page 67), as amended and supplemented by Section 18 of the act of Aug. 24, 1912 (Thirty-seventh Statutes at Large, page 518), is hereby amended to provide that the survey, classification, and appraisement of the surface of the segregated coal and asphalt lands of the Choctaw and Chickasaw Nations shall be continued in the manner prescribed in said acts, except as otherwise provided herein, and shall be completed not later than eight months from the date of the approval hereof, such appraisement and classification to be made by the appraisers appointed by the President Nov. 25, 1912, or by their successors in office, at a compensation of not to exceed $15 per day each, with allowance for actual and necessary expenses, including transportation, not to exceed $5 per day each, to be determined by the Secretary of the Interior.

Sec. 2. That said survey, classification, and appraisement shall be made under such regulations in such manner as may be prescribed by the Secretary of the Interior, and the disposal of said lands, including purchases by holders of coal or asphalt leases, may be proceeded with when and as the appraisement of the several tracts shall be completed.

A bill reading in part as follows has been introduced in the House by Representative Foster and referred to the Committee on Public Buildings and Grounds:

That the Secretary of the Interior be, and he is hereby, authorized and directed to enter into a contract or contracts for the erection and completion of fireproof laboratories and other buildings suitable and necessary for the investigations of the Bureau of Mines, on a site hereinafter provided, in the city of Pittsburgh, Penn., within the total limit of cost hereinafter fixed.

That the said laboratories and other buildings shall be constructed under the supervision of and in accordance with plans and estimates to be approved by a board consisting of the Supervising Architect, the Chief of Engineers of the Army, and the Director of the Bureau of Mines, and shall be so constructed as to cost, complete, with the necessary railroad sidings, approaches, plumbing, lighting, heating, ventilating and hoisting apparatus, and other necessary appurtenances, not to exceed the sum of $500,000, of which amount the sum of $300,000 is hereby appropriated and shall be immediately available for the preparation of plans for said laboratories and other buildings and for carrying forward construction work; and the Secretary of the Interior is hereby authorized to employ, without regard to civil service laws or regulations, and to pay for, out of this appropriation, such architectural or other technical services as may be recommended by the above board to aid in the preparation of the plans and specifications and to supervise the construction work herein provided for.

Concerning Alaska Coal Lands

Senator Jones, of Washington, has offered the following bill in the Senate relating to the establishment of coal-land titles in Alaska:

That every person who located or entered, or attempted in good faith to locate or enter, any coal land in Alaska under the coal-land laws of the United States prior to Nov. 12, 1906, and whose location or entry thereof has been suspended, contested, denied or canceled by the United States, is hereby authorized, at any time within one year from the date of the approval of this act, to bring a suit in equity against the United States, in any court of competent jurisdiction in the district where the land is situate, to quiet his title thereof; and if, upon the trial of such cause, it shall be found by the court upon the evidence that the said locator or entryman has complied with the coal-land laws of the United States up to the time of the suspension, contest, denial, or cancellation of his location or entry, such location or entry shall be reinstated by order of the court, and the locator or entryman may thereupon complete said entry by making the proof required to the court

A bill of similar character has been offered in the House by Delegate Wickersham, of Alaska, but this measure contains the following proviso in addition to the main text:

That either the locator or entryman so bringing said suit or the United States may appeal said cause in the manner provided by the laws relating to appeals from said court, that if the final decree of the said courts shall be in favor of the said locator or entryman a patent shall be issued in the usual form, conveying the said land to the said locator or entryman; that if the final decree of said court in said cause shall be in favor of the United States, the said locator or entryman shall be held to have no right to or equity in said land, and his location or entry shall be canceled and held for naught.

WILKES-BARRE, PENN.

Three men were buried beneath a rush of coal and rock in the East Lehigh Colliery, at Tamaqua. A 15-ft. gangway leading to the place where the men were working is filled for several feet with caved material, and several days will probably be required to reach the men. Nine men were entombed in this mine three weeks ago, eight of whom were rescued after being imprisoned for 40 hours.

Anthracite Strikes

Strikes are on at four collieries in the anthracite-coal region. In Nanticoke nearly a thousand men are out of work as a result of a dispute between the workers and the Susquehanna Coal Co. The men claim that the company ordered representatives of the union off the company's property, and they are determined that this action shall be repealed. Until it is they say they will remain idle.

The breaker hands at the West End Colliery are on strike at Mocanaqua. The trouble arises from the time of blowing the first whistle in the morning. The first whistle is not blown until 7.15, and the men and boys are not paid for the extra quarter of an hour.

At the Lytle and Pine Hill Collieries, both subsidiary interests of the Pennsylvania R.R. Co. west of Pottsville, the rockmen have gone on strike. They claim they are not receiving the full wages decided by the agreement entered into between the miners and operators last spring. A request for an increase of 10 per cent. has been refused by the company.

The Meeting of the Conciliation Board

At a meeting of the conciliation board, held in Wilkes-Barre, the Lehigh & Wilkes-Barre Coal Co. was ordered to pay its contract miners 61c. per yard for cutting top clod 4 in. and over in thickness. The company claimed that they were supposed to pay only when the thickness exceeded 6 in. All back claims are also to be paid to the men. The same company agreed to have two kinds of explosives at the Lance Colliery for the men to determine which is the better for their work.

The employees of the No. 7 Colliery of the Susquehanna Coal Co., who have been on strike because the company refused to allow the grievance committee to examine the union buttons of the men, were ordered back to work. The board has never made a ruling on this question, and it was decided that the men should return to work, and present their case in a proper form at a later date.

The grievance of the contract miners of the Hollenback Colliery of the L. & W. B. C. Co. was ordered sent to the umpire by President Dempsey. The miners want 20c. per foot for mining rock, and the company offered 13c. The umpire will decide the question. Relative to the grievance of the employees of the South Wilkes-Barre Colliery of the L. & W. B. C. Co., the board decided to take further testimony, and probably render a decision at the next meeting.

The contract rock miners of the Laflin Colliery of the D. & H. Co. presented a grievance in which they declared that they received only a 5 per cent. increase following the recent award, though the coal miners received the full 10 per cent. The case will be given further attention by the board at the next meeting. A grievance was presented by the contract miners of the Seneca Colliery of the L. V. C. Co., at Pittston. The men ask 50c. per foot for removing rock and bone. The miners from the Drifton district ask for 61c. a foot for removing impurities in the vein. These cases will also be discussed further at the next meeting

Mine Caves

Wilkes-Barre and Scranton have been the scenes of serious mine caves during the week. Twenty houses were damaged in West Scranton by a surface disturbance caused, it is claimed, by a cave in the workings of the People's Coal Co. The cave affects properties on Lafayette St. to Price, North Main St. and North Hyde Park Ave.

The workings of the Hillside Coal & Iron Co., at Cork Lane, Pittston, settled and caused considerable damage, affecting several houses and breaking the water pipes of the Spring Brook Water Co. Officials of the company have warned the residents to be on the lookout for more caves as the workings are still settling.

Fully a score of houses on North Pennsylvania Ave. and Wyoming St., between Chester and Ralph Sts., in Wilkes-Barre, were damaged by a surface disturbance caused by mining operations at the Dorrance Colliery of the L. V. C. Co. The majority of the properties are not affected seriously.

PENNSYLVANIA

Anthracite

Seminole—There was a strike at the Shawmut mine a short time ago and no coal was mined for a period of four days. The disagreement is said to have arisen from the fact that some of the employees were working longer hours than prescribed by the union. The matter has been settled, however, and the men have returned to work.

Tamaqua—Little hope is entertained by the rescuers at the East Lehigh colliery for the safety of the three men entombed Jan. 22. It is believed that they were caught in the fall of top rock and killed instantly. The character of the débris which must be removed indicates that it may be a week before the bodies will be reached.

Harrisburg—The State Railroad Commission has recommended that the rate per ton for coal from the Clearfield region to Lancaster and points between Harrisburg and Lancaster should not exceed $1.40 per gross ton. This ruling was made in the complaint of the Manufacturers Association of Lancaster against the charges made by the Pennsylvania R.R. on bituminous coal.

Fredericktown—The bursting of a flywheel on a generator engine at the mines of the Clyde Coal Co. resulted in the total wrecking of the generator and serious damage to the building. A large piece of the wheel tore a hole in the roof and smaller fragments tore through the wall. The generator supplied light and power to the mines, and as a result of the accident these latter will have to be shut down. The cause of the accident is unknown.

Nanticoke—Seventeen men had a narrow escape from death at the No. 4 Slope of the Susquehanna Coal Co. at Nanticoke, when a trip of three cars in which they were riding to the surface broke loose and ran down the slope. Seven of the men were injured, three seriously. The accident was caused by the rope, in some unknown manner, becoming detached from the cars as they were ascending a slope about 4500 ft. in length. The cars were derailed after traveling downward about 200 ft., and the ten men who remained in the cars were injured considerably less than the seven who jumped from the trip when they discovered their danger.

Bituminous

Charleroi—Five hundred miners employed in the Jumbo mine of the Pittsburgh Coal Co., near McDonald, have gone on strike because the company officials refused to discharge three nonunion men employed at the mine.

WEST VIRGINIA

Charleston—District No. 17 of the United Mine Workers wound up its convention here by the passing of resolutions denouncing a martial law regime.

ALABAMA

Birmingham—The Alabama Consolidated Coal & Iron Co.'s Searles Mine, which has been idle for several months, will be put into operation at once. The entire output of approximately 1000 tons per day has been sold to the Tennessee Coal, Iron & R.R. Co., and will be made into coke in their new by-product ovens at Corey.

OHIO

Coshocton—Thirty miners, who were entombed in the Tyndale mine No. 1 of the Columbus Coal & Mining Co., have been rescued through the airshaft. Several of the men were faint from exhaustion and foul air.

Columbus—A hearing on the merits and demerits of the antiscreen bill, which provides that miners must be paid on the mine-run rate in the Buckeye State, will be held during the coming two weeks before the Senate committee on mining. The bill which was introduced in the Ohio legislature by Senator Green is bitterly opposed by operators in every mining section of the state. The passage of the bill will mean a long fight between miners and operators Apr. 1, 1914, when the present mining scale expires.

Operators gathered at Dennison, Ohio, recently and claimed in case the bill became a law all of their operations which are valued upward of $2,000,000 will be dismantled.

INDIANA

Princeton—The Princeton Coal Co.'s mine has been shut down until fans can be installed at the bottom of the air shaft. The mine, worked at 440 ft., is one of the deepest in the state. Two hundred miners are employed.

Terre Haute—Fifteen hundred miners who struck in the Clinton field, returned to work, pending negotiations by their officials for redress of their grievances, chief of which was alleged unsatisfactory train service to and from the mines.

FOREIGN NEWS

Germany

Berlin—In Haselbach, near Altenburg, a burning subterranean coal deposit has just been discovered. The whole town stands above the burning coal field. For some time several of the larger houses of the place had to be repaired because of the mysterious cracks in the walls. Finally the architects decided to drill into the ground to ascertain the cause. They came upon the burning coal field less than seven yards under the surface.

PERSONALS

W. M. Whitmore, a coal dealer of Dayton, O., is seriously ill at his home.

John P. White, of Oskaloosa, Ia., president of the United Mine Workers of America, has been reëlected president of the organization over A. Bradley, of Mt. Olive, Ill. Frank J. Hayes, of Collinsville, Ill., was reëlected vice-president. He had no opposition. Edwin Perry, of Oskaloosa, Ia., was reëlected secretary-treasurer by a large majority. On the auditing and credentials committee John J. Mosson, of North Lawrence, Ohio; Albert Neutzling, of Glen Carbon, Ill., and William Dondaldson, of Dubois, Penn., were elected. Three tellers were elected: William Young, South Fork, Penn.; Thomas Paskell, Shawnee, Ohio; Thomas Holiday, Granville, Ill. Twenty-one candidates were in the race for delegates to the American Federation of Labor. The following were elected: John P. White, John Mitchell, Spring Valley, Ill.; Frank J. Hayes, Collinsville, Ill.; John H. Walker, Springfield, Ill.; William Green, Coshocton, Ohio; Duncan McDonald, Springfield, Ill.; Adolph Germer, Belleville, Ill. The newly elected officers will be installed early in February.

BOOK REVIEW

ANNALES DES MINES DE BELGIQUE—Tome XVII 4-me livraison, 1912. 366 pp., 6¼x10 in. Paper. L. Narcisse, 4 rue de Presbytère, Brussels.

This section of the government mining annual contains "The Iron Ore Problem in Belgium," by A. Delmer, "The Coefficient of Safety of Hoisting Ropes," by F. Herbst, republished from "Gluckauf," "Ankylostomaisis in the Sicilian Sulphur Mines" from the "Rassegna Mineraria," "General Rules for the Use of Electric Machines and Transformers (except Locomotives) Adopted by the Belgian Committee of Electro-Technology, Session of Feb. 20, 1912."

This is followed by the statistical section, relating to the mining and metallurgical industries and to boilers, engines, etc. Reports are made on underground haulage by storage-battery locomotives, mechanical coal cutting, lining a shaft with reinforced concrete, safety forms used during shaft sinking, a method of hauling excavated earth from a spoil pit for use in flushing, a bucket for removing earth, installation of electric signals at shafts and Nellen's elastic metal mine posts. The book is completed by a series of cross-sections of strata in the Hainault coal basin.

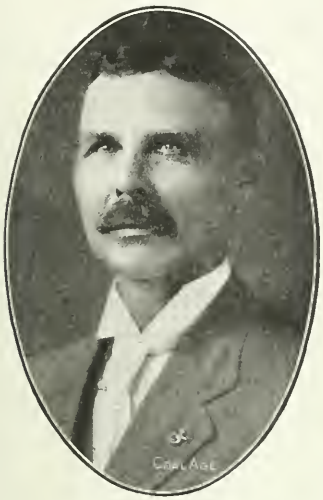
PUBLICATIONS RECEIVED

FIRST ANNUAL REPORT OF THE STATE MINE INSPECTOR OF NEW MEXICO, FOR THE YEAR ENDED NOV. 30, 1912. By Rees H. Beddow, state coal mine inspector, Gallup, New Mexico. Paper, 6x9 in.; 35 pages.

The report is the first made under the law regulating the operation of mines for New Mexico, approved June 13, 1912, and made operative 90 days later. Rees H. Beddow was appointed the first state coal mine inspector, succeeding Jo. E. Sheridan, who was mine inspector under the federal government.

The report is a brief summary of the 52 coal mines in the state, 33 of which reported to the mine inspector, 16 failed to make any report and three other mines are reported not working. Beside the usual statistical tables, the report contains a brief summary of mine inspections made by former Mine Inspector Sheridan, from July 15 to Oct. 30, 1912. The report also contains the New Mexico mining law

OBITUARY



EDWARD L. WOLFORD

Edward L. Wolford, probably one of Indiana's most prominent coal miners, died at his home Jan. 12. A strange coincident arises in the fact that his death occurred within a few hundred feet from the spot where he was born July 7, 1861.

The history of his life is interesting. After receiving his early education, Mr. Wolford was attracted by the mining business in the locality of Linton, Ind. His executive ability soon drew attention to himself as a wizard in organization and development.

In 1892 he entered the Island Valley Coal & Mining Co., acting as treasurer until the business closed out. His next position was that of secretary of the South Linton Coal Co., of which concern he was also a prominent stockholder and general manager.

Mr. Wolford was one of the original promoters and organizers of the Black Creek Semi-Block Coal Co., and was secretary-treasurer of this company until the time of its merger in 1906. When the Linton Coal Co. was organized Mr. Wolford became general manager. Later in the organization of the United Fourth Vein Coal Co., he demonstrated his keen executive ability and won for himself the respect of all in the coal mining business.

Through the achievements of Mr. Wolford this company effected the consolidation of 6 other companies, together with itself, at a capital stock of $1,000,000. Mr. Wolford became president and general manager of this concern and remained in that capacity until the time of his death.

He is survived by three sons and a daughter.

CONSTRUCTION NEWS

Johnstown, Penn.—The Fallen Timber Coal Co.'s new tipple is almost completed and it is expected that coal will be shipped within a few days. The company will employ about 150 men.

Rankin, Ill.—The new $12,000 coal dock, of the L. E. & W., is now completed. It is built entirely of steel and is run by a 12-hp. gasoline engine. It is the only one of its kind on the system

Miller Grove, Ill.—The new coal chutes which were being erected by the Fairbanks Morse Co., at a cost of $45,000, have been completed and the machinery for hoisting the coal has been installed. This newest chute is said to be the best of its kind on the Frisco System.

Duluth, Minn.—Various coal companies at the head of the Lakes are making preparations for the enlarging of their coal docks and many contracts have already been let for the same. A contract has been let recently for a new dock for the Berwind Fuel Co., which will have a capacity of 800,000 tons.

Townsend, W. Va.—A large power plant is now in the course of construction on the south side of the Kanawha, at Cabin Creek Junction. The foundation has been laid and practically all the frame work is complete. The West Virginia Power Co. is said to be the chief company promoting the new enterprise.

Morgantown, W. Va.—A company of Ohio coal operators is preparing to open up a tract of 140 acres of the Pittsburgh seam of coal just below Lowsville, together with a 90-acre tract of the Sewickley coal at Rivesville, along the Buchanan & Northern R.R. An uptodate mining plant is being installed at Watts, and it is reported that the Ohio firm will mine the coal on a royalty basis.

Franklin, Penn.—The Pennsylvania Southern R.R. proposes to construct eight miles of new track, which will cut the distance between Franklin and Clarion from 60 to 39 miles. Valuable coal deposits are being developed along this line, and it is stated on good authority that a new coal company, having 2000 acres of the best coal land in Clarion County, is being organized, with offices in Franklin.

Scottdale, Penn.—It is expected that the Hecla-Baggaley line of the West Penn Railways Co. will be completed by June 1. Most of the lesser surface grading has been done and work on the larger cuts has been started. Steel for the bridges is being delivered and ties and rails have been ordered. This road will furnish train service for nine coke towns, with a population of 15,000 or more, which are now virtually cut off.

Pittsburgh, Penn.—It is rumored that within the next three years 10,000 new coke ovens will be built in this territory, to meet the constantly increasing demand for coke from the Connellsville region. A secondary purpose is said to be to offset the number of ovens that have been abandoned because of exhaustion of coal in that region.

The Pittsburgh-Buffalo Co. has planned for 250 new ovens near Marianna, and the Pittsburgh-Westmoreland Coal Co. is contemplating the addition of many hundred ovens in its 20,000-acre holding.

NEW INCORPORATIONS

Henryetta, Okla.—The Summers Coal Co.; capital stock, $50,000; to develop coal lands.

Knoxville, Tenn.—The Hickory Creek Coal Co., capital stock, $30,000; to develop coal lands.

Ottumwa, Ia.—The Trio Coal Co.; capital stock, $10,000; to mine and sell coal and operate coal mines.

Middlesboro, Ky.—The Mingo Coal Co.; capital stock, $1500. Incorporators: John Reese, Mollie Reese and Mossie Reese.

Williamsburg, Ky.—The Bank Coal Co.; capital stock, $6000; to purchase or lease coal lands and engage in operating.

St. Louis, Mo.—The Briquette Coal Manufacturing Co.; capital stock, $100,000. Incorporators: J. Carlton O'Neal, D. E. O'Neal and Virgil Turpin.

Phoenix, Ariz.—The Black Pine Mining Co.; capital stock, $1,000,000; to deal in coal and the byproducts thereof, together with other minerals.

St. Louis, Mo.—The Ratican Coal & Contracting Co.; capital stock, $10,000. Incorporators: I. C. Muckerman, Wm. Ratican and P. J. Ratican.

Kansas City, Mo.—The V. McDaniel Fuel Co. has been incorporated here, with a capital of $4000, by V. McDaniel, G. L. Stauffer and Charles Hayward.

Bloomington, Ill.—The Meadow Grain & Coal Co.; capital stock, $12,100; to deal in grain and coal. Incorporators: John Streid, Andrew Baller, and Emanuel Oyer.

Ernukla, Penn.—Application will be made by George C. Miller, Dennie D. Mallory, Gordon F. Proudfoot, John B. Moorhead and James S. Carmichael, Penny Coal Co.

Austin, Tex.—The Libby Manufacturing Co., capital stock, $50,000, to mine and sell lignite coal. Incorporators, L. C. Libby, W. H. Seay, P. M. Fleming. Principal office at Mount Pleasant, Titus County.

Scranton, Penn.—Charters were granted by the state department in Harrisburg to the Noble-Williams Coal Co. and the George D. Fuchs Co., both incorporated by Scranton men and both capitalized at $5000.

Cleveland, Ohio—The Balkan Mining Co., mining and dealing in iron ore and coal, etc.; capital stock, $300,000. Incorporators: G. W. Cottrell, C. G. Roads, I. L. Evans, Henry G. Dodge and Gustav von den Steinen.

Hamilton, Ohio—The Hamilton-Otto Coke Co., of Hamilton, Ohio, has been incorporated with a capital stock of $700,000, to mine and deal in coal and coke. The incorporators are J. C. Thomas, E. M. Peters, E. C. Seimer, John W. Linfert and Robert Ramsey.

Fairmont, W. Va.—The Karnak Coal Co.; capital stock, $150,000; to develop coal and other mineral lands in Pawpaw district, Marion county. Incorporators, David Morrison, J. W. Hayward, C. T. Porter, and G. D. Ewert, of Cleveland, O., and M. T. Porter, of Lakewood, O.

New York, N. Y.—The Socorro Mining & Milling Co.; capital stock, $2,000,000; to engage in all kinds of mining. Incorporators: J. L. Kauffman, B. Abbott, C. E. McMahon, M. A. Lynch, and G. H. Fitzgerald. Principal offices at 165 Broadway, and chief works to be located in Socorro County, New Mexico.

Sugarcreek, Ohio—The Sugarcreek Clay Product Co., of Sugarcreek, Ohio, has been incorporated with a capital stock of $40,000, to mine and deal in clay, coal and brick and other clay products. The incorporators are Amra Hotchstetler, J. M. Hotchstetler, E. E. Weaver, W. B. Hochstetler, and J. F. Zahner.

Charleston, W. Va.—The Thomas Coal Co.; capital stock, $50,000; the production and selling of coal, oil and timber. Incorporators: D. C. Thomas, Classton, Penn.; J. W. Blower and E. B. Graham, of Columbus, O.; L. G. Worsten and H. D. Wilson, of Atherton, O. The principal office and chief works are at Seng, Logan county.

Joplin, Mo.—A company was organized here comprised of Webb City and Oklahoma mining operators for the purpose of drilling virgin land north of Hattonville, Okla. A lease on 500 acres near that city was taken by A. D. Hatten, a local operator. Local members of the company, A. D. Hatten, T. F. Coyne, and A. J. McInturff, will leave in a few days for their property near Hattonville

INDUSTRIAL NEWS

Connellsville, Penn.—A New York syndicate has purchased 30,000 acres of coal in Macoupin County, Illinois, for $600,000.

Harlan, Ky.—The Harlan Coal Mining Co. is reported to have sold to the Clover Fork Coal Co. a tract of about 500 acres of land.

Somerset, Penn.—Lloyd G. McCrum has opened the Operator's Special Agency for coal and coke trade in the Shafer Block, Somerset, Penn.

Cantine, Ill.—The washer of the Lumaghi Coal Co., of St. Louis, which was recently destroyed by fire, with a loss of $50,000, will be rebuilt at once.

Chicago, Ill.—The fifth conference of the Western Electric prize salesmen at Hawthorne was held at the Hotel LaSalle during the week of Jan. 6.

Birmingham, Ala.—Margaret No. 3, the new mine being opened up by the Alabama Fuel & Iron Co., at Margaret, Alabama, will be ready to ship coal by Feb. 1.

Holden, W. Va.—The U. S. Coal & Oil Co. will add to the equipment of its mines six 6-ton electric mining locomotives, which have been ordered from the General Electric Co.

Windber, Penn.—The Berwind-White Coal Mining Co. has ordered a 4375-kv.-a. Curtis turbo-generator, which will be furnished and installed in the company's power plant by the General Electric Co.

Cresson, Penn.—The Pennsylvania Coal & Coke Corporation will install in the power plant two 345-kv.-a., 2-unit, 3-motor-generator sets and switchboards recently ordered from the General Electric Co.

Charleston, W. Va.—The mine of the Lewis Coal Co., at the mouth of Cabin Creek, which has been idle since Apr. 18, has resumed operation, giving employment to about 500 miners and mine laborers.

Fairmont, W. Va.—The Consolidation Coal Co. will equip its collieries at McRoberts, Ky., with five 10-ton 42-in. gage electric mining locomotives. The order for these machines has been placed with the General Electric Co.

Hooversville, Penn.—Washington Custer, a prominent farmer living in Shade Township, has disposed of the coal under a large tract of land to the Loyalhanna Coal & Coke Co., which is establishing a new mining town near Reitz.

Colver, Penn.—The Ebensburg Coal Co. has arranged to add to its power-plant equipment a 500-kw. rotary converter, three 185-kv.-a. and three 75-kv.-a. transformers, and switchboard apparatus. The equipment will be furnished by the General Electric Co.

Williamsburg, Ky.—The Appalachian Ry. Co., of Knoxville, Tenn., has started the actual work of surveying the line which it proposes to construct from Williamsburg, Ky., to Petros, Tenn., a distance of about 60 miles, for the purpose of giving it access to a rich coal section.

Birmingham, Ala.—The byproduct coke-oven plant of the Tennessee Coal, Iron & R.R. Co., at Corey, is now manufacturing 3000 tons of coke daily. H. M. Urban has been appointed assistant general superintendent of the byproduct coke-oven plant to succeed H. R. deHoll, who goes with the Inland Steel Co., at Chicago.

New York, N. Y.—At a recent meeting of the Executive Committee of the American Museum of Safety, it was unanimously decided that the "Scientific American" gold medal for the most efficient safety device invented during the last three years, and exhibited at the Museum, should be awarded to the Draeger Oxygen Apparatus Co.

Pittsburgh, Penn.—The Rochester & Pittsburgh Coal & Iron Co. will add to its power-plant equipment at Punxsutawney, Penn., two 300-kw. rotary converters, two 75-hp. and two 100-hp. motors, three 75-kw., six 110-kw. and one 200-kw. transformers, and switchboard apparatus. All this material has been ordered from the General Electric Co.

Hazard, Ky.—The first large operation in Perry County field is being rapidly opened up by the Kentucky Jewel Coal Co., which has leased from the Slemp Coal Co., a good-sized boundary for immediate development. The exact location of the new plant is one mile east of Hazard, and it will be designed to handle a daily output of 800 to 1000 tons.

Jackson, Ky.—The extension of the Louisville & Nashville R.R. from Jackson, up the North Fork of the Kentucky River, has opened up a heretofore entirely undeveloped and valuable coal territory.

Up to date, there are no operations in this field, but from now on it is expected to be a factor in the coal business.

Chicago, Ill.—The Consolidated Indiana Coal Co. announces that Frank Ragan has been appointed general sales agent of the company, with headquarters at 139 West Van Buren St., Chicago. Customers and the coal trade are requested to send their orders and inquiries to Mr. Ragan.

Wilkes-Barre, Penn.—During the past week the Auchincloss colliery of the D., L. & W. Coal Co. broke the colliery record for the number of tons of coal loaded for transportation. The previous record was 1156 tons, but the new one is 1226 tons of prepared coal. This is an excellent record for an experimental colliery like the Auchincloss.

Roundup, Mont.—Coal of a very fine quality has been discovered by John Davis on Horse Thief Creek. The coal seam extends over an 80-acre tract belonging to M. M. Klein, and is all very convenient for loading cars on the spur. A shaft 100 ft. in depth has already been opened, and an operating mine will be opened as rapidly as possible on the Klein and Davis properties.

Charleston, W. Va.—The New River Pocahontas Consolidated Coal Co. will equip its collieries with new electrical apparatus consisting of an 850-kv.-a., 3-unit, 4-bearing motor-generator set, a 435-kv.-a. motor-generator set, a 380-hp. motor, and an electric hoist with control equipment, air compressor and switchboard. All the apparatus will be furnished by the General Electric Co.

Hazard, Ky.—The Kentucky Jewel Coal Co. has leased about 500 acres of valuable coal land from the Slemp interests, and has started on the construction of a $50,000 plant, from which they expect to be shipping from eight hundred to a thousand tons per day, by early fall.

H. E. Bullock, who has made a success in the Jellico field, will give his personal attention to the construction and operation of the plant here. The plans, as formulated, call for a modern plant, using only the best and most scientific methods of mining.

Miike, Japan—Some Koppers coke ovens similar to those employed at Gary, Ind., have been erected at Miike by the Mitsui Busan Kaisha to deal with coal dust, which has hitherto been wasted. The capacity of the plant, says the London "Times Engineering Supplement," is 300 tons of dust at one charge, and the time of coking is 26 to 28 hr. One ton of the dust is stated to produce 10,000 cu.ft. of gas, 65 to 70% of coke, 6% of coal tar, and 1 to 1.3% of sulphate of ammonia. Part of the gas produced is to be used in large gas engines for the generation of electricity. Current will also be supplied from this source for the lighting of the towns of Omuta and Miike.

COAL TRADE REVIEWS

GENERAL REVIEW

Cancelations of orders for anthracite are being received such numbers as to cause some anxiety among the companies. There is considerable coal moving, and while there nothing as yet to indicate that any is going into storage, continuation of the prevailing unseasonable weather conlons is liable to make such a disposition necessary in the ar future. Domestic consumers have certainly effected a eat economy in fuel so far this year, but February and rch of the last two years saw a heavy consumption, and ere are still possibilities of the market assuming rather ave proportions yet. However, conditions have been even ore favorable than the most optimistic of the anthracite oducers had dared hoped for, and it is hardly possible that ere will be any real distress during the remainder of the ason. The trade is showing a direct reversal of form, and fullness more characteristic of June and July.

There seems to be plenty of bituminous coal for prompt ading in the Eastern coastwise trade, and the market has own a tendency to soften still further. Buying is limited d confined mostly to the largest consumers, small buyers pearing confident that the market will ease off still rther. The more popular grades are beginning to come rough as the pressure is released, and the prospects are ditions will shortly be more normal. There are rumors of ntracts at 15c. above last year's figures, but buyers as a e are holding off pending more settled conditions.

Eastern dealers generally are holding firm on the preling high prices, appreciating the fact that once they e off it will be difficult to restore them. In spite of their st efforts, however, slight reductions have occurred, and re will undoubtedly follow in rapid succession, unless re seasonable weather appears. There are considerable sold tonnages at some points, and buyers are showing a al lack of interest in the market. Prompt shipment is obnable in the Pittsburgh district at practically contract ces, with the exception of slack, which brings a small emium; the manufacturing demand here has been someat less than was expected.

The unseasonable weather has had a disastrous effect on the trade in Ohio, and the shortage caused by the reit flood is probably the only thing that has prevented a lent break. The domestic market is particularly weak, ile the steam grades are fairly strong, but showing a dency to act in sympathy with the domestic. At Hampton ads the continued warm weather, good loading at the nes, and prompt movement by the railroads have softened market, and prices are again off; however, contract ces for the new year are fairly well established at 15c. r the prevailing circular. There is a good healthy dend for the steam grades in the South, while the domestics rather weak, but the mines are making record protions.

Quietness prevails throughout the Middle Western mar, small tonnages are being taken on contract, and a num- of mines are shutting down. There is less coal being ght than was ever known in January, retailers appear to heavily overstocked, and the only redeeming feature of trade is the steam business.

BOSTON, MASS.

The market continues to soften and prices are still lower. Hampton Roads there seems to be plenty of coal for mpt loading, and there is only a limited amount of buying the part of corporations and contractors who are still ind on their requirements. Pocahontas and New River reported to have sold at less than $3 f.o.b. for shipment in next fortnight or so, several of the shippers having quietly ced a moderate volume of coal. The business for the ment is confined to the largest buyers, for none of the aller plants appear to have enough confidence in either a ersal of weather conditions in February or in any higher ces than are currently quoted to justify taking on fuel more than a month or so ahead.

For inland distribution, contracts are rumored to have n closed at 15c. higher than the delivered price for last r and extending to Apr. 1, 1914. The feeling is, however, t buyers are going to be diffident about entering the market until the season is far enough advanced to show a more settled outlook.

There continues to be serious interruption in all-rail deliveries from certain districts because of floods and slow car movement. The market in that direction, therefore, shows more life than at tidewater, and is likely to be more responsive to changes in the weather. Nothing has been heard of any canvassing for contracts for 1913-1914, but season prices on bituminous all-rail will probably be out before long.

The anthracite trade shows almost a reversal of form. Dealers are getting particular over the assortment of sizes in their cargoes, and cancelations are reported. Egg is in long supply, and there is some trouble between the companies who want to ship this grade and the dealers who don't want to receive it. Shipments are not any too plentiful, that is, they would not be if we were having a normal January, but the demand from the consumer is almost nil. Retailers are laying off men and teams and there is a lassitude about the trade that is more characteristic of June and July. Premiums are not heard of now, in the face of the companies freely offering to ship on old orders during February. There is a marked change in that respect from a week ago.

Current prices at wholesale are about as follows:

Clearfields, f.o.b. mine	$1 60@$1.75
Clearfields, f.o.b. Philadelphia	2 85@ 3 00
Clearfields, f.o.b. New York	3.15@ 3 30
Cambrias and Somersets, f.o.b. mine	1 70@ 1.80
Cambrias and Somersets, f.o.b. Philadelphia	2.90@ 3 10
Cambrias and Somersets, f.o.b. New York	3.20@ 3 35
Pocahontas, New River, f.o.b. Hampton Roads	3.00 and less
Pocahontas, New River, on cars Providence	4 25@ 4 50
Pocahontas, New River, on cars Boston	4 35@ 4 53

NEW YORK

Bituminous—There has been a slight increase in the stocks at tide water, and the market has shown a further absence of strength during the week. While quotations are being normally held at last week's level, there are rumors of operators making sales at a concession of 10c. on the off grades, with the better qualities still holding firm and difficult to obtain. This easing off of the situation continues to be ascribed to the unseasonable weather conditions. Had it not been for a pronounced shortage of equipment on the Pennsylvania lines, it is probable that this slump would have attained even greater proportion. A rather unique condition prevails in transportation circles; the supply of equipment on the New York Central has seldom been known to be better, while the Pennsylvania is failing utterly to meet the demands upon them for cars.

The weather continues to be the controlling feature in the market, and an abrupt fall in temperature would doubtless bring with it a sharp advance in quotations. There is still a scarcity of labor noticeable, but the men are working much better, petty strikes are less prevalent, and on the whole production in Pennsylvania is on the increase.

We continue New York quotations on the following basis with the low-grade soft coals rather weak as noted:

	Anthracite		Bituminous	
	Circular	Individual		
Broken*	$5 00	$5 00@5 10	West Virginia, steam	$3.05@3.25
Chestnut†	5 50	6.00@6.15	Fair grades, Penna.	3.15@3.25
Pea*	2.75	3.75@4.35	Good grade, Penna.	3.30@3.40
Buckwheat**	2 75	2 75@2 80	Best miller, Penna.	3 40@3.50
Buckwheat†	2.50	2 40@2 50	Georges Creek	3.50
Rice**	2 25	2.25@2 30		
Rice†	1 95	1.85@1 95		
Barley†	1.75	1.25@1 50		

* Scranton and Lehigh. ** Scranton. † Lehigh and Schuylkill.

Anthracite—While the demand for hard coal still continues greatly in excess of the production, operators are slowly but surely losing control of the market, and providing no abnormal weather conditions appear within the next thirty days the trade will again be on a normal basis. Premiums are still being offered on some grades, although not in such a great amount, while, on the other hand, concessions below circular are readily obtainable on other sizes. Cancelations of orders seem to be increasing, while operators are continually facing the possibility of being caught with heavy consignments of demurrage coal on their hands. Such conditions, of course, have a tendency to force the market, with the re-

sult that buyers feel much easier. The smaller sizes are in practically full supply, while sellers are almost to the point of making concessions on egg in order to move it more rapidly.

Work in the mining regions continues to be interrupted by small strikes on the part of the miners. However, the companies are getting a plentiful supply of equipment for loading, and production is quite heavy.

PHILADELPHIA, PENN.

Cancelations are being received in depressing numbers, and dealers whose orders were being pushed with the large companies some weeks ago, are now tumbling over themselves to have them canceled. There is a noticeable falling off in the demand for all sizes, even pea coal, which up to a week or so ago, was in active demand, premiums being asked and freely given for reasonably prompt shipment. Stove and pea were about the only sizes for which there was any pressing demand at all, and even these are now becoming soft. Of course, there is considerable coal moving, and there is not anything as yet to indicate that the large companies are being compelled to stock, but a continuation of the present unseasonable weather is likely to pave the way for disposition of the coal into the storage yards.

However, that there is comparatively little coal in stock at the various yards, and a sudden flurry of snow, combined with a healthy fall in the thermometer, would likely bring about a condition similar to that existing a couple of months ago. Householders are economizing in their consumption of coal, hoping that the present weather will continue until spring, but this is doubtful. The last two winters in this vicinity has seen the heaviest snows, and the most strenuous weather conditions during the months of February and March, and it is not too much to say that the present light requirements will not answer later on in the season. The month of March, taking the last two years, has been as large as any of the so called winter months, in the consumption of fuel, and if it is any criterion, the present year will be the same.

There has been a marked reduction in the prices for bituminous coal, the market falling anywhere from 25 to 35c. off quotations of a week or two past, and unless there is a decided change in the weather, this price stagnation is likely to continue. Car supply at the mines seems to be fairly good, and the market apears to be in a fairly acceptable mood, although not insistent.

PITTSBURGH, PENN.

Bituminous—The market for prompt coal has eased off more, and shipment is obtainable at practically the contract prices, with the exception of slack, which frequently involves a small premium. Production is ample for all requirements, with a fair supply of labor and plenty of cars. Manufacturing demand is somewhat less than was expected, and it is inferred that the accumulating of stocks some time ago has operated to decrease the demand at this time. Regular prices remain quotable as follows: Slack, 90c.; nut and slack, $1.05; nut, $1.25; mine-run, $1.30; ¾-in., $1.40; 1¼-in., $1.55, per ton at mine, Pittsburgh district.

Connellsville Coke—Under pressure of materially increased production, coke prices have declined. Prompt furnace coke has been available at lower and lower prices in the past ten days, and late last week the decline was sharp, down to $3.50, at which fairly satisfactory brands could be purchased without difficulty. The market holds at this level, but in some quarters still lower prices are expected as conditions continue unusually favorable for production. There has been scarcely any inquiry for contract coke, although there are possibly some uncovered consumers who are holding off. Occasionally cut prices are offered by producers, but in general a definite contract market has not developed under the new conditions. Foundry coke is easier and more readily obtained. We quote, with contract prices practically nominal: Prompt furnace, $3.50; contract, first half, $3.25; year, $3; prompt foundry, $4@4.25; contract foundry, $3.25@3.75, per ton at ovens.

BALTIMORE, MD.

The continued open weather conditions again proved a serious handicap to the local market and caused a marked falling off in demand with a further drop in prices. The only thing which can give a better tone to the market is a spell of severe weather, but the weather man promises no relief in this way.

The scale of prices for the week was about 10c. lower on all grades, and even then consumers were not particularly interested.

Of course, the usual supply of coal is moving under contract, and prompt deliveries are now the rule. Train movements are as good as they usually are in midsummer, and roads seem to be able to supply all equipment desired by operators. Operators are experiencing difficulty in getting sufficient miners to produce the coal in quantities to meet an easy market, and this would be much more acute should the demand suddenly increase. West Virginia companies are doing everything to divert miners to their properties in that state.

BUFFALO, N. Y.

The coal market is quiet, due almost entirely to the weather. Everybody agrees that a good snowstorm would firm prices and restore the demand in both anthracite and bituminous. The weather has also assisted the railroads in moving coal, and they have almost entirely caught up with business, so that there is now some unsold bituminous at various points for the first time in months. Certain enterprising jobbers have lately busied themselves picking up what they could of this consignment coal and getting it off the market.

The bituminous market has not broken to any extent, and if steady weather should set in at once the sag would straighten out rapidly, for the consumption is as large as ever and promises to continue. Iron furnaces are running full blast and the demand for all classes and grades of iron and steel is as active as ever. The operators are doing what they can to flood the market with coal, but are not able to get much surplus as yet.

Everybody is anxious for cold weather, but none is expected for several days. This state of things affects anthracite most, but it slows down business generally as well. Already the complaints that the railroads are confiscating coal have ceased and blockades are forgotten.

The bituminous trade is agreed that prices are at least 10c. off and not strong at that, quotations being $2.90 for select lump, $2.75 for three-quarter, $2.65 for mine-run and $2.25 for slack. Coke is tending downward, though mainly on account of excessive prices of late; quotations are based on $6 for best Connellsville 72-hour foundry. Allegheny Valley coal is quite as active and strong as Pittsburgh, at about 25c. less.

The premium on independent anthracite is about 50c. on stove and 25c. on chestnut, egg selling at circular at the mines, with jobbers adding a little for their profit. It appears that the extra prices paid for this class of coal are about at an end, which means that the large companies are pretty nearly caught up with their orders and will remain so till some actual coal weather appears. All complaints from this or that isolated district of being out of coal have disappeared.

COLUMBUS, OHIO

Mild weather has softened the coal trade in Ohio still farther and as a result quotations took another tumble. Prices are weak generally, and particularly so in the domestic grades. Dealers have large stocks on hand, and as a result are not inclined to buy to any extent now. In fact, orders for future delivery, which were placed earlier in the month, are generally being canceled.

The steam trade is still strong although quotations have sagged considerably in sympathy with domestic coal. Manufacturing establishments are taking about as large a tonnage as usual, although they are not stocking up any. Factories engaged in iron and steel lines are the best buyers of steam grades. The tonnage required by railroads is also large and the freight movement is holding up well.

Production in the various mining districts of the Buckeye State has been hampered by lack of demand and, consequently, it is estimated that it is less than 50 per cent. of normal. In the Hocking Valley the output was fairly large and somewhat above that figure. In eastern Ohio steam business is good and there was a fair production, while in other districts, which cater more to the domestic trade, the output was low

Quotations in the Ohio fields are as follows:

	Hocking	Pittsburgh	Pomeroy	Kanawha
Domestic lump	$1 75		$1 75	$1 65
¾-inch	1 50	$1 30	1 50	1.40
Nut	1 35		1.50	
Mine-run	1.20	1.15	1.25	1.20
Nut, pea and slack	1 15		1 15	1 10
Coarse slack	1.05	1 15	1.05	1.00

CLEVELAND, OHIO

The unseasonable weather had a drastic effect on the market during the past week and prices fell off from 5c. to 10c. a ton on all grades of coal. The flood that devastated the Ohio valley prevented a violent decline. A few weeks ago high premiums were being paid, but with the stringency of the car supply less noticeable, coupled with the spring-like weather, premiums have disappeared and sales organizations

are having difficulty in keeping the mines supplied with orders.

Coal men are convinced that dealers have overbought and do not look for an improvement in the domestic market until the cold weather arrives.

Wholesale quotations per short tons, f.o.b. mines, are as follows:

District	Freight rate	¼-in.lump	Mine-run	Slack
Youghiogheoy	$1 00	$1.30	$1 20	$1.00
Pittsburgh No. 8	0 90	1.10	1.00	1.00
Goshen No. 6	0 70	1 24	1.15	1.00
Coshocton	0.70	1.70	1.45	1.10

Massillon lump is quoted at $2.50 mines. Pocahontas lump and egg is sold at $2, run-of-mine $1.25, and slack 90c. at the mines. Hocking lump has dropped to $1.55, mines. Prices on furnace coke dropped to $3.25 f.o.b. ovens with about $1 added for foundry grade. Coal sales people are holding up quotations on contract business, realizing that prices will again take a decided jump upward at the opening of navigation. This will take a large tonnage off the rail market and improve conditions generally.

HAMPTON ROADS, VA.

The continued warm weather, good loading at the mines and prompt movement by the railroads have all contributed to a still further lowering of tidewater prices, $2.80 f.o.b. per long ton being offered and sales made at $2.90 to $3.05. Inland business is now being sought and some contracts have already been taken from Apr. 1 to Dec. 31. The change in the contract year has been determined upon so as to make all contracts after 1913 effective during the calendar year. The price of standard New River-Pocahontas coals on inland contracts seems to be settled at $1.25 per net ton, an advance of 15c. over this contract year.

Now that the Chesapeake & Ohio Ry. is open to the west and the bridge that caused the diversion of tonnage is again in service, the movement of Kanawha coal to tidewater has about ceased. This is offered at $2.70 per gross ton and a sale of 5000 tons was made last Monday at $2.75 less commission, about $1.25 f.o.b. mines per long ton. Local prices for the new contract year do not seem to have been settled as yet, but they will probably be $1.25 per net ton, f.o.b. mines, an advance of 15 cents.

The report that the Italian government had contracted for 200,000 tons of American coal has been confirmed and the entire tonnage will be shipped from Hampton Roads.

LOUISVILLE, KY.

The continuance of mild rainy weather in this vicinity has further depressed the market, to an unusually low point. With several weeks of quite moderate weather, and small demand for heating coal, the domestic consumption has fallen away to practically nothing. Dealers report that their supplies are all but untouched, and that their sales are hardly 25 per cent. of what they usually are at this period of the year.

The prices being quoted on nut and slack indicate pretty accurately the state of the market. Eastern Kentucky nut and slack is selling at 90c. to $1.05, according to grade; and western Kentucky is in good demand at 85c., while the Indiana variety, which is usually not wanted here, is being offered at about the same price. Eastern Kentucky block can be had for $1.75@2; lump, $1.65@1.75; round, $1.50@1.65; and mine-run, $1.25.

Indications are for colder weather, and this seems to be about the only salvation for the coal interests here. But even if the entire month of February should be genuinely wintery, this will be poor consolation for having lost practically all of the fall and early winter through a car shortage, and the month of January by unseasonable weather.

BIRMINGHAM, ALA.

The warm weather still continues and there is a growing uneasiness among the domestic dealers and operators, lest we should have no more real winter. There is a healthy demand for both steam and coking coals, and many mines are producing record outputs. The market for these grades of coal seems to broaden from day to day and the products of newly opened mines find a ready market.

Coke is the most active commodity in this district. The output at the present time is above all previous high records and bids fair to go still higher. There is an export inquiry here for approximately 300 tons per day of smelter coke and if this order is secured it will take practically all the available surplus; it is reported that the figure asked is $1, local ovens. Some foundry-coke sales have been reported as high at $4.50 ovens for spot shipment, which is the highest price received for coke in this district since the early part of 1907.

The steam coal and coke markets are being stimulated by the record number of blast furnaces now in operation in this district. The 1912 production of pig iron was considerably higher than any previous year and an additional furnace will be blown in during February.

INDIANAPOLIS, IND.

The dullness of the coal trade here is the worst ever known for January in the history of the industry. One operator who has just returned from an extensive trip, said he found retailers' yards full and much coal on the road still coming to them and that he expected to close down his mine. On mine shipments, operators can get out without a loss, but those consigning their coal cannot get cost out of it. Operators say it is too late now to recover this winter. Retailers bought heavily early in the season, stimulated by the car shortage, and are overstocked almost without exception.

The steam grades are much better than the domestic. Factories are busy; but are using 25% less fuel than last winter on account of the mild weather. Mines that can put in half time or better fom now on will be in luck. Operators are giving their attention now to selling for next season. One of the novel situations is that five cars of anthracite coal are held for demurrage at Columbus, Ind., and are offered at a bargain. Indiana prices, f.o.b. mines are:

No. 4 mine-run	$1 10	Domestic lump 5- and 6-in.	$1.65
Nos. 5 and 6 mine-run	1 00	Screenings, No. 4	0 70
No. 4 steam lump, 1½-in.	1 25	Screenings No. 5 and 6	0 60
Nut, No. 4	1.30	Washed coal, Nos. 1 & 2.	$1.75@2.00
Egg	1 40	Brazil block	2.20
Domestic lump 2½-in.	1.50		

CHICAGO

Quietness prevails in both the steam and domestic coal markets in Chicago. Several railroads operating their own mines have closed them down and a number of lines, which have been purchasing coal under a maximum and minimum contract, are now taking the minimum.

There has been an increase in the cancelation of orders for anthracite coal. Dealers say they are lacking in storage space. Smokeless mine-run is firm at $1.50@1.60, while lump and egg is selling at from $1.75@2. There has been a reduction of between 5c. and 10c. a ton in mine-run and steam lump coal of the Springfield variety. On account of a small production of lump, screenings have advanced from 5c. to 10c. a ton. Prices in the coke market are steady, but there has been a decline in the volume of sales. Gas-house coke has been cut to $5.85. Fair prices are being paid in the West for splint coal in box cars. There is comparatively little demand for Hocking Valley coal, prices remaining close to $1.75, the mines.

Prevailing prices at Chicago are:

	Sullivan Co.	Springfield	Clinton	W. Va.
4-in. lump	$2 62		$2.27	
Domestic lump		$2 32		$3.80 @ 4.05
Egg	2 52			
Steam lump	2.07 @ 2 17	2 02	2 17	
Mine-run		1 87	1.97	3.55 @ 3.65
Screenings	1.77 @ 1 87	1 62 @ 1 67	1.62	

Coke—Prices asked for coke are: Connellsville and Wise County, $6.50@6.75; byproduct, egg, stove and nut, $5.75@6; gas house, $5.85.

MINNEAPOLIS-ST. PAUL

The retailer in the Twin Cities and in the country has done a nice, steady business, and while not rushed, he is enjoying a steady trade and will make money before the winter is over. The wholesale trade is quiet, as has been the general condition ever since the record-breaking month of November. The much hoped for cold weather does not seem to make its appearance, and coal men, while trying to keep a stiff upper lip and smile, find it very difficult with the thermometer registering 50 deg. above zero.

Prices on all grades of coal, with the possible exception of hard coal, are weak. This includes soft coals at the docks, which are reported below circular, as well as Illinois and Eastern grades. Demurrage coal is to be had at low prices, this being a secondary consideration if the coal can be moved. Smokeless is sold at the docks for from 25c. to 50c. below Jan. 1 circular. Franklin County lump, egg and No. 1 nut is selling at from $1.40 to $1.50, and Carterville in the same sizes is quoted at $1.40.

DETROIT, MICH.

Bituminous—Detroit dealers and steam consumers have bought less coal in the last two weeks than over any similar period for the past two years, not even excepting the summer time. About the only thing worth featuring in the market here today is the scarcity of the slack. This perhaps is due to the floods which have made it impossible for the railroads to handle cars, thus necessitating the shutting down of some mines

The local market is quotable on about the following basis:

	W.Va. Splint	Gas	Hocking	Cambridge	Pitts. No. 8	Pocahontas	Jackson Hill
Lump	1 35		1 40			2 00	2 25
Egg	1 35		1 40			2 00	2 25
Nut	1 50		1 50			...	...
¾ lump	1 10	1 10	1 10	1 10	1 10	...	...
Mine-run	0 90	0 90	...	1 00	1 00	1 25	....
Slack	1 00	1 00	1 00	1 00	1 00	Open	...

Anthracite—The movement of anthracite is still slow and should the extremely cold weather which was promised, materialize, the supply in the local yards would soon be exhausted.

Coke—The demand for this article is falling off rapidly. Some of the local ovens are still shut down. Connellsville is being reported at $4. Solvay $4.25, and Gas House $4, f.o.b. ovens.

ST. LOUIS, MO.

There is absolutely no demand for coal either in the city proper nor in the country; several mines in the Standard field have shut down until conditions get better, and the same applies to a few operations in the Carterville district field. At no time during the past summer was the condition of the coal market any worse than it is right now.

Carterville and Franklin County lump and egg have been selling as low as $1.10 at the mines, with nut coal at $1, screenings at 75c. and mine-run at $1. These prices are below the cost and the overproduction in the field will continue to force prices down in order to move a tonnage that could be sold just as easily at 25c. per ton more if the production was under control.

The prevailing market is as follows:

	Carterville and Franklin Co	Trenton and Big Muddy	Mt. Olive	Standard
2-in. lump				$1 00
3-in. lump			$1 35	
6-in. lump	$1 20 @ 1 30		1 50	1 20
Lump and egg	1 45 @ 1 60	$2 00		
No. 1 nut	1 05 @ 1 15			
Screenings	0 75 @ 0 85			0 60
Mine-run	1 00 @ 1 10			0 90
No. 1 washed nut	1 30 @ 1 40			
No. 2 washed nut	1 40 @ 1 50			
No. 3 washed nut	1 35 @ 1 45			
No. 4 washed nut	1 00 @ 1 10			
No. 5 washed nut	0 75 @ 0 85			

OGDEN, UTAH

Real winter weather is prevailing over the territory west of the Mississippi and so far January has been a good month for the mine operators. The consumption about equals the production and there are steady shipments, from all districts.

About the middle of January, Nebraska was visited by a cold spell and dealers were able to clean up their storage coal. This has caused orders to be placed at the mines and shipments east from the Wyoming district are at a maximum.

Mines in Colorado report an abundance of orders and plenty of coal. The shortage of anthracite is noticeable in Nebraska and the dealers are compelled to handle a lot of premium coal. This has also increased the demand for the high-grade bituminous coal.

The continued cold weather has created a fair demand for slack and there are no indications of a surplus, although there are days that none can be loaded on account of the routing on the cars. Nut grade is moving nicely with none on track at the mines.

Both Utah and Wyoming prices continue strong as follows: Lump, $2.75; nut, $2.25; mine-run, $1.85. Wyoming slack brings $1, with Utah 25c. higher

PRODUCTION AND TRANSPORTATION STATISTICS

CONNELLSVILLE COKE

The "Courier" reports production and shipments in the Connellsville region for the week ended Jan. 25, as follows.

Production (tons)	Week	4 weeks	*Shipments (cars)*	Week	4 weeks
			Pittsburgh	4,303	17,322
Connellsville	229,940	1,003,675	W. of Pittsburgh	7,117	27,348
Lower Connellsville	186,342	742,300	E. of Region	870	3,613
Total	416,282	1,745,975	Total	12,290	48,283
Same period 1912	376,597	1,395,120		11,113	40,920

The Car Situation

American Ry. Association reports surpluses and shortages of coal equipment for 2 weeks ended Jan. 15 as follows:

	Surplus	Shortage	Net Surplus
New England Lines	137	173	*36
N. Y.; N. J.; Del.; Md.; Eastern Penn.	1,653	1190	463
Ohio; Ind.; Mich.; Western, Penn.	1,694	531	1,163
W. Va.; Va.; N. & S. Cal.	768	442	326
Ky.; Tenn.; Miss.; Ala.; Ga.; Fla.	538	653	*115
Iowa; Ill.; Wis.; Minn.; N. & S. Da.	2,083	502	1,581
Mont.; Wyo.; Neb.	109	10	99
Kan.; Colo.; Mo.; Ark.; Okla.	2,089	0	2,089
Texas; La.; N. Mex.	398	8	390
Ore.; Idaho; Calif.; Ariz.	2,682	0	2,682
Canadian Lines	0	0	0
Totals	12,151	3509	8,642
Same period 1912	64,719	88	64,631

*Shortage.

FOREIGN MARKETS

GREAT BRITAIN

Jan. 17—The market continues very firm in all departments. A great deal of attention is being paid to the arrangement of February stems. Quotations are approximately as follows:

Best Welsh steam	$4 68	Best Monmouthshires	$4 26
Best seconds	4 50	Seconds	4 14
Seconds	4 38	Best Cardiff smalls	3 60
Best dry coals	4 62	Seconds	3 36

The prices for Cardiff coals are f.o.b. Cardiff, Penarth, or Barry, while those for Monmouthshire descriptions are f.o.b. Newport; both exclusive of wharfage, and for cash in 30 days —less 2½%.

British Exports—The following is a comparative statement of February stems. Quotations are approximately as 1912 in long tons:

	Year		December	
	1911	1912	1911	1912
Anthracite	2,454,523	2,547,712	221,359	230,803
Steam	47,119,017	46,539,983	4,255,301	4,210,920
Gas	10,504,172	10,559,845	910,050	829,435
Household	1,540,710	1,639,571	166,491	141,763
Other sorts	2,980,844	3,157,893	240,710	284,447
Total	64,599,266	64,445,004	5,793,911	5,697,368
Coke	1,059,879	1,026,021	115,956	97,409
Manufactured fuel	1,612,741	1,565,432	130,912	171,400
Grand total	67,271,883	67,036,457	6,040,770	5,966,177

COAL SECURITIES

The following table gives the range of various active coal securities and dividends paid during the week ending Jan. 25:

Company	Week's Range High	Low	Last	Year's Range High	Low
American Coal Products	90	90	90	..	
American Coal Products Pref	111	111	111	..	
Colorado Fuel & Iron	35	31⅛	34⅛	36	31
Consolidation Coal of Maryland	102¾	102⅝	102⅞	102⅞	102⅛
Island Creek Coal Pref	86	85	85	..	..
Lehigh Valley Coal Sales	240	204	204	..	..
Pittsburgh Coal	22⅞	21⅛	22⅛	24⅞	21⅛
Pittsburgh Coal Pref	89½	88	89½	95	87
Pond Creek	26⅜	24⅛	25	28⅛	24⅛
Reading	165⅝	160⅞	164⅜	168¼	160⅜
Reading 1st Pref	90⅝	90¼	90⅜	90¼	90
Reading 2nd Pref	..	..	..	93	91
Virginia Iron, Coal & Coke	53½	52⅞	52⅝	53½	52

Bonds Company	Closing Bid	Asked	Week's Range or Last Sale	Year's Range	
Colo. F. & I. gen. s.f.g 5s	99	102	98	97	100⅜
Colo. F. & I. gen 6s	101½		107½ June '12	107½	107½
Col. Ind. 1st & coll 5s, gu	83½		83½ 84	72½	85½
Cons. Ind. Coal Mc 1s 5s		84½	85 June '11	..	..
Cons. Coal 1st and ref 5s		94	93 Oct. '12	93	94
Gr. Riv. Coal & C. 1st g 6s	94	100	102½ Apr. '06	..	..
K. & H. C. & C. 1st s f g 5s			98 98	97½	98⅛
Pocah. Con. Coll. 1st s f 5s	87½	88	87½ Jan. '13	81⅛	89⅛
St. L. Rky. Mt & Pac 1st 5s	77½	78	77½ 77½	79⅛	84½
Tenn. Coal gen 5s	102	103½	102½ 103	101½	103
Birm. Div. 1st consol 6s	103	Sale	103 103	102¼	104
Tenn. Div. 1st g 6s	101½	103½	101½ Dec. '12	101½	104
Cah. C. M. Co. 1st g 6s			110 Jan. '09	..	..
Utah Fuel 1st g 5s					
Victor Fuel 1st s f 5s		83	85½ Oct. '12	85½	86
Va. I. Coal & Coke 1st g 5s	97	Sale	96½ 97	94¼	98½

Jefferson & Clearfield Coal & Iron Co.—Dividend on preferred of 2½% payable Feb. 15, to holders of record, Feb. 7.

COAL AGE

Vol. 3 NEW YORK, FEBRUARY 8, 1913 No. 6

Arnold Bennett, the famous English author, who recently made a short visit to the United States, has been writing his impressions of us for one of the leading monthlies. One of these articles contains the following:

"What strikes and frightens the backward European almost as much as anything else in the United States is the efficiency and fearful universality of the telephone."

Mr. Mine Operator, do you think that sentence is equally applicable to the telephone service in the average American coal mine? We think not. But if not, why not?

We'll let you answer that if you can. We've heard plenty try to give a reason but, frankly, we are still in the dark.

If you reverse the question and ask why telephones should be "fearfully universal" in and about our coal mines, every man in or out will give you a prompt and reasonable answer. But if you press the matter a little further, you'll probably find that your informer is a little hazy as to what constitutes efficiency in telephone practice.

We once heard an operator expatiating on the efficiency and dependability of his mine-telephone system. A few weeks later circumstances led us to make a trip through one of his mines and out of curiosity, we investigated the telephone system. Here is what we observed.

The mine consisted of a main slope with long right and left headings turned off at regular intervals. Some of these headings were several miles in length, and they were served with electric haulage locomotives.

The telephone system underground consisted of three phones: one at the first pair of entries, one about midway down the slope and one near the face of that roadway.

When the locomotives were at the mouths of these entries waiting on empties, the motormen were within hearing distance of these phones. When they were inside gathering trips, the phone bells were useless. If you think this is an extreme case, begin to observe if you please, how few mine phones are within hearing distance of a regular worker, who could be depended upon to hear the telephone signal bell.

In an office building the boss who can't so regulate his affairs as to be within hearing distance of his telephone every minute of the day feels justified in employing an office girl to assume such service; if he has a few assistants scattered around in adjoining rooms, he supplies each of their desks with phone extensions and push buttons and bells. He could summon any of these subordinates by simply opening a door and beckoning, but why do that when the phone saves even these few steps?

In our friend's coal mine, to summon an assistant requires the following operation: Ring, ring, ring, until someone happens to answer. Then order that someone to go to the face of one of these cross-entries (a matter of possibly one mile), as the assistant reported earlier in the day that he expected to be there. Perhaps he'll be found there, perhaps not.

In case of fire what chance would the workers at the face have if their escape depended upon some one traveling a mile to warn them?

A large coal-mine organization which has once become accustomed to an efficient telephone system would no more be able to operate without it, than a train despatcher be able to handle his trains without keeping in touch with them by wire. This comparison may seem a little exaggerated at first blush, but a little consideration will overcome such an impression.

The train despatcher has a fixed number of trains operating on a fixed schedule and passing at fixed passing points; he would not *require telegraph communication* with them if the schedules were always maintained—how often are they maintained as a matter of fact?

How often are the mine foremen and his assistants able to carry out an entire day's work according to a previously arranged schedule?

IDEAS AND SUGGESTIONS

Co-operation

By E. L. Cole

Those of us who are employed in the coal-mining industry are continually having the cry of economy dinned into our ears, until it forms a part of our very being. There is also the demand for the elimination of wasteful methods. And our superiors have provided elaborate accounting methods, so that we are at all times confronted with statements, proving that the cost of production is one that requires constant vigilance on the part of all, to insure maximum results with minimum expenditures.

But there is one phase of this problem, whereby the cost of production is enhanced, though even the most elaborate system of accounting fails to show the large losses thus sustained. This is the lack of thorough co-operation between the heads of the various departments.

Too often the men who are charged with the management of departmental work are prone to guard with zealous care, what they are pleased to term "the encroaching on their territory," by the heads of other departments. They frequently remark, in the presence of subordinates, their opinion of the offender, and there rises a wall of antagonism, high and wide, between those who are supposed to work together for the interests of their employer.

Moreover, we see the subordinates infused with a hostile feeling toward the other departments, and there is a total absence of the *esprit de corps*, with the result that there is a marked falling off in the efficiency of the entire organization.

It is not necessary for me to cite instances of this lack of coöperation, where heads of departments are prone to stand on their so called "dignity." The reader needs only to study conditions in his own department and, if he is candid, he will often be obliged to admit that the absence of discipline is but the reflex of his own attitude toward the heads and employees of other departments.

Troubles in industrial work are nearly always due to the sins of omission, or commission, of the department head who is most prone to stand on his "dignity," and who is first to take offense when he meets the head of another department "trespassing" on what he considers his "private domain."

Have you clearly and forcibly impressed on the minds of your employees that their salary, as well as that of all others, is payment for services rendered to the same employer? And that to be guilty, even in a small measure, of refusing to coöperate with your fellow employees is nothing short of larceny? Is in fact receiving money under false pretense.

Concerning Conservation of Coal

By Carson W. Smith*

Has it ever been proposed that the state should tax a coal company for coal left and rendered inaccessible in a mine? Suppose for instance that some state took the notion that it was trustee to posterity for the coal within its boundary, and said to the coal-mining man:

"Now, friend, we have come to the conclusion that you can do differently and a lot better with these mines of yours. We don't like the way in which you are gouging out the best and cheapest portions of our coal, leaving so much that is totally and forever lost. We don't believe you have the right to spoil what will be so valuable and necessary in just a few years, and we are going to try to find a way so you won't want to do this.

"So we are going to tax you for what coal you don't get! That is, of course, within certain reasonable limits. If you lose coal in your mine, you are destroying this state's wealth, and so you will pay back what you have lost for us. And if you can't operate your coal mine under these conditions and make money, *then your mine never should have been opened*, and this will compel you to close down until such a time that coal will be worth more money to us and we can pay you such a price for it that you can afford to fulfill our conditions!"

The amount of coal left and ruined each year in the mines of this country must be appalling. It is certainly unfortunate, and to a large extent unnecessary. This loss, however, will continue to be excessive just as long as the present economic conditions of the coal business continue.

No man, just for the love of humanity, is going to get out coal that costs him more than he can sell it for. When he encounters such coal in his mine he is going to leave it there—and this coal generally is in such shape that its future recovery is impossible, and if it is not taken out with the rest, it is gone forever. This is good enough for the operator, as it cuts down his average cost and enables him to make more money than he otherwise would. It is good enough for the consumer, as he gets cheaper coal—for the time being.

Who was it said, "After us, the deluge!"? Is not this our attitude?

A sinking fund is good policy in most any business. Would it be amiss for the people of this state to curtail their profits to a slight degree, so that their business might be greatly prolonged? Real patriotism is not in living only for ourselves and for today—or even for our children just for tomorrow. Practical conservation, I take it, is a real patriotism, indeed. It is as intimately associated with the future welfare of the nation, as preserving the integrity of this republic. And a great many strong men have offered up their lives to the future of

*Dacono, Colo.

this United States. We, today, scarcely think of conservation as being so serious a matter.

Could a state administer successfully a law imposing a tax of 15c. a ton on all coal lost, destroyed and rendered unavailable by the operating company? Would it be impracticable, unwise and unconstitutional to do so? Possibly.

One can plainly see, however, what would be some of the results in the coal world from such a measure. First probably, the price of coal would go up. Later on certain mines would shut down. The coal production of the whole country would decrease to the resulting economic balance.

In the coal mines, operators would begin to spend money to make their mines fireproof and explosion proof and trouble proof. And they would begin to get out all the coal—within what the law considered reasonable. Instead of seeing ten million tons in a property, the owner would see fifteen million tons, and he would build accordingly. His men would live in better houses. They would work under safer conditions. They would have instructions in careful mining, and as their skill grew, so would their pay. And, above all, no longer would they work for their bread in daily danger of their lives, for disaster to them spells ruin to the company!

The price of coal would go up—and the public would pay for it. Why, God bless them, of course they would pay for it!

The Value of Discipline

By a Pennsylvania Engineer

Nearly every time we pick up a table of statistics giving the death rate per thousand tons of coal mined and the rate per thousand men employed, we are sure to see a parallel column comparing the United States unfavorably with other coal-producing countries. Among the reasons why this is so, is the fact that a more strict discipline is enforced in the foreign countries than in our own coal-mining operations. Discipline is, by all odds, one of the most important factors in the safe operation of a coal mine; and this means discipline not only for the mine workers, but also for the officials, of whatever standing they may be.

Not so very long ago, the worth of a miner was judged by the time in which he cut his coal and loaded his quota of cars for the day. Haste to finish the shift, however, nearly always entails a haste in which there are apt to be infractions of the mine rules and the mine laws which mean increased danger, not only to the offending miner, but also to his neighbors.

How often do the foremen and firebosses, in their daily examination of the workings, find little infractions of the law which may lead to serious consequences, and pass the matter over with a slight reproof? Frequently the miner is found making a cartridge with a lighted lamp on his head, instead of keeping his light five feet away. He is not discharged, as he should be, but is given a lecture and the next time probably does the same thing. The foreman excuses himself for not inflicting a more serious punishment by saying that if the man were discharged, he would find work immediately in a near-by colliery, and as men are needed in his own mine, he might as well keep him.

Often the foreman, in walking through the mine, finds something wrong with the air current, and on investigation, finds that the "nipper" or doorboy has left his place and gone in on a trip with the driver, leaving the door open, as he expected to be gone but a short time. Does the foreman discharge him? Very seldom; he needs doorboys, and the next one would probably do the same thing. So the boy is let off with a reprimand, and threatened with dismissal if the offense is repeated. Such things do not make for a good standard of discipline, and thus go far toward rendering the mines more unsafe than they would be if all rules were enforced.

Nor is the trouble wholly with the workmen. The foreman, in a hurry to go from one section to another, will ride up a slope in a mine car, instead of having the man-cars put on; or he will ride on an electric or air motor; either of which acts would be severely censured if perpetrated by a workman. And yet, how can he expect the miners to wait for the man-cars, or to walk a long, roundabout manway, when they see him travel in the mine cars?

The strict discipline existing in European mines is one of the reasons for the decreasing death rate, even though the working conditions are said to be more dangerous than in this country. We must, then, enforce strictly both the mine laws and the special rules of our collieries, and make the men, of all classes, understand that any deviation from these rules means instant dismissal.

Cutting the Price of Coal

By a Pennsylvania Inspector

We are often surprised to find that men, as intelligent as the coal operators of the present day, are continually underselling one another; in fact, cutting each other's throats. Every person interested is asking someone to explain how he can make a fair profit on his investment.

If these same operators would give the matter just one hour's thought, each and every one would arrive at the same conclusion; namely, that all coal must be sold at a standard price which will give everyone the fair profit for which they are continually clamoring. This can never be accomplished as long as coal is sold at the mine. There must be a fixed price for the different grades of the product at every market place.

If one concern has all the necessary timber on its property to operate its plant and can probably save two or three cents on props and mine ties, it is so much to its advantage, and means so much more profit on each ton of coal mined, if coal is sold at a fixed price.

Other operators are interested in steel mills. They figure that they can get their rails at a lower cost than other coal companies. This is all well and good—but instead of making that profit—the difference in cost of steel paid by them and the other company—they sell their coal just that much cheaper and the others must do likewise. Then they wonder why the price of coal is not higher.

It is all up to you, Mr. Operator. It is you who must get busy. You cannot look to some outsider to drop in and show you how to run your business. Do you realize that there would be just as much coal consumed if the prices were three or four times what they are at present? The operators must get together; they, and they alone, can remedy the low prices.

The Bering River Coal Field, Alaska

By W. R. Crane*

SYNOPSIS—The Bering River coal field is shut in by high ranges of mountains and large glaciers. It only covers 69 square miles, but the total thickness of the beds in the Carbon Mountain district is 75 ft. and in some parts of Cunningham Ridge it may be equally thick. The folding and faulting are considerable and the volatile content changes rapidly from east to west.

The Bering River coal field lies north of Controller Bay and the Bering River, and extends some 20 miles in a northeasterly direction from Bering Lake on the west to the Bering Glacier on the east and south. The Martin River Glacier and the Chugach Mountains lie to the north of the field. The accompanying map gives the position of the prospected areas in which coal has been found, which is of good grade and in beds of sufficient thickness to warrant working. See Fig. 1.

Coal in Cold Storage

The coal field is practically surrounded by lofty, snow-clad mountain ranges and extensive fields of glacial ice. It is but natural then that the climatic conditions should be affected to a marked degree by the close proximity of such vast ice-bound areas. An annual precipitation, approaching 150 in., is not uncommon, and this is practically equally divided throughout the year, although the summer months are probably somewhat drier than the other seasons.

The field is practically isolated from the interior by the glaciers and rugged mountain ranges, which isolation is so complete that moose, caribou and deer are not to be found here, and the smaller animals and birds are decidedly limited in variety.

The Chugach Mountains, lying to the north of the coal field, have elevations of 6000 to 12,000 ft., and increase in height as they approach the coast, while the mountains lying within the field seldom attain a height of more than 2000 ft., although occasionally isolated peaks have elevations of 2500 to 4000 feet.

Mountains of moderate elevation rise abruptly from the flats and lowlands of the Bering River, and are cut by cañons in which both swift mountain and glacial streams are actively at work cutting the gorge deeper and wider. Erosion is much more active below timber line than above, due largely to the protection that the rock masses receive from the moss which covers the mountains.

Spruce and hemlock are abundant but seldom reach a greater elevation than 1000 ft., which is the normal timber line. Above timber, the mountains are covered with a mantle of moss and small plants, also in many places with thickets of low bushes. Many flats or parks on the summit of the mountains produce luxuriant growths of low grass, which might furnish excellent feed for animals were it not for the exceedingly wet and marshy condition of the soil.

The average temperature for this region is below 50 deg., ranging from 2 deg. to 84 deg. above zero. Were it not for the excessive rainfall, it would be possible to carry on mining operations the whole year round. While there is occasionally a heavy fall of snow, which would seriously interfere with cutting and handling timber and performing other outside operations, yet there are many seasons when the fall of snow would be of no consequence.

Only 69 Square Miles of Coal Land

The total area of the Bering River region does not exceed 430 square miles, of which 69 square miles are underlaid with coal or at least consist of coal-bearing formations. While the coal-bearing area is gradually being extended it is not probable that there will be any material additions made.

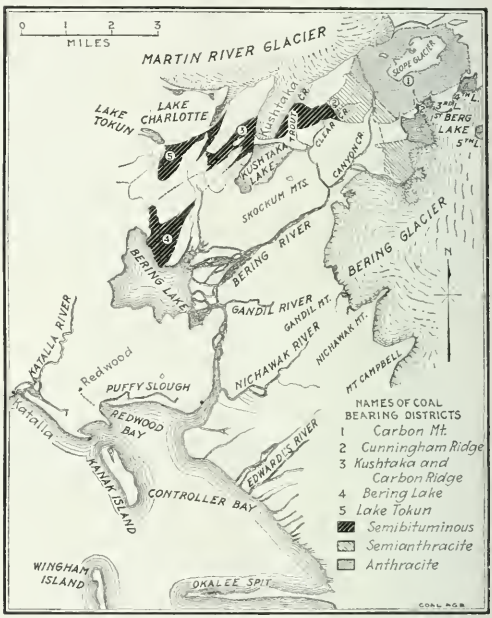


Fig. 1. Plan Showing the Bering River Coal Field and Its Relation to the Coast Line

According to Dr. G. C. Martin[1], the area containing coal can be subdivided into definite parts according to the character of the fuel found. The anthracite and semi-anthracite coal are distributed over 26.6 square miles, semibituminous over 20.2 square miles and there is an area of 21.6 square miles probably underlaid with coal, although the coal-bearing formations do not appear on the surface.

While the existence of coal in the Bering River field was known at an early date to the Indians and possibly to the Russians, definite knowledge regarding it does not seem to have become known until 1898, when R. A. Johnson, of California, learned of it from the Indians while investigating the oil resources of Yakutat Bay and the re-

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[1] U. S. G. S., Bull. No. 335, p. 65.

gion about Katalla. Considerable prospecting was done, and the Alaskan Commercial Co., now the Alaska Development Co. was formed, being interested in both oil and coal. The coal on Kushtaka Ridge was located by this company.

Heat from Igneous Rocks Has Devolatilized the Coal

For convenience of discussion, the coals of this field will be considered according to location rather than character, although the kind of coal will be carefully designated for each particular locality. The five areas into which the coals of this field may be grouped are: Carbon Mountain, Cunningham Ridge, Kushtaka and Carbon ridges, the Bering Lake district, and Lake Tokun district. The order of these fields is from east to west, which is also the order of the occurrence of the different kinds of coal; namely, anthracite, semianthracite and semibituminous.

It is somewhat difficult to explain why there should be such a wide divergence in character of coals as is found

Fig. 2. Some Badly Disturbed Coal in the Cunningham Ridge District

in the two extremes of this field, particularly if the explanation is based on supposedly greater intensity of earth movements. Dr. Martin[1] holds that the rocks of the anthracite region have been more closely folded, while those of the bituminous areas have more or less open folds, the structure being simpler.

To the writer a more plausible explanation is that the anthracite coals were close to igneous masses and in certain instances were even in actual contact with igneous intrusions now forming sills and dikes. These, though small, are evidence of the comparatively close proximity of larger masses of igneous materials. Further, there are localities in the heart of the bituminous area, which have undergone fully as extensive folding and faulting as any part of the anthracite area, and yet the coal retains its bituminous character. This matter will be referred to again under the head of occurrence of coals both in this and the Matanuska fields.

No estimate of the quantity of coal available for mining in this field will be attempted in this connection, owing to the fact that the coal beds in many localities exhibit a tendency to be quite variable in thickness and any estimate based on the assumption that a uniform bed will be maintained for a given depth or area covered by the seams will be of little value until more definite information is available.

[1] U. S. G. S. Bull. 335, p. 91

That part of the field occupied by Carbon Mountain is several hundred feet higher than the other parts. It is capped by a large mass of snow and ice, known as a "slope glacier." There is probably no part of the Bering River field which has been more thoroughly and systematically prospected.

The northern portion and the greater part of Carbon Mountain contains beds of anthracite coal, while there are a number of isolated portions in the southern extension of the mountains containing semianthracite. It is probable that coal will ultimately be discovered on all parts of the mountain, for the area is constantly being extended by careful prospecting.

It is extremely difficult to estimate the number of coal beds occurring on Carbon Mountain, owing to the shape and the exceedingly irregular surface formed by the enormous streams diverging radially from the summit and fed by the capping of ice, also due to the ever-changing dip and strike of the strata. While it is not impossible to correlate the coal beds from the top to the bottom of the mountain from data obtained through examination of outcrops, yet it would be very difficult and has not been attempted.

Seventy-five Feet of Coal on Carbon Mountain

It is not difficult, however, to obtain an approximate estimate of the aggregate thickness of coal beds occurring at or near the base of the mountain. As Canyon Creek is approximately straight, a line of sectioning could be taken paralleling that creek. Such a line would be nearly normal to the strike of the majority of the coal outcrops thus preventing the repetition of coal beds unless a fold was cross, in which case the fact would be evident from reversal of dip.

From all information available, it is safe to say that there are 65 ft. of semianthracite and 10 ft. of anthracite, or a total of 75 ft. of workable coals at present located along the lower part of the mountain and in this direction.

Maps of this mountain show a large number of outcrops, many of which are evidently on the strike of the same bed of coal, while others, which appear to be on other beds, may be upon the same, due to a change in direction of strike as a result of folding. Further, many outcrops located are of beds too small to be of any commercial value. There are, however, a number of coal beds on this mountain that range from 6 to 20 ft. in thickness, which have not been located at the base of the mountain.

Cunningham Ridge District

The Cunningham Ridge is about equally divided between the semianthracite and the semibituminous coals, the former area being at the east end of the field. The semianthracite area has undergone extensive folding, as is shown by the condition of the strata on the wall of the cañon facing Canyon Creek. See Fig. 2. From the summit to the base of the mountain the strata have been so folded and faulted that it is practically impossible to trace the separate beds continuously for even half a mile. The dip of the strata is constantly changing from north to south. Under such conditions, particularly when accompanied by cross-folding and faulting, it is practically a hopeless task to attempt to secure definite information regarding the number of workable coal beds. Conditions are, however, not so bad a mile or two to the westward, and more definite information can be secured.

Clear Creek extends in a northeasterly direction from Kushtaka Lake and cuts through the center of the productive area of the semianthracite field. Passing up this stream, non-coal-bearing formations are first crossed over, then a small extension of the semi-bituminous area is encountered, in which a 4-ft. bed of coal outcrops. Continuing up the bed of the creek, the gorge becomes deeper and the outcropping of coal beds can readily be observed. It is not, however, until an elevation of about 650 ft. is reached that coal is found in any considerable quantity. Between elevations 650 and 800 ft., and for several hundred feet along the course of the creek, extensive beds of high-grade coal occur, standing at inclinations varying from 40 deg. to 67 deg. with the horizontal.

Irregularities Which Make Estimation Difficult

Here again a serious difficulty arises, rendering the estimation of footage of coal beds very uncertain. At the locality where the largest amount of coal occurs, a fault has displaced the beds; the creek following the strike of the fault for considerable distance. The direction of displacement is not vertical but makes an angle of about 45 deg. with the vertical, thus the coal beds, while occurring on both sides of the creek, are not continuous, and one must cross and recross the stream, often going a distance of several hundred feet, up or down stream, in order to examine the outcrops.

In estimating the number of coal beds in this locality, those on one side of the creek alone should be taken into consideration, those on the other side ignored. The objection that might be raised to this method of procedure is that the bed on one side is 40 ft. thick, while that on the other side is only 17 ft. It is doubtful, however, that the 40-ft. bed will maintain this width. It has probably been thickened or massed by the movement of the strata that accompanied the faulting—a contention that seems to be borne out by examination of apparently the same bed outcropping at a point several hundred feet up the mountain and evidently in line with the strike of the 40-ft. bed.

If this is correct the coal in this locality resolves itself into practically a 17-ft. bed. Several thinner beds of coal occur at or near the source of Clear Creek and almost on the summit of the mountain. The aggregate thickness of coal beds as observed along the line of Clear Creek is therefore 21 ft., of which 4 ft. is semi-bituminous.

Passing to Trout Creek, which traverses the western portion of the Cunningham Ridge, a number of outcrops of excellent coal are to be found, which aggregate some 55 ft. in thickness.

The high ridge extending in a southwesterly direction from Monument Mountain and forming a divide between Trout and Clear Creeks, also contains a number of large outcrops, which, as in the case of the Carbon Mountain, have not been traced to a lower level. The ridge is quite narrow, is practically devoid of vegetation, and it is, therefore, an easy matter to make observation on the occurrence of existing coal beds. From north to south, seams of coal of the following thickness were noted: 3 ft., 38 ft., 31 ft. 3 in., and 3 ft., making a total thickness of 75 ft. within a distance of less than a fourth of a mile. The coal beds of the western portion of this district stand at angles varying from a few degrees even up to the vertical.

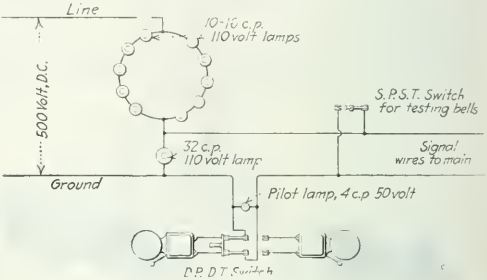
(To be continued in an early issue)

A Simple Electric Mine Signaling System

By Joseph Daniels*

The accompanying sketch shows a simple, economical and dependable system of electric signaling. The current for lighting, pumping, underground and surface haulage is 550 volts, d.c. This current is utilized for signaling purposes in the manner to be described. No. 12, B. & S. galvanized-iron wire is carried down the slopes and suspended from small porcelain knobs on plugs driven into the roof or fastened to posts on the side. These wires are also carried into each level or gangway and a double-pole switch is provided at each level to cut out the signal wires below that point.

In the engine room the current to operate the gongs is supplied by shunting the ground light of a series of ten



Layout for Signaling System

16-cp., 110-volt lamps, as indicated in the diagram. Two series of lights are in the lamp bank rheostat, thus providing for accident in case one series should burn out. Two bells, a pilot light, and a testing switch are installed on a board in front of the hoisting engineer. The bells are so arranged that either one may be used, in case the other is out of order, by simply throwing the handle of a double-throw, double-pole switch. The pilot light is connected in parallel with the bells and burns brightly at each signal, thus acting as a substitute in case the bell fails to ring. The single pole switch, connected with the signal wires to the mine, permits the engineer to test the signaling system from his station. Signals from the mine are sent by short-circuiting the wires in the slope. This is done by means of a copper spanner of ample width, so that the trip runner can close the circuit without having to get off the trip or grasp the signal wires in his hands.

The system does not require much labor, expensive apparatus or material to install, and its maintenance amounts to practically nothing. In case of any trouble in the mine, short-circuits or broken wires can be easily located and quickly repaired.

The U. S. Geological Survey classifies land as coal land only when the coal lies at what is now considered a depth minable in this country. The character of the coal determines the depth to a certain extent. The higher grade coals are allowed a maximum depth of 3000 ft., less is allowed for poorer grades. Lands underlaid with coal at a depth of 3500 or 4000 ft. are classed as "non coal" lands. The amount of coal below 3000 ft. has not yet been estimated, but it is without doubt large. The coal above this depth is estimated by the Geological Survey to be 2000 billion tons. Less than 11 billion tons have been mined. A large part of the estimated 2000 billion tons consists of comparitively low grades of lignite

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Our Future in the Export Trade—II

By F. R. Wadleigh*

SYNOPSIS—The second of the series on this important subject. This installment is confined entirely to a study of British coals, methods of mining, quality, transportation and marketing conditions. Satisfactory analyses of the British product, the only serious competitor of the American fuels, are difficult to obtain.

A distance of from 20 to 30 miles is all that intervenes between the Welsh mines and the tidewater shipping ports; in fact, nearly every coal field in Great Britain is within that distance. This would seem to give the Welsh coals an immense advantage in transportation over the American product with their 300- to 400-mile haul, part of it through a mountainous country. This advantage is entirely overcome, however, by the efficiency of the American coal roads and their ability to handle immense tonnages at low costs.

South Wales Coals

There has been so much loose talk and so many incorrect and misleading statements made in the United States trade papers, regarding Welsh and Cardiff coals that it is advisable to give some information regarding them, the beds from which they are mined and the different qualities of each.

There are different kinds and grades of Welsh or "Cardiff" coals and to lump them all together for purposes of comparison, as has been frequently done, would be about the same as putting all the Pennsylvania and West Virginia products in the same class. In speaking of the Cardiff coals, it should be noted that some of those from other ports, Swansea, Newport and Port Talbot, are also of first-class quality. In addition to these there are also many other coals in Great Britain that enter the export markets and with which United States coals must come into competition, some of them being nearly equal in quality to the best Welsh product.

Let us first consider the British export tonnage and see how much of it is Welsh coal. The total exports from Great Britain, in 1911, amounted to 61,599,266 long tons, valued at $170,944,298.80, or an average of $2.616 per ton. Of this total, 16,127,000 tons were exported from Cardiff and 8,743,000 from the other three British channel ports, so that 24,900,000 tons may be taken as the annual total exports of Welsh coal, leaving out the small ports, Llanelly, Neath, etc. Of this total about 8,000,000 tons goes to countries where we can never compete, because of geographical and transportation reasons. Of the total British exports about 37 per cent. comes from South Wales.

This leaves 16,000,000 tons for the United States coals to displace, as far as they can do so, an uphill task and one that has not yet been properly started. An old Spanish proverb will apply here: "In scratching and eating, everything is in the beginning." Currents of export trade once well started, gather volume as they move and have settled channels. Our attempts on this export market have been spasmodic and unsystematic; we must overcome a bad beginning and do our best to reverse or change the trade channels.

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The South Wales Coal Field—The great coal basin of South Wales is the second largest in Great Britain, containing vertical strata about 10,000 ft. in thickness and covering about 996 square miles. It is divided by Carmarthen Bay into two parts. The larger to the east into Monmouthshire is 56 miles long, and the smaller toward the Atlantic Ocean, 17 miles long, and both of them are about 12 to 16 miles across. Its general topography is not unlike that of the New River-Pocahontas field—mountainous and cut by deep valleys.

The coals in this basin vary considerably in character, from true bituminous or gas coals to anthracite. This variation usually shows from east to west; in the east, gas coals prevail, while in the middle they are semibituminous but gradually turn to anthracite in the west; it is even found that seams in the same hill may vary from bituminous to anthracite. In the total area there are 75 seams of coal, 22 of them over 2 ft. in thickness, the latter showing an aggregate of about 51 ft. The estimates of the Royal Commission of 1904-5 on Coal Supplies, gave the total available net tonnage of unmined coal, taking the limit of depth in working as 4000 ft., and the minimum workable thickness at 2 ft., as 21,372,409,604 tons.

Beds of Coal—Owing to the variations mentioned above and to the great mixture of names, many seams having different names in different localities, it is difficult to give any general characteristics of the different beds, except as applied to given localities. Most of the best grades of steam coal, however, come from the Eastern Middle section, in East Glamorgan, to the north, which is about 61 square miles in area. In this section, along the Aberdare, Rhondda and Merthyr Valleys, is mined the majority of the Welsh Admiralty coals, Nixons Navigation, Ferndale, Powell Duffryn, Corys Merthyr, Insoles Merthyr, Penrikyber, Great Western Navigation. (A complete list of coals on the Admiralty list will be found elsewhere.)

Analyses of Welsh Coals—Before making comparisons of the analyses of Welsh coals given below and those of United States coals, it must be understood that it is difficult to make any accurate and final comparisons, based on actual analysis of the coals as shipped and on trials under boilers. There are comparatively few published analyses and calorimeter tests of British coals and such as have appeared seldom give any data as to how samples were taken—whether from commercial shipments or from the seams in the mine.

The methods of making and reporting analyses also differ and in many cases a different type of calorimeter is used, making comparisons misleading; while the few comparative boiler tests that have been made between United States and Welsh coals were often under conditions unfavorable to our product or else the figures were open to doubt. Practically all of such tests have been made by private interests and the results have not been published and are only known by the parties interested.

The British government has made no such elaborate series of tests and analyses of their coals as has our government and as there is comparatively little buying on specifications in Great Britain, little information is available from either of these sources.

Class "A" is the one that includes the best Admiralty coals, due largely to its comparative smokelessness; the coals in class "B" are just as high or higher in heating value and are largely preferred to class "A" coals as they burn more freely and the small coals coke and open out in the fire. By this coking and expansion into a more or less cellular condition, better combustion results and there is little loss through the grates; they can also be burned with smaller grate area and less draft. It is these class "B" coals, which the New River and Pocahontas fuels most resemble in character, structure and in burning qualities, and it is for the reasons given above that they equal the Admiralty coals in the results obtained under boilers.

TABLE NO. 1. ANALYSES OF NINE TYPICAL SOUTH WALES COALS (EVANS)

	A	B	C	D
Fixed carbon	82 50	78 00	67 30	75.75—75.75
Volatile	12 50	17 00	26.00	20 00—18 00
Ash	4 00	4 00	5 50	5 00
Moisture	1 00	1 00	1 20	1 25
Sulphur	0 85	0 75	0 85	1 75
B t.u. (calculated)	14,877	15,038	14,607	14,841—14,842

	E	F	G	H	I
Fixed carbon	70 30	66 00	85 00	89 50	87 00
Volatile	25.00	27 50	10 00	5 50	8 00
Ash	3 50	5 00	4 00	3 50	3 50
Moisture	1 20	1 50	1 00	1 50	1 50
Sulphur	0 60	1 50	0 75	0 50	0 50
B.t.u. (Calculated)	14,981	14,614	14,763	14,364	14,620

A, Cardiff Best Large; semi-bituminous steam. B, Cardiff Large, second steam. C, Best Newport Large; bituminous steam. D, Ronda No. 2 seam. E, Ronda No. 3 Seam. F, Gas Coals. G, Dry Steam. H, Anthracite. I, Bastard Anthracite.

The researches of Professor Constans and Dr. Schlapfer, of the Zurich Polytechnic, in 1909, give convincing reasons for the superiority of the coals with the higher per cent. of volatile, such as class "B" and the New River and Pocahontas coals. These researches have established the fact that coals containing about 20 per cent. volatile constituents, yield the highest temperature and best thermal efficiencies. The conclusion that coal which gives the most satisfactory results in the calorimeter, because it contains a moderate amount of gaseous constituents, should also give the most satisfactory results in practice under boilers, is confirmed by these studies and by actual extensive experiments.

TABLE NO. 2. ULTIMATE ANALYSES OF MONMOUTHSHIRE BLACK VEIN COALS

	Newport Abercarn	Mynydd	Western Valley
Carbon	84 91	82 91	83.64
Hydrogen	5 33	4 89	4 59
Oxygen	3 27	5 93	7 01
Nitrogen	1 61	1 00	1 06
Sulphur	0.57	1 11	0 71
Ash	4 31	3 12	2 23
B.t.u.	14,454	14,677	14,504
Moisture	0 80	1 04	0 76

Note:—These are hard coals and stand handling well.

TABLE NO. 3. TYPICAL ANALYSES OF SOUTH WALES AND MONMOUTHSHIRE STEAM COALS

	Fixed Carbon	Volatile	Sulphur	Ash	Moisture	B.t.u. (Calculated)
Best Admiralty Steam	83 40	12.20	0 70	2 80	0 90	14,971
Second Quality Welsh Steam	77 20	17 90	0 70	3 00	1 20	15,064
Cardiff Dry Steam	85.50	11 00	0 80	2.00	0 70	14,996
Best Monmouthshire Steam	75 50	20.50	0 80	2 20	1 00	15,197
Second Quality Monmouthshire Steam	72 80	21.20	1 30	3 50	1 20	14,871
Swansea Dry Steam	85 50	10 00	0 90	2 60	1 00	14,812

(Note: Air dried coals, selected analyses)

Professor Constans states, in summing up the results of his experiments, that from a commercial standpoint, especially where freight charges are at all heavy, short flame coals, containing from 16 to 23 per cent. volatile matter, will prove most economical, because it does not pay to transport either ashes or volatile matter that will escape unburnt.

Mining, Preparation, Screening and Loading Conditions

Most of the mines in South Wales are worked on the single or double, room-and-pillar system, modified by local conditions. Every effort is made to get the coal out in as lumpy condition as possible. Wedges are largely used for breaking down the coal, instead of explosives; the hydraulic cartridge is coming into extended use, especially where explosives are prohibited.

The coal is dumped from the mine cars on picking tables and screens, the greatest care being taken to avoid breakage; it is then passed over screens with 1¾-in. openings, that going over screen being the "large" coal, while the portion going through is divided further by screening into the following sizes:

	Inches		Inches
Nuts, through	1¾	over	1⅛
Beans, through	1⅛	over	⅝
Peas, through	⅝	over	⅜
Duff, through	⅜		

At many collieries the small coals are washed, the nuts, beans and peas being sold for steam making or, mixed with large coals, for ships' bunkers and the duff is used in the manufacture of briquettes and coke. As to what we term run-of-mine coal, there is very little shipped or indeed taken from the mine. The British term "thro" and thro'" coal does not have exactly the same meaning as our run-of-mine. "Wro't thro'" coal is our run-of-mine, while nearly all the thro' and thro' coal is made by mixing large and small, at the docks, in proportions to suit the buyer.

It will be seen, therefore, that practically all of the Welsh coal shipped is screened coal. There are three descriptions of large coal, as follows:

Colliery Screened—Screened at the mine only.

Single Screened—Screened once at the mine and also passed over one ¾-in. screen at docks, the latter process taking out about 5 per cent. of the small coal.

Double Screened—Screened at the mine and passed over two ¾-in. screens at the docks, removing about 8 per cent. small coal.

As to difference in price, the "Single Screened" coal averages about 8c. more per ton than "Colliery Screened" and the "Double Screened" 12c. more. The British export statistics show that most of the fuel shipped to countries where we compete is large coal, which, of course, has at least one screening, over 1¾-in. screens.

TABLE NO 4. ANALYSES OF DIFFERENT WALES COALS

	Moisture	Volatile Matter	Fixed Carbon	Ash	Sulphur
Clyne Valley 3-ft Seam	Dry	29 90	65.76	4.34	0 84
Ffrochiven Steam	0.70	10.34	85.74	2 30	0 92
Glanmorwg	1.56	14.52	79 54	4 38	
Great Western Forest Coal	1 16		1 76	0.69	
Cwmnant Graigola Seam		10.04	85.44	3.54	0 98
Pontardulais Smokeless	0 68	11 34	82.48	4.52	0 98
Merthyr Slantwit	0 81	17.72	73.73	7 75	2 41

All of the docks or piers at the Welsh coal-loading ports are equipped with special appliances for loading ships, most of them worked by hydraulic pressure and having various devices for preventing breakage and for screening the coal; nearly all of the hydraulic tips are equipped with anti-breakage boxes. The Lewis-Hunter coaling boxes are considered the most satisfactory, as they not only avoid breakage of the coal, but do away almost entirely with any trimming of cargoes. These boxes are filled with coal (about 12 tons), lowered into the hatchway of the ship and when the desired height is reached, the conical

bottom of the box is allowed to drop, discharging the coal by sliding in four directions. If it is desired to put the coal only on one side of the hold, the conical bottom can be secured by chains for that purpose. There are several other loading devices at the British docks, but all of them have one point in common, the avoidance of any breakage of the coal.* Of course, the speed of loading cannot compare with the records made by the United States piers, but they are able to do good work even along that line, as the following will show:

5279	tons	loaded in	12½	hours
4773	tons	loaded in	10	hours
6715	tons	loaded in	11	hours

A record of 995 tons in one hour by four Lewis-Hunter cranes working one ship.

Welsh Coal Contract Form

This is the form generally used by the larger buyers and sellers of South Wales and Monmouthshire coals, a knowledge of which is essential information for the United States exporter of coal.

TABLE NO. 5. A TYPICAL SERIES OF ULTIMATE AND PROXIMATE ANALYSES OF THE WELSH COALS

The following analyses of Welsh coals are taken from Greenevells "Analyses of British Coals and Cokes", 1907, the method of taking samples being specified in only three instances, as noted; the others are picked mine samples and do not represent the coal as shipped, as is shown by the analyses of Naval Merthyr coal, the mine sample yielding 15,492 B.t.u. and the coal as shipped 15,199.

	Proximate				Ultimate					
Admiralty Coals	Moisture	Carbon	Volatile	Ash	Carbon	Hydrogen	Oxygen	Nitrogen	Sulphur	B.t.u.
Great Western Navigation	1 24	77 99	18 53	3.04	86.48	4 04	3 62	0 88	0.70	14,899*
Corys Merthyr	0 43	84 64	12.36	1 86	89 07	4 42	2 40	1 11	0 71	15,508†
Hills Plymouth Merthyr	1 07			3.97	86 98	4.39	1 72	1 01	0 86	15,190†
Naval Merthyr (Mine Sample)	1.01	80 16	16.37	2.46	88 14	4 58	2 11	1 07	0 63	15,492†
Naval Merthyr (Cargo Sample)	1.04	78 83	16 64	3.49	87 04	4.55	2 19	1 01	0 68	15,197†
Oriental Merthyr	0.91			3.37	86 76	4 76	2 24	1 29	0 67	15,471†
Ynysfario Merthyr	1.22	85 57	11 69	0 99					0 53	15,172*
Coals not on Admiralty List										
Blaendydach	1 20	75.73	19.37	3 01					0 69	15,070*
Yankee Seam	Dry	67 60	30 10	2 30	85.10	5.38	6.09		1 13	15,336†
Clyne Valley 4-ft. Seam	Dry	67 86	29 50	2.64	85.40	5.16	5.62		1 18	15,307†
Aberdare Merthyr	1 25	76 07	18 19	2.93	86.01	4 65	2 61	0 99	1 56	15,193†
Rheola Merthyr	1 31	86 92	7.98	2.78	87 65	4 05	2 21	0 99	1 01	15,085†
Cwmammau Smokeless	0 70	85.57	11 76	1.97					0 52	15,185*
No. 3 Rhondda	1 59	72 10	24.58	1.64	84 93	5 11	4 91	1.08	0 74	15,219*
Phoenix Merthyr	Dry	79 90	16.80	2.50	87 64	4.31	3 30	1 45	0 80	15,444†
Talbot Merthyr	0 83	78 02	18 83	3.15					1 28	15,172*

* Calculated from analysis. † Favre and Silbermann Calorimeter, not used in the United States and giving higher results than the Mahler type

Note: Greenwell states that this collection of analyses "seems to represent mostly samples furnished by the producers" and while in some cases "fairly large quantities of coal" must have been sampled, in others "there can be little doubt that the analyses represent a picked sample.

WELSH COAL CONTRACT

(Generally adopted by the chief purchasers and sellers in South Wales and Monmouthshire)

Memorandum of Agreement entered into at.....this .....day of .....19.. between.....of.....hereinafter called the "Purchasers" and.....called the "Vendors."

1. Quantity—The Purchasers agree to buy and the Vendors agree to sell.....tons of .....Large.....Coal on the following conditions:

2. Delivery—The Purchasers will provide tonnage to take delivery of the coal from the.....to the..... in as nearly as possible equal proportions per calendar month. Such deliveries shall be into ship at one of the following docks: .....as ordered, on application to the Vendors before ship's arrival.

3. Loading—The time for loading to be mutually agreed between the Purchasers and the Vendors when each Vessel is placed on stem, and being subject in the case of steam vessels to the conditions and exceptions of Clauses 2 and 3 of the Chamber of Shipping Welsh Coal Charter, 1896, and in the case of sailing vessels to the Vendors' usual printed form of guarantee. In the event of the Purchasers and Vendors not being able to mutually arrange a stem, the Purchasers shall have the right to place a vessel on stem for the portion of the month's deliveries then due on giving seven days' notice to the Vendors, in which case the Vendors shall be allowed customary hours for loading.

4. Trimming—The Trimming shall be done by Trimmers nominated by the Vendors or their agents, and the Tariff Rates of the Port for Trimming shall be paid to the Vendors by the Purchasers in default of Payment by the Shipowners. The Vendors shall not be responsible for fire, explosion or accident in connection with the Trimming or for any act, default or negligence of the Trimmers or Foremen.

5. Wharfage—The Purchasers undertake to pay to the Vendors or the Dock Company the usual wharfage of 4c. per ton.

6. Quantity and Weight—The Purchasers shall inspect the coal in the wagons on the tip-road at the place of shipment, and any objection to quality or condition shall be raised before shipment, or be deemed to be waived. The returns of weight as ascertained at the Loading Tips by the Dock or Railway Company shall be final and conclusive for all purposes whatsoever.

7. Price—The Purchasers shall pay the Vendors the price of.....per ton for colliery screened coal.....per ton if single screened at time of shipment.....per ton if double screened at time of shipment.

8. Payment—The Purchaser shall make payment as follows:

.....

9. Strikes and Accidents—In the event of a stoppage or partial stoppage of the Vendors' Pits, or any of them, or on the Railway or Railways over which the Vendors' traffic is usually carried between any of the Vendors' Pits and the place of shipment, or at the Dock named as the place of shipment or of a suspension of work by Trimmers or Dock, Railway, or other hands connected with the working, delivery or shipment of the said coal or from any cause whatever, whether or not of the same nature, the Vendors shall not be called upon to deliver any coal during a total stoppage, and in the event of a partial stoppage the Vendor shall be entitled to a reduction in the deliveries proportionate to the reduction in their output. No liability shall attach to the Vendors for any such default of shipment, notwithstanding the fact that during such period coal may have been shipped by them. The time within which the above-named quantities are to be taken and delivered shall be extended for a period at least equal to that during which deliveries are suspended, or as otherwise arranged by mutual agreement.

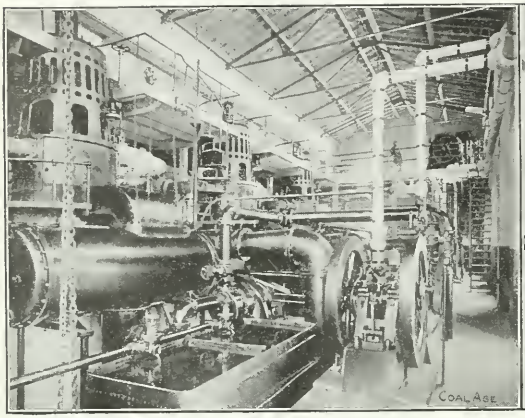
10. Insolvency—In case of any default on the part of the Purchasers in making any payment on the date specified, the Vendors may suspend deliveries until such payment is made, and it shall be at their option whether they will afterward make up any deficiency in deliveries so caused; or if the Purchasers shall have been declared bankrupt, called any meeting of their creditors, or make any acknowledgment that they are unable to pay their debts in full, it shall be at the Vendors' option to consider the contract null and void.

11. Damage for Failure to Take or Deliver—Unless otherwise mutually arranged, Purchasers agree in the event of their failing to charter and stem tonnage to take each month their regular monthly quantity in accordance with the terms of this contract to pay to the Vendors as and for liquidated damages the difference between the current price on the last days of such month and the contract prices on the quantity they have so failed to take, and the Vendors agree that in the event of their declining to accept tonnage to take each month the regular monthly quantity in accordance with the terms of this contract, to pay to the Purchasers as and for liquidated damages the difference between the current price on the last day of such month and the contract price on the quantity for which they have so declined to accept tonnage.

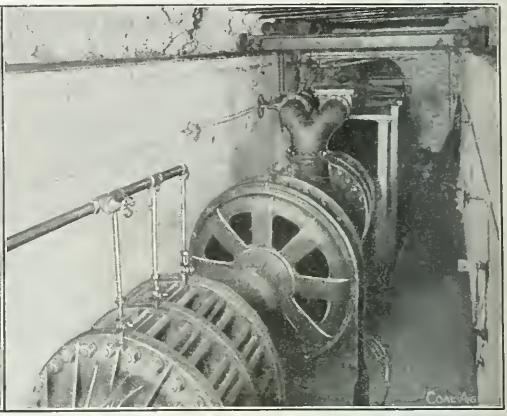
12. War—In the event of the United Kingdom being at war with any European Powers or any prohibition being made by the British Government on the export of Welsh coal, the quantity due for delivery under this contract during the period over which such war or prohibition extends shall be cancelled.

*Some interesting descriptions of English bunkering stations will be found on pages 147, 316, 355 and 364 of Coal Age, Vol. 2.—Editor.

SNAP SHOTS IN COAL MINING

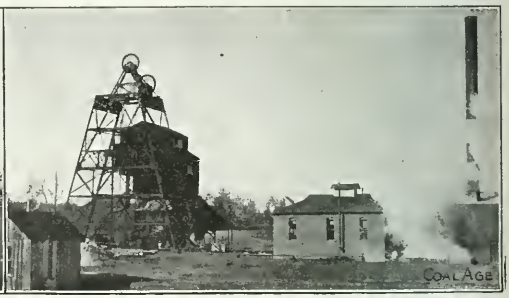


Showing General Electric Steam-turbine Generators in D. L. & W. R.R. Co.'s Nanticoke Power Station

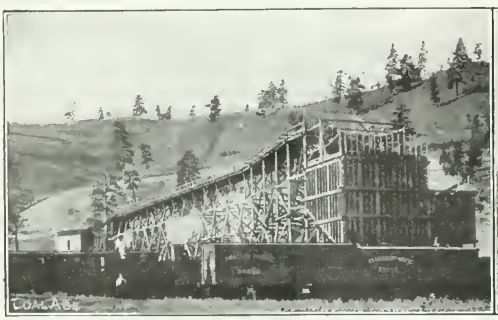


Centrifugal Pump of D. L. & W. R.R. Co. at Hampton Sump, Direct Connected to G. E. Induction Motor

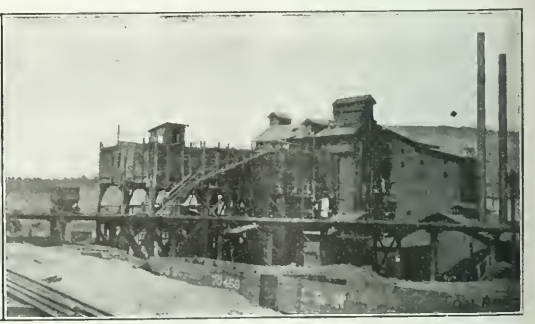
The Store of the Western Coal & Mining Co., at Bush, Ill., Was Destroyed by a Cyclone



Steel Tipple, Engine House and Part of Boiler Plant, Lake Creek Mine, Johnston City, Ill.



Tipple and Trestle Approach, Inland Coal & Coke Co., Merritt, B. C. Located on Canadian Pacific R.R.

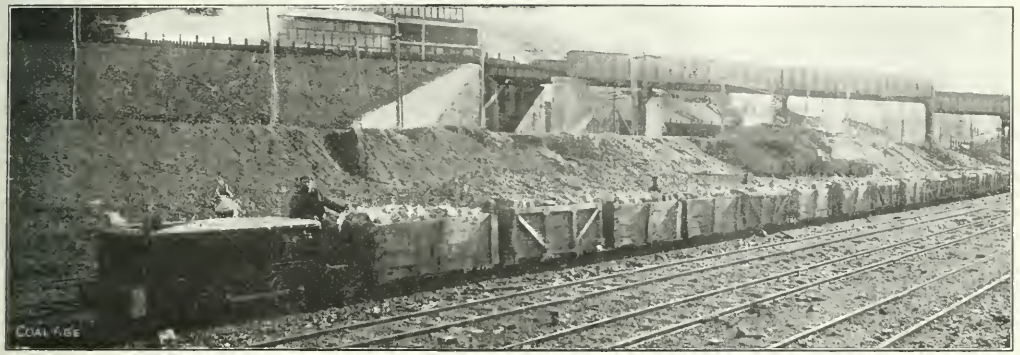


Coal Washery of St. Bernard Mining Co., Earlington, Ky. Only Washery in Western Kentucky Field

A New Gasoline Locomotive

The accompanying illustration shows an 11-ton gasoline locomotive drawing a trip of 18 four-ton cars up a ½ per cent. grade at the Prospect Colliery of the Lehigh Valley Coal Company.

This machine was built by the Vulcan Iron Works, of Wilkes-Barre, Penn. The track gage is 42 in., the wheel base 48 in., the height is 4 ft. and the width is 4 ft. 8 in. The diameter of the driving wheels is 21 in. and the tractive effort is 4000 lb. Operating at 600 r.p.m. the engine will develop 45 hp. while the speed varies from 4 to 8 miles per hour. The machine is equipped with hand-operated brake, and as may be seen in the photograph, is provided with a bell to give warning of approach. When used underground, this bell is dispensed with.



A Vulcan Gasoline Locomotive at the Prospect Colliery, Wilkes-Barre, Penn.

In the present stage of its development there can be no question as to the utility of the locomotive impelled by internal-combustion engines. It must be acknowledged, however, that these machines require a certain amount of skill on the part of the operator in order to obtain the best results, and naturally this can only be acquired through intelligent experience.

The builders of gasoline mine locomotives have all the experience of the automobile designers from which to profit as well as that of the makers of electrically operated haulage motors. They should be able, therefore, to turn out a product which, so far as reliability is concerned, is equal to any present-day automobile or power truck. And, although slight difficulties may be experienced at first in operating such motors, these will rapidly disappear as the driver gains familiarity with the machine.

One Western mine manager who recently installed gasoline locomotives in several of his mines, had serious trouble at first, in securing men of sufficient intelligence and mechanical experience to successfully operate these machines. This trouble was overcome when he secured a number of chauffeurs, who were out of employment in a near-by city, and sent these men to the mines to operate the gasoline locomotives.

⁂

According to actual tests, coals consumed in producer-gas plants develop about 2½ times the power that the same coals would develop in the ordinary steam-boiler plant.

Small Steam Turbines

When running at an economical speed, the small steam turbine is now practically equal in steam economy to the reciprocating engine of equal capacity. Due to the higher speeds employed, less floor space is used. Practically no attention is required, as the only lubricated parts are the main bearings and the governor.

The turbine shaft has a constant turning effort exerted upon it, which makes it desirable in driving small lighting sets, exciters, centrifugal pumps and blowers.

Since there is no inside lubrication, the exhaust steam is free from oil, and, therefore, may be used in an open feed-water heater and returned to the boiler, the efficiency of the thermal process being practically 100 per cent. Due to the absence of mechanical friction in the chamber in which the steam does its work, the parts here do not wear appreciably, and, therefore, the steam economy of the turbine remains practically constant.

⁂

The Mine Mule of Today

[One of our advertisers after reading Mr. Braley's verses on the mine mule, in our Jan. 25 issue, comes back with the following refrain: The effort entitles him to whatever publicity he will get.—Ed.]

That pictures Mr. Mine Mule as he once was long ago,
The poor old sinner had to work, you bet;
But now the modern mine mule, as he works all day below,
Hardly has enough to do to make him sweat.
He's as playful as a kitten and as gentle as a lamb,
And the skinner now is acting like a saint,
And you never hear him cussing—not a single little damn,
All of which may seem a story, but it ain't.

And the cause for all these changes in the labors of the mine,
Which is making Mr. Mine Mule fling his heels,
And which turns the busy skinner to a person near divine,
Is the Hyatt Roller Bearings in the wheels.
And so every day is easy for the skinner and his friend,
And they're looking "like a dividend that's fat,"
And they think that Braley's joking when he carols near the end—
"May he go where all the saintly mules are at."

British Inspector's Report, 1911

SYNOPSIS—An account of some methods of spraying in British mines and of a coal-dust explosion which occurring above ground, could not have been aided by gas. The use of electric hand-lamp lighting is on the increase. The dangers of electric shotfiring with damp detonators are exemplified and a severe outburst resulting in 3 fatalities is described. Some notes follow on the use of ropes to increase the strength of collars and on the flushing of gobs.

Thomas Mottram in his report for the Liverpool and North Wales district of Great Britain says that there are some mines at which steps are now being taken to prevent coal dust from entering the downcast. In some cases the sides of the shafts are to be enclosed between the surface and the landing. In three or four instances the coal dust made in unloading the cage and in dumping and screening the coal is collected by suction.

Tubes connected with the screens at one end suck in the dust by means of an exhauster; and a water-spraying device then douses what is thus collected. The chamber which receives the dust is provided with an outlet for clean air and another for the conduct of the water and dust to a settling tank. By this means a considerable quantity of the surface dust, which would otherwise descend the downcast, is secured and ultimately used for fuel.

Spraying Loads and Empties

Even where this system is in vogue, a considerable amount of dust still descends the downcast, it being blown from the cars in their rapid ascent to the surface. This can be obviated to a considerable extent by spraying the contents of the cars in transit or near the shaft bottom. Where this is done the comparative absence of dust at the bottom of the shaft is quite apparent. The spraying of empty cars at the screens or at some other convenient point on the surface, is also well worthy of consideration.

Portable Spray Tank

Reference is made to a portable spray tank for laying the dust in working places at Pemberton colliery, Wigan.

This 2-gal. device is only 16½x8x5¼ in., and is carried by means of a canvas sling thrown over the shoulders of the operator. It is necessary to fill the tank three times to water each working place—a length of 60 or 90 ft. of floor, roof and sides. The pump empties the tank in 8 to 10 min., according to the speed of rotation of the crank. The diameter of the nozzle is 1½ mm. (1/16 in.). The water is thrown out in a fine spray, and it takes 30 min. to water each working place.

A Coal Dust Explosion Above Ground

It may be interesting in connection with this dust problem to describe a somewhat remarkable coal-dust explosion on the surface, caused by excessive sparking of an electric motor at New Brancepeth colliery. The explosion, to which reference is made by Inspector A. D. Nicholson of the Durham district, took place in the coal-grinding house where a 25-hp. direct-current motor at 500 volts was in use for driving the machinery.

The motor was enclosed but not gas-tight, and stood on a platform about 6 ft. above the ground floor. Owing to the short circuiting of one of the armature coils much sparking resulted and this ignited the coal dust inside the motor casing causing an explosion which produced sufficient force to blow off the sheet-iron covering over the commutator end of the motor.

The flame thus produced was sufficient to explode the fine dust held in suspension within the building and the flame extended 6 ft. outside the open door of the house and for a height of 15 ft. inside. The report was heard some distance away. Some panes of glass were broken, but there was no further damage as the roof, which was partly open, was composed of corrugated iron. Fortunately the engineman was not inside the building at the time. In view of this accident, the company decided to erect the motor outside the crusher house.

Portable Electric vs. Oil Safety Lamps

In the Yorkshire district, 241,382 working people were employed in 1911 and 211,356 safety lamps were in use. A noticeable feature was the increase in the number of portable electric lamps from 69 to 922. With the approval of the late Inspector W. H. Pickering, the management of two mines introduced this type of lamp into the workings.

They give an incomparably better light than the safety lamps and in his view their general use would have the effect of reducing accidents, especially from falls of roof and from haulage. Before agreeing to the introduction of these lamps, however, he drew the attention of the management to the following points:

1. An explosion might occur in an explosive atmosphere (a) if the connection between the battery and filament was broken or (b) if both glasses were shattered.

2. If electric lamps are used, arrangements will have to be made for the periodical testing for firedamp by safety lamps or other means.

3. Objection (a) can be overcome by a proper method of locking the lamp (e.g. by a lead rivet) and a rule requiring that no lamp shall be unlocked and opened except on the surface.

4. The danger that the glass will be broken is far more remote than in the case of an oil safety lamp. It is probable that a shock which would break the outer glass would also break the thin glass of the bulb. The outer glass, however, is stronger than that of an ordinary safety lamp and is better protected. The better light given by the electric lamp enables the miner to set it in a place safe from falls or where tools cannot strike it.

5. The lamp gives such a splendid and clear light that accidents should be greatly reduced wherever these lamps are used.

6. The following conditions should be observed in using these lamps: (a) They should be locked with a lead rivet having a clear device on each face. (b) No lamps should be opened except by an authorized person and on the surface. (c) Arrangements should be made for frequent testing for firedamp by safety lamps or other means. (d) Any man ill-using a lamp, or damaging it, or having

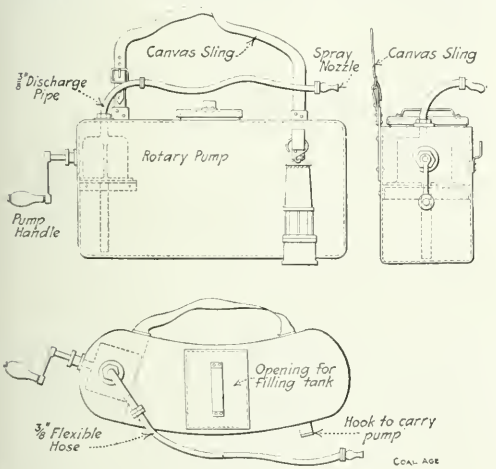
it within two feet of the swing of the tools, should be prosecuted.

Explosion of Shot After Battery is Disconnected

There is a prevalent belief that, when shots are fired by electricity, all danger in returning to a missed or hanging shot is removed if the firing cable has been disconnected from the battery.

Reference to this is made by Inspector Hugh Johnstone of the Midland and Southern district, and he says the fallacy of this idea has been proved on many occasions. One of these delayed ignitions occurred at Snowdon colliery in Kent, where 13 shots charged with Rippite and provided with No. 7 electric low-tension detonators, especially insulated for submarine work, were being fired in the bottom of a shaft then being sunk.

They were coupled together in series and connected up



A Portable Spray Used to Dampen the Ribs in a Room Prior to Shooting Down Coal

to a dynamo which was generating a current of 220 volts. The shots failed to go off and the wires were uncoupled from the cable. Three minutes afterwards, one of the shots in the middle of the series exploded, leaving the other 12 shots intact. The makers of the explosive were questioned about this failure but while they admitted that such occurrences, although rare, were unfortunately not unknown, they were unable to give any conclusive explanation.

Danger of Dampened Fuses

Mr. Johnstone says he has come across quite a number of such occurrences in which shots have exploded an appreciable time after the cable had been disconnected from the exploder and in one case after it had also been disconnected from the fuse wires.

The most feasible explanation appears to him to be that the priming charge in the detonator had become more or less damp and had been ignited but not flashed by the passage of the current. Thus it had smouldered for a time until sufficient heat was developed to fire the fulminate of mercury.

Some years ago Inspector Johnstone experimented with a number of electric powder fuses in which the priming charge had been purposely dampened, and in some cases actually moistened, by exposing them to a jet of wet steam. Although they all failed to fire on the first attempt, by repeatedly passing the current through them, the inspector succeeded in firing even those which had been moistened. It appears to him that the only way to obviate risk of accident is to prohibit any one from returning upon electrically fired hanging shots until at least 15 min. have elapsed.

An Outburst of Gas Dislodges 190 Tons of Coal

An accident of an unusual character, causing the death of three miners, John Peden, George Peden and James Jamieson, occurred at Valleyfield colliery, and is discussed by Inspector W. Walker, who has charge of the Scotland district. The sinking of both shafts had just been completed.

A cage was put in the No. 2 shaft and rapid progress was being made in the work of forming the shaft parting and driving the roadways. The guides were fixed in the No. 1 or downcast shaft, but as the sheaves of the head-frame were being erected, this shaft was not available at the time of the accident. The upcast or No. 2 shaft is 1290 ft. deep and cuts the Five Foot Seam in which the accident occurred at a depth of 1200 ft. Two levels had been turned out of the shaft in this seam, one to the north-west and the other to the south-east.

An outburst of gas occurred at the face of the south-east level in the Five Foot Seam about 300 ft. from the No. 2 shaft, displacing more than 190 tons of coal and the men were overcome and suffocated by it. There were six men on the south-east side of the pit, three in the heading nearest to the shaft and three in the face of the level, the latter being suffocated by the coal displaced by the outburst.

Draft Produced by Ascending Steam

The colliery being new and the fan incomplete, the inspector says ventilation was produced by means of induced draft caused by the discharge of exhaust and live steam into the upcast shaft. This resulted in about 7200 cu.ft. of air per min. travelling the workings and around the South side of the Five Foot Seam. The first heading which is 60 ft. away from the shaft, was 117 ft. up from the level, and the second 120 ft. further in, 60 ft. up. When measured, at 8 a.m. on the day of the accident, the face of the south-east level was 114 ft. from the second heading.

A brick wall 4 in. in thickness had been built on the low side of the road from the upcast shaft to within 10 ft. of the level face and from this point the air was carried forward by ordinary brattice cloth and on leaving the face of the level it was conducted up to the end of each of the headings by the same means. The haulage road was, therefore, the return airway.

The Cause of the Outburst.

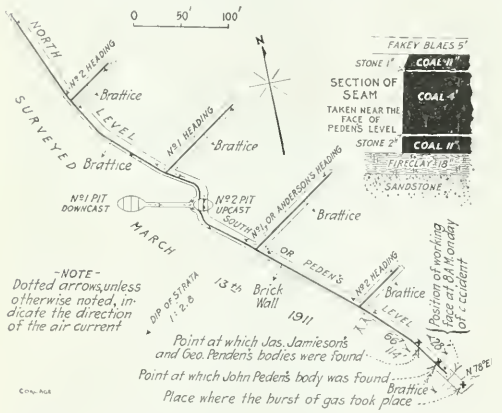
Only the south-east level was affected. At the time of the outburst three men were working in the first or outside heading, none in the second heading and three in the face of the level. When the three last mentioned were found by the rescue party from the surface, George Peden and James Jamieson were facing outby, lying

about 48 ft. back from the face; John Peden was also lying facing downwards, about 20 ft. back from the original end of the level.

All three, being buried under 5 ft. of coal dust, had been smothered, but on removing John Peden's clothes it was found that he was severely blistered, due to his having been close to the face, and having experienced the full effect of the sudden expansion of the gas. When the face of the level was ultimately reached, it was discovered that a small rise fault crossed about 7 ft. in advance of the original position of the end of the heading and that the face of the level had been blown out or advanced for 12 ft. in addition to which a hole, some 30 ft. long and running parallel with the fault, had been formed on the upper side where the seam rises 1 in 1½, whereas at the shaft the inclination is 1 in 2.8. The coal near the fault was burnt, and further back it was sooty and soft.

Precautions to Prevent Outburst Accidents

After the accident the agent undertook that boreholes be kept at least 40 ft. in advance of the faces of the levels



A Fatal Outburst of Gas at a Fault Removing 190 Tons of Coal, Thereby Smothering Three Men

and headings. On one occasion when a borehole of this kind was being drilled, the rods were blown out of the hole and gas at high pressure continued to be given off for some hours.

The holes have frequently been choked with small coal. At times, this slack has been blown out in clouds of fine dust to such an extent that boring had to be discontinued until the gas blew off and the pressure decreased.

To prevent outbursts of this kind, causing loss of life, the inspector thinks it necessary, in addition to boring in advance, to have experienced men, such as firemen in charge, always on the watch for movements in the coal face. Also he advises that the same workmen be kept in such places with orders to retire if there is any sign of the coal working more easily or moving toward them. As soon as a pocket is located the face should be riddled with holes in order to liberate the gas behind it.

Burnt Coal Common in Fifeshire

Burnt coal is often found in the coal mines in Fifeshire. In the deeper measures, it is as a rule close to faults. As he points out, it is caused by the obtrusion of whin (eruptive rock) beds, which appear to have burnt the coal after it was deposited. Through movement of the surrounding strata, small parts of the coal seam have been disintegrated, and thus filled with gas at high pressure.

When the intervening solid coal between the burned area and the face of the workings becomes too weak to resist the pressure, it bursts away and the small coal pours out like running sand. This disintegrated coal containing gas appears to be in local patches.

At Valleyfield, the south-east level appears to have been driven against one of these pockets of gas and disintegrated coal, with the result that upon the face reaching within 7 ft. of the fault, the pressure overcame the resistance of the coal and blew it out with such force that the men had no chance to escape. Safety lamps had been introduced or more men would have been killed, as an explosion of gas would have followed the outburst.

Old Wire Ropes as Roof Supports

Old wire ropes are utilized at a mine in Lanarkshire, in conjunction with timber as aids to the support of the roof on a haulage road.

The seam lies from 24 to 84 ft. below the surface and it is owing to this fact that some difficulty has been experienced in its working. The stratum above the seam, at a depth of 60 to 84 ft., is fakey blaes (laminated blue shale), but nearer the surface, the roof is composed of irregular blaes, boulder and surface clays. In wet weather, owing to its becoming saturated with water, it is difficult to support.

Formerly much timber was used but its life was short and little could be withdrawn or restored. After hearing a paper read by Sam Mavor, before the Mining Institute of Scotland in 1908, describing a method of supporting roofs in Silesia by means of timber strengthened by old ropes, the management decided to give the system a trial. It has been found that not only was the saving of timber and labor considerable, but the roof of the main haulage road was much more efficiently supported. Collars or cross bars which before would have had to be renewed in six months, have already lasted over 3 years.

How the Ropes Are Fastened

The method of fixing the rope to the collars is as follows: The timber is carefully examined, and after it is decided which is the more suitable side on which to place the rope, a small piece of the thick end of the collar is flattened and a small "V" shaped notch is cut in the end of it; the rope is drawn straight and tightened along the under side of the collar to within about 12 in. of the small end, and a staple driven down over the rope to prevent its moving.

The rope being in position is further secured by the addition of staples along its length at intervals of about 20 in. The end of the rope is turned back over the end of the collar and secured on the upper side by means of other staples. The other end of the collar is left unfinished because the length which may be required is not known and the original length may have to be reduced before the collar is used. In this condition the timber is sent down the shaft. The man putting the collar in position finishes the uncompleted end in the same way as

the other, after he finds the exact length which is required.

Great care is necessary in the choice of the rope to see that only the best is used, that there are no broken wires at the time of erection and that it is in such condition that the wires are not likely to break as long as the timber remains in position, as broken wires would be dangerous to persons and animals traveling along the road.

Flushing Gravel

A portion of the Wishaw Coal Co's leasehold at Dalzell and Broomside colliery lies along the banks of the Clyde, and the greater part of the area is covered with a bed of water-bearing gravel.

The main seam, 150 ft. below the surface at this point, has been worked out into pillars known as "stoops" about 60 ft. square. Owing to the danger of rapid subsidence, breakage of the roof and flooding of the workings, a constant menace to those in the deeper seams, the owners were advised by their mining engineer, R. W. Dron, to extract the pillars and fill the waste with "redd" from the refuse heaps on the surface, by means of the flushing system.

The seam in question is 4 ft. thick, and has a strong roof and blaes floor. The dip of the strata is 1 to 8 to the south-west, and fairly regular.

A large heap of washer debris consisting of burnt shale and fireclay was at hand on the surface, and that is probably the best material for flushing, as in the absence of grit the iron pipes carrying the filling materials are not worn. Moreover the fill is not subject to spontaneous combustion.

The pipe line is carried down a borehole to the workings of the main seam; another borehole affords a passageway for the electric cables which supply power to the pump, and a third hole is used for the discharge column which returns the used water to the surface.

The material passes through cast-iron pipes to the working face. There it enters a line of wrought-iron pipe, $\frac{3}{16}$-in. thick, of the same diameter as is used for the main line.

The working face consists of four pillars with the roads between them, amounting in all to a straight line of 260 ft. to the full dip of the strata. This face was at first prepared for the flushing by a rock packwall 30 ft. wide erected on the low end, but since work has been in progress it has been found that little or no pressure falls on the wall and it is now built only about 6 ft. wide.

How the Cars Are Handled

An ingenious method of letting the full cars down the face is in operation. A bogie is attached by a clip to a single rope and passes down the face collecting the cars filled by the miners and lowering them to the haulage road.

Turf as a Fuel

In most parts of the Faroe Islands, turf is still the chief fuel used. In some places, however, coal is preferred, and its use is increasing as the supply of turf is becoming exhausted. Nowadays there is less economy than formerly in burning turf, since coal has become somewhat cheaper, and much time and labor are required to cut the turf and carry it often many miles over rough country to the homes of the people.

An Early Coke Plant

The accompanying illustration shows the surface plant of the Waverly mine of the Pittsburgh Coal Co., located at Smithtown, Penn. In view of the fact that this picture was taken in the year 1877, it is interesting from an historical standpoint. The old type of railroad cars is particularly noticeable. On the left is a train of short gondola cars, such as were used at that time.

The Waverly Plant in 1877

In the foreground, and extending back to the washery is a battery of beehive ovens, which are in the course of erection. In those days this mine was operated by the late Judge Thomas Mellon, of Pittsburgh, Penn., and J. B. Corey, of Braddock, Penn. The waterboy who stands at the right in the picture is J. B. Neel, now employed by the Pittsburgh Coal Co.

Increased Shipments of Australian Coal

The shipments of coal from Newcastle, New South Wales, during the six months ended June 30, 1912, amounted to 2,218,692 tons, valued at $5,603,833, compared with 1,846,633 tons, valued at $4,696,128, for the corresponding period in 1911. The increased shipments were principally to other parts of the Commonwealth and New Zealand. Victoria took 118,000 tons more than during the first six months of 1911, New Zealand 73,000 tons more, South Australia 19,000 tons more, Western Australia 28,000 tons more, and Tasmania and Queensland each about 10,000 tons more. The increase in the foreign trade was 53,877 tons, Chile taking 47,000 tons more and Java doubling its purchases, while the Straits Settlements took 28,000 tons less and the Philippine Islands 45,000 tons less.

Geo. Knox, in a recent article, states that it is difficult to adopt the flushing system in mines where the working operations are far advanced, particularly in those seams where the advancing system of longwall is in use and the shafts are sunk to the dip of the territory. It cannot be applied to newly opened collieries, nor to most collieries where thick seams are worked, either by retreating longwall or room and pillar. The only difficulty in the latter case will be the cost of either driving tunnels or else levels in the upper seam to the rise of the coal to provide fall for the débris [illegible]

CURRENT COAL LITERATURE

How Coal Mining Threatens the Town of Frank

The commission appointed by the Canadian Department of Mines to investigate the prospect of further falls from Turtle Mountain onto the town of Frank, Alta., included Reginald A. Daly, W. G. Miller and Geo. S. Rice. The latter is, of course, mining engineer of the U. S. Bureau of Mines.

Fear of a Second Slide

A slide, occurring on Apr. 29, 1903, killed 70 people in the town of Frank and destroyed much property, including nearly 7000 ft. of the Crows Nest Branch of the Canadian Pacific Ry. Quoting an earlier commission, which reported June 12, 1903, the commissioners say:

In their report, R. G. McConnell and R. W. Brock state that the slide was due, not to a single cause, but to a combination of causes, among which the opening up of large chambers in the mine, situated under the base of the Turtle Mountain, may have been contributory. Speaking of the North peak and shoulder of the mountain overlooking the town, they say "the caving of the rooms in the mine, after the coal has been withdrawn, perhaps long after the inhabitants of the town have lost all dread of another disaster, may precipitate it suddenly in a second destructive slide. Since this possibility must always overhang the town, it certainly seems advisable that it be moved a short distance up the valley beyond the reach of danger."

It appears that all the cross-sections striking the two main peaks of Turtle Mountain show that the slope continuously gets steeper as the peak is approached. The level of the Crows Nest River is 4155, while the North peak of Turtle Mountain is 6911 and the South peak is 7204.

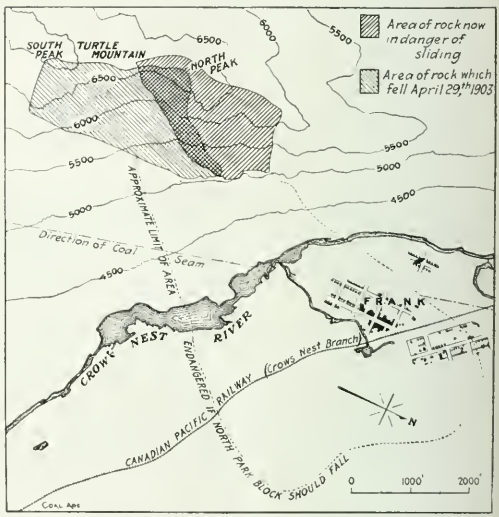
Cannot Slide on Bedding Planes

As will be seen from the cross-section accompanying this article the sloping of the measures is such as to assure that parts of the mountain could not slide into the valley by the slipping of one bed on another because the measures dip in the opposite direction with an extremely marked pitch. But the trouble arises not from the bedding planes, but from the jointing of the measures. These joints are lying at so steep an angle that if they part from any cause such as the weight of the rock, seismic, mining or other disturbances, or from the action of frost, the detached masses will freely slide and even more readily roll down into the valley.

The commissioners state that the rock, constituting the coarse rock débris in the longest talus slope eastward from a point near the South peak, is of such a character that it will rest on an angle of 30 deg. to the horizontal, but if the rock mass begins to move on a surface of that slope it will continue to slide till it reaches the foot of the mountain. That is, its angle of rest is 30 deg.

We have seen that the measures on the mountain are so disposed that they cannot slide into the valley, but if they should be broken by any means at right angles to the plane of bedding, the parts thus broken would be almost sure to be precipitated onto the town below. All that is necessary is that the plane of fracture should lie at 32 deg., or more to the horizontal.

The pieces deprived of their structural connection with the mass of the mountain would be sure to slide over the plane of fracture and descend to the valley. Bearing in mind this outside value for the limiting angle, an



Plan Showing Area of Rock Threatening to Precipitate Itself on the Town of Frank, Alberta, Can., Where a Large Slide Has Already Fallen

inspection will show the large amount of rock which could fall from Turtle Mountain.

The Weakness of Turtle Mountain

If that mountain were composed of homogeneous granite or nonjointed limestone, the foregoing calculation would have no practical value; the strength of such rock would be such as to make absurd any reference to the critical angle above defined in connection with the problem of the mountain's stability. But Turtle Mountain is peculiar in possessing a structure which forbids placing an estimate of an absolutely safe angle for the eastern slope at much greater than 30 or 35 degrees.

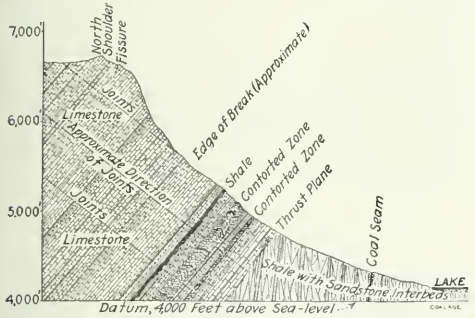
This is not meant to imply that all the rock bounded by slopes greater than about 35 deg. is in danger of sliding before the ordinary processes of erosion have lowered such slopes. Such a danger is remote according to the commission, except in a limited area where structural weakness is combined with steepness of slope in a manner to threaten disaster to the town.

A 3000-ft. Mountain on a Footing of Soft Shale

From the river flat to the lower contact of the limestone (that is, the outcrop of the thrust-plane), the mountain slope is underlain by soft shales, interrupted by coal seams and by some interbeds of sandstone. The whole is an unusually weak mass of rock; yet it forms the basal abutment which is today helping to sustain the heavy limestone forming the upper half of the mountain.

Weak as this lower member is, it might continue to hold up the entire slope if it were not for the inherent weakness of the limestone itself. The latter is composed of rapidly alternating beds of contrasted nature. Some of them are thick, massive and coherent, and, if the whole upper member were constituted of similar material, the chance for a destructive slide in the future would be greatly lessened.

But many other beds are flaggy, easily split along the bedding planes and, therefore, far less strong than the beds just mentioned. On this account alone the average strength of the whole limestone member is much below that of many, and perhaps most, of the great limestone



Cross-section of Measures, Showing Coal Seam, Weak Shale, Contorted Limestone and the Threatening North Peak

formations of British Columbia or Alberta. In addition, the total strength of the member is seriously lessened by the presence of two zones of crumpling within the mass.

These zones are diagrammatically shown in the section. It should be carefully noted that the lower edge of the rock, which fell in April, 1903, coincides with one of these contorted zones. That event actually illustrated the profound weakening of the mountain structure due to their presence. Another source of weakness is found in a band of soft shales, which breaks the continuity of the limestone.

The Limestone Is Full of Wide Joints

However, the chief reasons for concern as regards this matter of rock strength, are the heavy jointing of the limestone and the relation of the joints to the eastern slope of the mountain, the side facing the town. As is so often the case with sedimentary rocks, very abundant joints occurring in several systems are developed nearly or quite perpendicular to the bedding.

The dip of the strata is always westward, and varies from 50 deg. to 65 deg. At the North and South peaks, and for a considerable distance north of the former peak (that is, the part of the mountain opposite the town), the average dip is about 50 deg. to the west. This means that many of the joints mentioned dip directly eastward at an angle of 40 deg. The actual dips of the bedding and joints are almost ideal for the production of great intermittent slides from any mountain as steep as that under consideration.

The joints are thus of profound importance as they so seriously affect the strength of the limestone and, by their attitude, furnish potential slipping planes, which threaten to become sliding surfaces if a heavy jar or a disturbance of the basal abutment should occur. Moreover, the joints are favorable channels for the seepage of ground-water. This tends slowly to enlarge them and also to wet the rock, increasing the danger of sliding *en masse*.

Working Coal Mines a Source of Danger

The commission declares that mining in the coal seams at the foot of the mountain is likely to produce or aid in the production of a slide, thus imperiling the town of Frank and its inhabitants. The only method known to the commission that would insure against appreciable subsidence is that of hydraulic packing with sand.

The settlement, after packing with ordinary sand, is less than 5 per cent.; with granulated slag, settlement is inappreciable, and it would probably be equally imperceptible if sharp, clean sand were used. The use of loam and sandy clay, ashes or crushed shale is less successful, the settlement with such material being from 10 to 15 per cent.

Sand Flushing Not Practical

It does not appear possible to employ sand filling under ordinary commercial conditions in the Turtle Mountain district. There are no large bodies of clean sand at hand. The only available source from which material could be obtained in sufficient quantities would be the sandstone at the base of Bluff (Goat) Mountain. This would have to be quarried, crushed, transported and flushed into the mine. The cost with the high labor rates which prevail in Alberta, plus repairs, renewals and capital charges, would add not less than $1.25 per ton of coal extracted, even if done on a considerable scale. The cost of installing the necessary plant would also be great, so that the system appears commercially impossible under the competitive conditions of coal production in that district.

While the use of dry packing probably lessens the amount of subsidence, the experience with the long-wall method of mining both in America and Europe, where dry packing is employed, indicated that a settlement of 40 to 60 per cent. of the thickness of the seam must be expected. It takes several years to reach the full settlement, but any portion of such contraction might cause disastrous slides.

The only conditions under which mining should be carried on in the danger area above described are: (1) The townsite should be abandoned and compensation for the damage to the property of the Canadian Pacific Ry. assured. (2) The present entrance to No. 1 mine, which is a drift, should be abandoned and the mine should be operated by deep levels from the shaft, or from an opening at the extreme southern end of the property in the vicinity of Hillcrest. (3) Unusually heavy pillars should be left throughout the danger area, particularly in the upper levels, and not more than 50 per cent. of the coal should be extracted. (4) The excavated areas should be packed.

Edison Electric Mine Lamp

The *Engineering and Mining Journal* gives the following account of the Edison mine lamp:

The accompanying illustration shows the general features and the manner of carrying a new safety electric lamp, which is operated by an Edison storage battery of the type for the development of which Mr. Edison was recently awarded the Rathenau medal by the American Museum of Safety.

EDISON ELECTRIC LAMP AND STORAGE BATTERY

The battery is inclosed in a nickeled-steel container, from which the electrolyte cannot escape. It is claimed that the cell cannot be so over-charged, as to injure it, and charging it in the reverse direction, or leaving it in any state of charge or discharge does it no harm.

The cell must be charged, and the electrolyte replenished with distilled water, the electrolyte being changed every nine or ten months. No other attention is needed. The battery is inclosed in a locked case and a flexible cord connects it with the lamp. This cord cannot be disconnected and is covered at both ends by flexible steel armor for a part of its length. Danger of sparking by breaking at the connections is thus avoided.

The lamp itself has a tungsten filament and a parabolic reflector protected by a heavy glass lens, cushioned on gaskets. There is also a hook for attaching the lamp to the cap. The miner cannot get at the lamp without breaking a seal on the reflector.

Pittsburgh Greatest Fuel Consumer

More fuel is consumed in the city of Pittsburgh and its immediate vicinity, and more coal is shipped to and through the Pittsburgh district, than in any other district in the world, according to the U. S. Geological Survey. With a population of about one-ninth of that of Greater New York, the consumption of coal alone in Pittsburgh is nearly equal to that of the much larger city. Greater New York consumed in 1911 approximately 19,000,000 short tons, and Pittsburgh used about 16,500,000 short tons. But Pittsburgh consumes several million tons of coke and considerable quantities of natural gas, which, added to the coal consumption, gives that city a good lead over New York as a fuel consumer.

In the quantity of coal handled the comparisons are still more striking, Pittsburgh's business exceeding that of New York by nearly 50 per cent. In 1911 the total coal traffic in New York Harbor, including the city consumption, the trans-shipments to New England and up-river points, and the bunker and export trade, amounted to approximately 36,000,000 short tons, whereas the coal traffic of Pittsburgh, including rail shipments east and rail and water shipments west, amounted to nearly 53,000,000 tons.

In the total movement of coal to Pittsburgh and points east and west thereof, there was an increase in 1911 of 1,974,795 tons over 1910, all of the increase being in the shipments through or from the district. On account of the depression in the iron and steel trade, the local consumption of coal at Pittsburgh decreased about 1,250,000 tons, or from 15,600,654 tons in 1910, to 14,349,644 tons in 1911. The rail shipments to Pittsburgh decreased about 1,000,000 tons, and the water shipments about 250,000 tons. The decrease in the consumption of coke was, of course, much larger. The movements of coal both east and west, however, showed increases, western shipments increasing from 24,453,581 tons to 25,291,264 tons, all in water shipments to lower Mississippi River points, and eastern shipments, all-rail, increasing from 10,781,544 tons to 13,169,866 tons. The water shipments were the largest since 1907.

Blueprint Rack

The filing and handling of blueprints in a mine office often becomes a troublesome problem. The accompanying illustration, from *Engineering News*, Jan. 23, 1913,

A BLUEPRINT RACK

shows a rack that has proved useful in such cases. The prints are assembled in convenient groups, and bound together with softwood strips, $\frac{1}{4}$x$\frac{1}{4}$ in. in section, fastened by $\frac{3}{16}$x1-in. machine screws and wing nuts.

EDITORIALS

A Bill to Amend the Bituminous Mining Code

A bill of a proposed amendment to Secs. 3, 5 and 6, Art. 19, of the bituminous mining code, of Pennsylvania, has just been received. The bill is to be presented to the next legislature. Practically, it covers two important points, in the bituminous code, relating to the appointment of mine inspectors in the bituminous district of Pennsylvania. We give below the reading of these sections as they appear in the present law, together with the changes contemplated in the amendment. Section 3 reads as follows:

SEC. 3. The qualifications of candidates for the office of inspector shall be certified to the examining board, and shall be as follows:

The candidates shall be citizens of Pennsylvania, of temperate habits, of good repute as men of personal integrity, in good physical condition, and shall be [between the ages of thirty and fifty years: Provided, however, that any inspector appointed under the provisions of the act of May fifteen, one thousand eight hundred and ninety-three or under the provisions of this act, shall be eligible for reappointment, even if beyond fifty years of age, if in good physical condition.] The candidates shall have a knowledge of the different systems of working coal seams, and shall have had at least ten years' practical experience in bituminous mines, five years of which, immediately preceding their examination, shall have been in bituminous mines of this commonwealth, and shall also have had practical experience with explosive gas and other dangerous gases found in coal mines; and, upon examination, shall give evidence of such theoretical as well as practical knowledge and general intelligence respecting mines and mining, and the working and ventilation of mines, as will satisfy the examining board of their capability and fitness for the duties imposed upon inspectors of mines by the provisions of this act.

The amendment to this section proposes to omit the words of the section inclosed in brackets and substitute therefor the words: *"at least thirty years of age."* No other change is suggested in this section.

Section 5, of the present law, reads as follows:

"SEC. 5. The Governor shall, from the names certified to him by the Examining Board, commission one person to be inspector for each district, in pursuance of this act, whose commission shall be for a full term of four years from the fifteenth day of May following the regular examinations. (X) Each inspector appointed under the provisions of the act of May fifteen, one thousand eight hundred and ninety-three, may continue in office until May fifteen, one thousand nine hundred and thirteen.

After the passage of this act, the chief of the Department of Mines shall have the right to assign the inspectors to the districts for which, in his opinion, they are best fitted.

The proposed amendment is to insert at the point marked (*X*) the following: *"Applicants or candidates whose names have been so certified shall be chosen and commissioned in the order of rank of percentage attained at the examination held by the examining board, the higher to be first preferred over those of lower percentage, and, in case of a tie in percentage, the candidate or applicant oldest in point of service shall be preferred."*

No other change is contemplated in this section.

Section 6, of the present law, reads as follows:

"SEC. 6. When a vacancy occurs in said office of inspector, the governor shall commission, for the unexpired term, [from the names on file in the Department of Mines, a person who has received an average of at least ninety per centum. When the number of candidates who have received an average of at least ninety per centum] shall be exhausted, the governor shall cause the aforesaid examining board to meet for a special examination, and examine the persons who may present themselves for examination in accordance with section three of this article, and the board shall certify to the governor, also to the chief of the Department of Mines, the names of all applicants who have made a general average of at least ninety per centum in said examination, as provided for in section four of this article; one of whom shall be (X) commissioned by the governor, according to the provisions of section five of this article, for the office of inspector for the unexpired term. In conducting the said special examination the board shall comply with all the requirements of section three and four of this article."

There are two proposed changes in this section. The first is to substitute for the words inclosed in brackets the following: *"one from those whose names have been certified by the examining board. The choice of the one to be thus commissioned shall be made in the order of the rank of percentage attained by applicants or candidates, at examinations held by the examining board, the higher to be first preferred over those of lower percentage; and, in case of a tie in percentage, the candidate or applicant oldest in point of mining experience shall be preferred. When the number of candidates or applicants, whose names have been certified to the governor and the chief of the Department of Mines by the examining board".*

The second proposed change is to insert at the point marked (*X*) the following: *"chosen in accordance with the rank of percentage attained, at such examination, the higher to be first preferred over those of lower percentage, and, in case of tie in percentage the candidate or applicant oldest in point of mining experience to be preferred, and shall be".*

No other change is contemplated in this section.

* * * *

Referring briefly to these proposed changes, the limitation of "fifty years," provided by the new bituminous law (1911), is a wise safeguard against making eligible for appointment as mine inspectors, men of mature age who have passed the fifty mark and whose habits and opinions have quite generally become fixed. Men of this type, while possessing experience in certain fields and under certain conditions, are often prejudiced in their ideas and convictions. They have, as a rule, passed the age when they can readily adapt themselves to new conditions, which is one of the most important requirements in the qualifications of a mine inspector.

It is very proper, as the present law provides, that any mine inspector who has passed this age limit (50 years) shall be and is still eligible for reappointment to the office he has filled acceptably. His acquaintance with the conditions existing in the mines he is to inspect places him in another class from men who have had no experience as inspectors in the district. We would not, therefore, indorse the proposed amendment of Sec. 3.

The proposed amendments of Secs. 5 and 6 have, each, practically the same purpose in view; namely, to require the appointment by the governor, of that candidate who

has secured the highest percentage in the examination. According to the present law, the governor may appoint, as inspector, any one whose name appears on the certified list furnished him by the examining board.

As claimed by the advocates of this amendment, the present law places the inspector at the mercy of politicians, and has a tendency to make him part of the political machine. In support of the amendment, it is stated that the purpose of the law—the protection of life, health and property—requires that the men appointed to inspect the mines shall be free to perform this work unhampered by any political considerations and without fear of punishment, such as can be administered, by corporations, upon those who oppose their will.

These reasons appeal to the unprejudiced mind as being sound and furnishing sufficient excuse for the proposed amendment of both Secs. 5 and 6. We hope, therefore, that these two sections of the present law will be amended, in this respect.

Self Ignition of Coal

Rabid dogmatism has marked the discussion of spontaneous combustion. The advocates of the theory that iron pyrite or marcasite are the cause of this action have been unsparing of those who favor the belief that oxygenation of the coal substance is the real incendiary.

The promising suggestion and enlightening experiments of H. C. Porter, of the Bureau of Mines, that hydration may be the cause is worthy of careful consideration and he will fortify it if he can show that the coals, most subject to spontaneous ignition, heat more when exposed to hydration than coals which are not so subject.

This, M. Taffanel has shown, is true to a large degree for oxygenation. The coals of Liévin, Béthune and Lens containing 29, 14 and 12 per cent. of volatile matter respectively, on an ash-free analysis, absorbed at 60 deg., 2.90, 1.35 and 1.12 c.c. of oxygen per gram of coal. However, the coal from Nœux with 20 per cent. of volatile matter absorbed less oxygen than any of the others.

We wish to submit a working hypothesis for the consideration of our readers. It is based partly on the fact that the heat of combustion of the coal as an organic unit is almost identical with the heat which would result from the burning of its elements, omitting all that hydrogen from the calculation which may be considered as combined with oxygen to form hydrates or moisture. This fact suggests that if coal could be dissociated, the sum of the heats of the resulting chemical actions would be zero, the dissociation producing a number of calories equal to those which it absorbs.

If it be fair to argue on this basis, we must be convinced that the chemical dissociating actions which produce heat must be considerable. We know that some of the hydrocarbons will generate heat in breaking up, but whether any of them will produce enough to create the balance to which we have referred is at least doubtful.

We are inclined, therefore, to regard as significant the fact that sulphur and nitrogen are found in larger proportions in those types of coal which ignite spontaneously and that they are also components of compounds which create much heat on dissociation. It seems to take much energy to make sulphur or nitrogen mate with carbon; conversely their separation produces much heat.

The heat resulting from dissociation of a pound of cyanogen is 2273 B.t.u. and of hydrocyanic acid 1831. This assures us that at least some compounds of carbon and nitrogen are able to give out much heat on dissociation. The compounds of carbon with sulphur are perhaps fairly represented by carbon disulphide which on dissociation surrenders 1062 B.t.u. per gram of the liquid.

But these are compounds, which may not be found in coal, at least, in chemical freedom. They may be expected to be present in combination with other radicles. Most representative of the class of bodies, likely to be thus found in coal which has not been subjected to much heat, is oil of mustard, a truly organic body, $C_3H_5.NCS$, containing 826 B.t.u. per pound of the liquid. If 3 per cent. of sulphur in the coal were combined as oil of sulphur, the whole body of that compound would represent 9.3 per cent. of the mass of the coal. In many coals 3 per cent. is sulphur which is neither in a sulphate nor in a metallic sulphide and this sulphur probably forms compounds analogous to the oil we are discussing.

It is true that the oil of mustard itself is probably not to be found in coal, nor yet are any of the compounds mentioned, but it is certain that other hydrocarbons combined with sulphur and nitrogen are to be found and thermochemical inference suggests that they might be equally heat-giving on breaking up to simpler forms. Moreover, experience favors the suggestion that the sulphur, at least, will be ready to break loose from its union with organic bodies.

Hence we have suggested a chemical action which is probably most active in coals still in formation, and which is independent of oxygen. Such an action can take place in the heart of a coal pile and here it is that spontaneous combustion commences. But we do not explain by this hypothesis why coal is most subject to this action after it has been exposed to the air nor are we able to show why hydration increases the heat of the coal mass. But these are not sufficient objections to our assumption.

It is likely that hydration, dissociation and the oxygenation both of coal and pyrite all do their part and may help one another. The taking of the coal from the hill, not only oxidizes it, but removes the water which apparently is in chemical union with the coal, for otherwise its reunion would hardly be accompanied with so much heat.

This oxidizing and dehydration may possibly aid in the breaking up of the original compounds in the coal. In fact, there are reasons for thinking dehydration is more effective in American coals than oxidation because coals left in the mine, subject only to the latter, rarely take fire. Their desiccation is prevented by the subterranean moisture.

Educating the Coal User

When we recall that the early anthracite coal producer expended his money to find some means of burning anthracite in a stove, when we note with what ability the Standard Oil Co. has taken over the oiling of cars and engines, when we pass exhibitions of the gas companies in the big cities striving to show how light and heat can be more economically obtained from gas than from electricity or coal respectively, we wonder why the operator having a waste grade to sell, tries to make the market accept it only by a price differential.

SOCIOLOGICAL DEPARTMENT

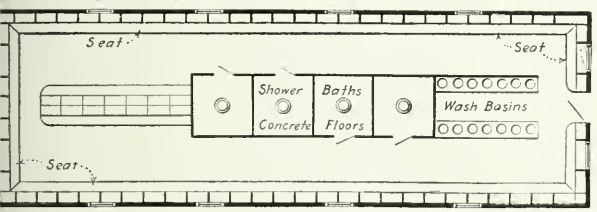
A Kentucky Bathhouse

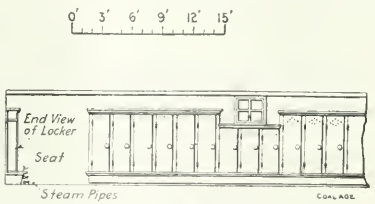
SPECIAL CORRESPONDENCE

The bathhouse for the use of coal miners is not an innoation. In the older mining communities it is as much part of the equipment of the modern mine as the tipple, he machine shop and the power plant, but in Kentucky, nd especially in the mountain district, it is not often to e found.

The Stearns Coal & Lumber Co., when it attempted o improve the condition of its miners, by erecting a washhouse" for their use, did so with some misgivings. t is rather a delicate subject to approach, to suggest that ny man would feel better if he had a bath once a day, nd miners, as a class, are sensitive, especially when it the "company" which does the suggesting.

The first experiment, for it was so considered, was at line No. 4, which employs about 200 men. A simple ooden building was constructed, with 60 lockers, four owers and about a dozen basins, over which were hotnd cold-water faucets. It was heated by a stove, and ectric lighted. The water was piped from a reservoir nd heated by an old portable boiler.





THE BATHHOUSE BUILT BY THE STEARNS COAL & LUMBER CO. AT NO. 10 MINE

The problem of maintaining the bathhouse was a erious one, for an attendant night and day was required. t was solved by charging all who used a locker 50c. er month, and all other employees at the mine 25c. per ionth "whether they needed a bath or not." There was onsiderable opposition to this at first, but the miners soon ealized the advantages and were willing to pay for them. s the arrangement stands, the "company" furnishes the uilding, equipment, water, light and fuel, and the minrs pay the other running expenses. This means of mainnance seems based on sound business principles. Luxries that cost nothing are not usually appreciated.

NINETY PER CENT. OF THE EMPLOYEES PETITION FOR A BATHHOUSE

In a short time the miners at No. 10, a larger mine beonging to the above company, sent a petition, signed by o less than 90 per cent. of their number, asking for a athhouse on similar terms. The plan shown herewith ill give an idea of the one which was constructed in nswer to their request.

It is larger than that at mine No. 4, containing 100 ockers. It has four showers with concrete floors. It is steam heated and is lighted by electricity. No lockers are placed over others and all are of such height as will receive a full suit of clothes without folding. Holes are bored in the doors for ventilation. A motor-driven pump and a 10,000-gal. tank provide water during continued dry weather; at other times water will be piped from hill-side springs.

Possibly the principal beneficiary of the miner's bathhouse is the housewife; but the miner derives much comfort from it, since it permits him to leave his working clothes at the mine, where they belong, and appear on trains, in the office, at the commissary and at home in apparel befitting the well-to-do workman.

Prizes for Efficiency

The Corona Coal Co. and H. B. Swoope & Co., who operate 10 mines in Clearfield County, near Madera, on the Pennsylvania and New York Central & Hudson River railroads, recently initiated a scheme for increasing the efficiency of their employees by the giving of prizes to those who showed themselves willing to do good service. The tonnage of the combined mines is about 500,000 tons per annum.

They promise to give, about Apr. 1, fifty cash prizes, and the awards will be made by a committee to consist of the general manager, mine superintendent, engineer and mine foremen. The prizes will run from $1 to $20 and the time to be considered in the award commenced Nov. 18, 1912, and extends to the time of distributing the prizes. All employees, regardless of where they may work, are eligible for a prize, except the members of the committee. However, the mine foremen receive extra pay for the above mentioned period if they make a good record.

OPEN TO ALL EMPLOYEES

Without limiting the nature of services for which rewards will be made, the general manager has outlined certain possible conditions which will find favor with the committee. A miner who works faithfully every day if possible and loads as much coal when the company needs it as he reasonably can and always tries to keep his coal clean, and who endeavors to help out the mine foreman by getting him miners and in other ways, will be a suitable recipient for one of these prizes.

A cutter and his scraper who systematically keep their places cut, and who see that there is somebody to replace them if they have to be away, will be favorably considered by the committee in the making of awards. A driver who works hard and uses good judgment, making as many trips as possible, who takes good care of his mules and encourages the men whose coal he hauls, who suggests improvement in the method of hauling or gathering coal, and who helps to get miners when they are scarce, will be in line for an award of merit.

Encouragement to Work Overtime

An employee on the tipple who keeps the tipple floor clean, who helps the motorman or driver to get away quickly with his trip, who loads out a railroad car after hours so that it will not stand over, who watches for the dirty coal and hustles for the company's interest, will be remembered when the distribution of prizes is made.

Motormen, trip riders, and team drivers who make an early start in the morning and a good tonnage each hour, remembering to be careful at the same time, who get in an extra trip now and then, and who are not afraid of an extra trip in the evening, particularly if needed to finish the end of a railroad car when cars are scarce, or any other employee in the boiler house, blacksmith's shop, on the road, or in the barn, who keeps the work moving will probably be rewarded for his activities in the interest of the company.

In short, 50 cash prizes will be given to the 50 men in the employ of these two companies who are of the most value to the corporations between Nov. 18 and Apr. 1. It will be interesting to see what effect this award will have on the efficiency of the employees. It is openly admitted that it is based on the practices in vogue in the Pennsylvania R.R. and the U. S. Steel Corporation. However, it is not necessary to point out that there are certain important differences in the character of the aims.

Precautions Taken by the Frick Co.

By Thomas W. Dawson*

To warn the enginemen, machinists and others, the following notice is posted: "Employees working around engines, moving or revolving machinery, shafts, etc., are warned of the danger, and are prohibited from wearing torn clothing, loose or unbuttoned jackets, blouses, shirts, long neckties and loose sleeves. Always wear the overall jacket, tucked in the trousers or under the overall bib. Never forget to examine your clothing before commencing work." There is also the sign, "Stop this machine before oiling, wiping or repairing."

By way of safety devices, there are safety guards for all smith-shop equipment, saws, lathes, emery wheels, gears, belts, pulleys, shafting and all wood- and steel-working machinery; a locking device for handwheels on valves; safety lock for electric switches; guards for water gages; concealed setscrews; safety gaskets to be inserted in steam blowoff and feed-water connections when cleaning and repairing boilers; safety-locking device for self-dumping cages; safety chucks for drill-press spindles; safety chuck for engine lathes; safety lock for belt shifter, guards for governors and governor pulley wheels; spark arrester for charging locomotives; soap lubrication for air compressors; wagon guard and dumping platform for swing-gate mine wagons; spooling device for tail rope on haulages; stiles or protected crossings over rope and sheaves where necessary for men to pass; improved safety catch for cages; device for positively rectifying wagon catches on car hauls; self-closing hinges for shaft gates; steel gallery and runway over boilers; protecting railing of all kinds around the revolving and moving parts of all machinery, and around drum pits, sumps, waste-heat flues, etc.; safety platform for operation of electric larries; extra cages ready to replace shaft cages for use in case of accident; rubber matting around all switchboards and electrical machinery; and printed rules and regulations for the proper care of all moving parts.

"Do Not Touch" signs are used about electricity, indicating the voltage of the current; and "Do Not Pass Under" signs will be found at such places where there is danger in passing underneath structures.

Notices Underground

When coal is hoisted, you will see a sign in large letters indicating the maximum load which may be placed on the cage, and the gross weight which that rope will support. The standard signals for the hoisting and lowering of cages or trips, and the number of men permitted to ride on a cage at one time, are indicated by signs having large letters, placed at the most convenient points for observation.

We have steel doors to drop over shafts which have wood headframes or coal bins above them, in case these wood structures catch fire; pits for reception of blowoff pipes from boilers, to prevent accidents to anyone who might be passing during their blowing off; and "drags" or "dogs" on the rear end of all trips hoisted on inclines or slopes.

A thorough search is made of one man or more of each cage load which is lowered into a mine generating gas, to discover matches or smoker's articles. All safety lamps are inspected thoroughly at the lamp house each morning immediately before they are given to the employees.

(To be continued in an early issue)

Winners of Victor American Fuel Co.'s Silver Cup at Gibson, N. M. From Left to Right: Dr. J. W. Stover, R. W. Dennard, T. Kuzniar, J. Kacer, and F. Kuzniar. Subjects, V. Komenda and P. McDermott

*Assistant chief engineer, H. C. Frick Coke Co., Scottdale, Penn.

Note—Abstract from paper entitled "Welfare, H. C. Frick Coke Co.," read before the winter meeting of the Coal Mining Institute of America, Dec. 18, 1912. Continued from our issue of Jan. 25, 154.

DISCUSSION BY READERS

Reducing Ventilation When Firing

Letter No. 9—I have been much interested in the discussions on reducing ventilation in mines at firing time. It seems to me that it would not be right to stop the fan or reduce the ventilation when firing in a mine that is making any gas at all, for at least two good reasons: 1. The continued flow of gas into the mine would soon produce a dangerous atmosphere if the fan were to be stopped or the ventilation checked. 2. The gases produced by the firing of a large quantity of powder, at the working face, must be diluted and swept away by a sufficient current of air, which must be kept traveling.

In the use of dynamite, it often happens that one or more sticks of the charge do not explode; but, being ignited, burn with a blaze. In the use of black powder, much the same result is often produced by a shot blowing its tamping, and much of the powder being thrown out and burning in the air. These occurrences often produce an explosion, if the atmosphere in the mine is not sufficiently diluted with good, pure air. To avoid these occurrences a competent man should inspect all shots before they are fired.

THOMAS R. PIERCE.

Scranton, Penn.

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Letter No. 10—I have followed closely all that has been written in COAL AGE, on the subject of reducing or shutting off the air when firing in mines, and from my own experience, strengthened by the opinions and experiences of some old-time shotfirers, I am convinced that it is safer to fire shots in the mine with the fan stopped, or at least with slack ventilation, than with a strong air current.

I have noticed that a "windy shot" seldom occurs in the first rooms on a long entry where the air is generally poor and there is much room for expansion and plenty of cooling surface. But, as we shoot the rooms in regular order and approach the face of the entry, the space becomes more contracted and the ventilation stronger. In finishing up, at the head of the entry, it is often necessary to light 5 or 6 shots together. These may not all explode at once, but follow each other in quick succession. In this close confined space, the gases produced by the burning of so much powder and distilled from the coal and the fine dust thrown into the air, combine to make a highly explosive atmosphere, which is often ignited by one of the shots, producing what is called a "windy shot," or perhaps a small local explosion.

It is my opinion that if there were no air current here these gases would not explode. Gas will not burn without a certain admixture of air or oxygen. In the absence of sufficient air, flame quickly dies out. This would greatly shorten the range of flame, in blasting, and limit the amount of destruction should a windy shot occur.

It would not be necessary to stop the fan or slow it down, at the time of firing. In order to reduce the ventilation in an entry we are about to shoot, all that is necessary is to short-circuit the air by setting open the door at the mouth of the entry, or at a point outside of where the firing begins. This will leave the section we are about to shoot unventilated and accomplish the same purpose as stopping the fan. Such a question as this I think is worthy of the attention of the Federal Bureau of Mines and should be thrashed out at the Pittsburgh experiment station.

R. J. PICKETT.

Shelburn, Ind.

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Letter No. 11—It has been generally admitted that firing shots against a high-water gage is dangerous, but to what extent has never been thoroughly settled. The opportunities for studying the problem are limited and we must therefore depend largely on theory.

In considering the question of reducing the ventilation in a mine at firing time, in its practical bearing, and ignoring for the time the possible effect of a high water gage or pressure, we must first ask: Are shots fired in absolutely still air dangerous and, if so, why? Personally, I maintain that in the majority of cases they are dangerous and the danger is greater in a gassy mine.

The argument in favor of shooting in still air appears to be that if the ventilation is stopped there will not be enough available oxygen to support an explosion if one should start. But, let us see if such is really the case. For example, say the day shift in a mine goes off at 4 p.m. and the shotfirers going down an hour later stop the fan. Allowing them time to get to the nearest working face, perhaps an hour will elapse from the time of stopping the fan until firing of shots begins. No change could take place in the atomspheric conditions, in this time, that would warrant our saying that an explosion could not occur, the fan having been stopped? In mines generating no gas the condition of the air is practically unchanged, except for a slight reduction in pressure, owing to there being no circulation. The oxygen content of the air has not been appreciably diminished by any chemical action, in so short a time. There is, then, but one difference; namely, the air is at rest instead of in motion and there is no ventilating pressure.

Let it be assumed that this condition exists in a mine that is dry and dusty, and that three shots are fired in the face, by fuse. What will be the result? It is practically impossible for a shortfirer to cut the fuses so that these shots will explode at the same time, but they will probably follow each other in quick succession. The first shot will cause a rush of air and dust away from the face, which will probably react or rebound about the time another shot goes off; and this may be repeated, each shot throwing more dust into the air, which soon becomes thoroughly dust-laden. If, now, one of the shots happens to be overcharged and blows its tamping, producing considerable flame, the resulting conditions are ripe for a dust explosion. Such an explosion, feeding on the oxygen of the air, will seek the lines of least resistance, regardless of whether the air is still or in motion.

I believe it is unnecessary to discuss this question, in respect to mines making much gas, for the state mining laws generally prohibit the firing of shots in the presence of firedamp, which would be sure to be present in any mine making gas.

I would like to ask what mine foreman, in charge of a mine generating large quantities of gas, would dare to stop his fan for 30 min. or an hour before the shortfirers go into the mine. It would be necessary to make an examination of each place before firing a shot therein, in order to make sure that no gas had accumulated while the fan was stopped. I think few, if any, firebosses would try such a caper. One would be liable to lose his certificate, in almost any state, if he did.

Ventilation in the mines may, of course, be carried to an unreasonable extent. A strong air current may increase the tendency of the air to rush back, after a windy shot; but if a given amount of air is required, at the working face, to dilute the inflammable gases generated, the same amount or more must certainly be kept in circulation during firing time when a deficiency of oxygen would result in producing a larger amount of inflammable gas (CO) from the explosion of the powder.

The more logical thing to do is to insist on rigid shot inspection; mine the coal wherever possible; and use permissible powders, with an electrical firing system operated from the surface. If this is done it will make little difference whether the air is still or moving.

As long as coal is shot by black powder and the holes are charged as some miners see fit, with no regard to the position or depth of the hole, there will be a good chance of explosion, no matter what steps are taken in regard to the ventilation of the mine.

O. G. Sharrer.

Hanna, Wyo.

The Bellevue Mine Explosion

Referring again to the discussion of the cause of the second explosion at Bellevue, Alberta, Canada, which occurred Dec. 9, 1910, I have been hoping that there would be a further discussion of the important questions involved and which have been referred to in the Stirling-Cadman discussion, Coal Age, Oct. 5, p. 457; and my own letter, Nov. 2, p. 617.

The verdict of the jury reads in substance as follows:

> We do upon our oath say that 30 men came to their death by carbon-monoxide poisoning, and one by a combination of carbon-monoxide poisoning and a fractured skull caused by a cave of rock in chutes Nos. 76 and 78.

This evidence was based on the percussive theory as advanced by James Ashworth, mining engineer, who was called by the government to give expert evidence on this disaster. The question arises as to whether a fall of roof rock, without an explosion of gas and dust, or either, in a coal mine, could generate heat sufficient to coke the dust so as to form minute globules of coke, char the timber, blow out stoppings and do other damage, besides generating large volumes of afterdamp containing carbon monoxide. According to the expert evidence given by Mr. Ashworth, all of these effects were caused by the percussive effect produced by the heavy cave of roof rock in the chutes mentioned.

If we understand correctly, Mr. Ashworth discards the ignition of a possible accumulation of firedamp or a cloud of dust by sparks from the falling rock, and ascribes all to the percussive effect produced on the mine air by the fall of roof; assuming that the compression of the air in the mine was sufficient to generate the heat necessary for the effects just named.

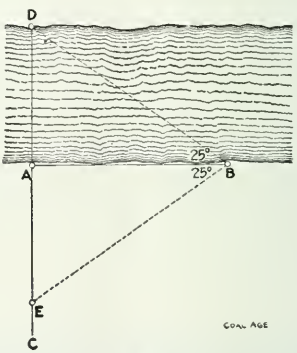
Others claimed that a body of gas and more or less dust was ignited by sparks, given out by the roof rock striking the iron chutes or in the grinding action of the roof as it fell. The discussion of these possible causes has created much interest among miners and mining men in general, throughout the Crow's Nest Pass; and we would gladly see the question further discussed.

J. W. Powell,
Mine Manager, Columbia Coal & Coke Co.
Coalmont, B. C., Canada.

Surveying Methods

Referring to the question of Mine Surveyor, Coal Age, Jan. 18, p. 113, I would like to suggest another method that has served my purpose on several occasions. This method is a very convenient one to use in a level country, although it could not be applied, in many cases, where the country is rugged and there is not sufficient room to extend the line. It possesses the advantage that it requires no technical knowledge on the part of the surveyor, or any calculation.

The method is as follows: Referring to the accompanying figure, set up the transit at *A*, on the edge of the



Simple Method of Measuring across a River

stream, and sight the telescope on some well defined object *D*, on the other side of the river. Then plunge the telescope and extend the line *DA* to *C*.

Now, deflect 90 deg. from the line *DC*, and locate a point *B* so that the line *AB* is at right angles to the line *DC*. It is not necessary to measure the distance *AB*, which can be any convenient distance. Set up the instrument at *B*, sight the point *A*; and, having first set the vernier at zero, deflect the telescope to *D*, and read the vernier. Now, sight again to *A*, with the vernier set at zero, and turn off the angle *ABE*, equal to the angle *ABD* just measured. In the figure, these angles are marked 25 deg., but may be any other angle. The point *E* must be located on the line *AC*. The distance *AE* will then be equal to the required distance *AD*; and this distance *AE* can be measured with the tape or chain.

Carbon, W. Va. Emil F. Hocke.

EXAMINATION QUESTIONS

Ventilation

(Answered by Request)

Ques.—A certain fan, at a certain mine, produces 65,000 cu.ft. of air per min., when running at 40 r.p.m.; what volume of air will this fan produce at the same mine when running at a speed of 55 r.p.m.?

Ans.—For the same power applied and the same conditions in the mine, the volume of air produced is, practically, proportional to the speed of the fan. In other words, the quantity ratio is equal to the speed ratio, therefore, calling the required volume of air x,

$$\frac{x}{65{,}000} = \frac{55}{40} = \frac{11}{8}$$

$$x = \frac{11}{8} \times 65{,}000 = 89{,}375, \text{ say } 90{,}000 \text{ cu.ft. per min.}$$

In practice, the increase of quantity is in a slightly less ratio than that of the speed. For example, the fifth power of the quantity ratio is equal to the fourth power of the speed ratio. Thus,

$$\left(\frac{x}{65{,}000}\right)^5 = \left(\frac{11}{8}\right)^4 = 1.375^4$$

$$x = 65{,}000 \sqrt[5]{1.375^4}$$

$$x = 65{,}000 \times 1.29 = 83{,}850 \text{ cu.ft. per min.}$$

Ques.—If 70,000 cu.ft. of air is passing through a fan drift per min., under a water gage of 2.1 in., what is the horsepower on the air?

Ans.—The horsepower on the air or the effective horsepower is

$$H = \frac{Qp}{33{,}000} = \frac{70{,}000\ (5.2 \times 2.1)}{33{,}000} = 23.16 \text{ hp.}$$

Ques.—If a certain power is passing 30,000 cu.ft. of air per min., in an airway 6x6 ft., what would be the size of a similar airway that will pass 40,000 cu.ft. per min., under the same power, assuming the airways are of equal length.

Ans.—In similar airways of equal length, for the same power on the air, the fifth powers of similar sides bear the same ratio to each other as the cubes of the quantities of air in circulation. In other words, the fifth power of the side ratio is equal to the cube of the quantity ratio. Therefore, calling the side of the required airway x, we have,

$$\left(\frac{x}{6}\right)^5 = \left(\frac{40{,}000}{30{,}000}\right)^3 = \left(\frac{4}{3}\right)^3 = \frac{64}{27} = 2.37$$

$$x = 6 \sqrt[5]{2.37} = 6 \times 1.188 = 7.128 \text{ ft.}$$

The size of the required airway is, therefore, 7.128×7.128 ft. The sectional area of this airway is $7.128 \times 7.128 = 50.8$ sq.ft.

Ques.—A current of 25,000 cu.ft. of air is split so that it travels in three airways subject to a common pressure. The size and length of the airways are as follows: Split A, 6x9 ft., 2100 ft. long; split B, 6x10 ft., 2400 ft. long; split C, 4x10 ft., 9000 ft. long. How will this quantity of air divide between these three splits if no regulators are employed?

Ans.—The area, perimeter and length of each of these airways are as follows:

A, $a = 6 \times 9 = 54$ sq.ft.; $o = 2\ (6 + 9) = 30$ ft.; $l = 2100$ ft.
B, $a = 6 \times 10 = 60$ sq.ft.; $o = 2\ (6 + 10) = 32$ ft.; $l = 2400$ ft.
C, $a = 4 \times 10 = 40$ sq.ft.; $o = 2\ (4 + 10) = 28$ ft.; $l = 9000$ ft.

Reduced, the lowest relative values are as follows:

A, $a = 27$; $o = 15$; $l = 7$
B, $a = 30$; $o = 16$; $l = 8$
C, $a = 20$; $o = 14$; $l = 30$

The relative split potentials are now found by substituting these relative values in the expression for potential,

$$N = a \sqrt{\frac{a}{lo}}$$

as follows:

A, $27 \sqrt{\frac{27}{7 \times 15}} = 27 \sqrt{\frac{9}{35}} = 27 \sqrt{0.2571} = 13.690$

B, $30 \sqrt{\frac{30}{8 \times 16}} = 30 \sqrt{\frac{15}{64}} = 30 \sqrt{0.2344} = 14.524$

C, $20 \sqrt{\frac{20}{30 \times 14}} = 20 \sqrt{\frac{1}{21}} = 20 \sqrt{0.0476} = 4.363$

Sum of potentials 32.577

The quantity of air passing in each split is proportional to the split potential, and is found as follows:

A, $Q_a = \frac{13.690}{32.577} \times 25{,}000 = 10{,}500$ cu.ft. per min.

B, $Q_b = \frac{14.524}{32.577} \times 25{,}000 = 11{,}150$ cu.ft. per min.

C, $Q_c = \frac{4.363}{32.577} \times 25{,}000 = 3{,}350$ cu.ft. per min.

Total . . . . . 25,000 cu.ft. per min.

Mensuration

Ques.—(a) What is the volume of a conical tank 8 ft. in diameter at the top, 9 ft. in diameter at the bottom and 10 ft. high? (b) How many gallons of water will this tank hold?

Ans.—(a) Calling the large diameter D, the small diameter d, and the height h, the volume of the tank is found by the following formula:

$$Vol. = \frac{0.7854\ h}{3} \times \frac{D^3 - d^3}{D - d}$$

Substituting the given values, the volume of the tank, in this case, is

$$Vol. = \frac{0.7854 \times 10}{3} \times \frac{9^3 - 8^3}{9 - 8} = 2.618\ (729 - 512)$$

$$= 2.618 \times 217 = 568.1 \text{ cu.ft.}$$

(b) The capacity of this tank in gallons is found as follows:

$$\frac{568.1 \times 1728}{231} = \text{say } 4250 \text{ gal.}$$

COAL AND COKE NEWS

Washington, D. C.

A statement made upon what appears to be good authority among Democratic members of Congress is to the effect that coal which is now dutiable under the Payne-Aldrich law will, in the forthcoming tariff reform measure, be shifted to the free list. The hearings before the committee are now finished, although briefs relating to various items are still being received.

Coal producers have not made any vigorous arguments before the committee recognizing as they apparently do the disposition to abolish the present rates, in the interest of the consumer and thereby to afford such relief as transportation conditions would permit.

It is the expressed view of Democrats that the coal section in the Canadian reciprocity bill for which practically all Democrats voted clearly committed the party to the idea of free trade in coal. They do not think that general free trade in this commodity would be more injurious to the domestic miner than free trade with Canada would have been, and while the Canadian bill did not provide for absolute free trade with that country in this item it did take a decisive step in that direction.

Another feature of the situation which has received considerable attention is the fact that the duties on various classes of manufactures are being materially cut and that under those conditions Congress ought to relieve the manufacturer of such increase in price as the coal duty necessitates. This is supposed to be particularly important to manufacturers in the Northwest.

An Important Decision

The Interstate Commerce Commission has rendered an important decision in the Louisville & Nashville coal and coke rates case. This proceeding involved the reasonableness of proposed increases on coal and coke from mines east of Middlesboro, Ky. It was sought to advance the rates on coal to the Ohio River and points south thereof 25c. per ton while the advance on coke was 30c. per ton north of the Ohio River. The Commission now finds that the defendants (the railroads) have not succeeded in establishing the reasonableness of the new rate and, therefore, the tariffs are ordered withdrawn, the present rates being continued. Incidentally the commission expresses some interesting opinions on methods of discussing the rate question and gives the following useful summary of this important controversy:

Briefly summed up the record shows, among other things, the following: (1) That the Louisville & Nashville encouraged in every proper manner the development of the mines and ovens in the St. Charles and Appalachia districts, assisting those operators in establishing a market north of the Ohio River; (2) That the present rates have been in effect nearly ten years and the advance contemplated will probably exclude the Virginia operators from the northern territory; (3) That the cost to the Louisville & Nashville for transporting coal and coke via Cincinnati is not fairly representative of the cost via that route because of substantial expenditures incident to improvements under way; (4) That via Louisville the cost to the Louisville & Nashville is materially less than via Cincinnati; (5) That according to the Louisville & Nashville's figures the cost to it equals or exceeds its revenue, while according to the commission's figures the cost is only from 71 to 82 per cents. of the revenue; (6) That these costs include all costs except return upon income account, the out-of-pocket cost being, therefore, even at the Louisville & Nashville's figures, about 60 per cent. of its revenue; (7) That the Louisville & Nashville system as a whole is prosperous, that its Cumberland Valley division as a whole is prosperous, that the portion of the Cumberland Valley division east of Middlesboro shows either a profit or a loss dependent upon the method used in the assignment of cost and revenue; (8) That the eastern half of the Cumberland Valley division is more expensive per unit of freight to operate than the western half because for ten years it has remained practically unimproved and a much more economic line could be secured from Wassiota to Appalachia; (9) That while joint rates are under investigation all of the cost and revenue figures relate only to the movement to the Ohio River; (10) That the freight traffic manager of the Louisville & Nashville admits that his road seems to have been "trimmed" by the northern lines in the matter of divisions; and (11) that beyond a few categorical answers there is no testimony tending to show the reasonableness of the increased joint rates in their entirely.

Under all the circumstances our conclusion is that the burden cast by law upon defendants to show the reasonableness of the increased rates has not been sustained and that such rates should not be allowed to become effective. We are further of opinion and find that the present rates are reasonable and should be continued for a period of two years. An order in accordance with these findings will be issued.

Look for Higher Anthracite Prices

According to reports that are being received by government officials engaged in the investigation of the coal situation, materially higher prices for anthracite coal are to be expected in the near future, unless there should be a reduction in freight rates tending to offset them. As to future demand it is apparently positively assured while, according to information received by the bureau of mines production is about reaching its maximum capacity—a point from which it is certain shortly to recede. This prospect in connection with coal prices is likely to be seriously discussed in connection with the reports to Congress regarding the coal situation that are now in process of preparation.

PENNSYLVANIA

Anthracite

Scranton—It was announced here, Feb. 3, that following a meeting of the directors held in New York, the Erie Railroad Co. has divorced all relations with its coal holdings. Henceforth they will be operated as two separate corporations. The headquarters of the coal department, now located in New York, will be removed to Dunmore, where the offices of the Pennsylvania Coal Co. are now located. F. D. Underwood, president of the Erie, retires as president of all the coal companies that are subsidiary to it. He is succeeded by Captain W. A. May, vice-president and general manager of the coal companies.

Treverton—Treverton and Shamokin locals of the United Mine Workers have adopted resolutions to work on days that colliery employees, who are killed, are buried and to give the widow $150. If a breaker boy is killed, the parents will receive $50.

Taylor—As a part of the campaign that has been waged for months in the interest of a 100% organization of mine workers throughout the anthracite field, about 6500 employees of the Lackawanna Coal Co., at eight of its collieries in Scranton and Taylor, quit Feb. 1. They refused to work with nonunion men, engineers being included in this list, the miners insisting that they should belong to the organization.

Pottsville—Two large collieries of the Reading Coal Mining Co. are crippled as a result of the strike of 2200 of their men. The reason is said to be that certain of the employees refused to wear union buttons.

Bituminous

Connellsville—A scarcity of labor has been serious in the eastern Tennessee field since the holidays and, as a consequence, the car supply in that section is exceptionally good. The full output is not being loaded at any of the mines.

It is said that many miners in the Tennessee-Kentucky field left that region shortly before Christmas, owing to the scarcity of cars and the consequent slack work and came to the Connellsville region.

Greensburg—The U. S. Weather Bureau is notifying mine owners throughout the country that it will inform them, if they so desire, of the times when it would be advisable to take extra precautions to prevent explosions and mine disasters. The weather bureau declares that when there is a marked fall in atmospheric pressure the chances for mine explosions are greatly increased.

Carrolltown—Mine Inspector Monteith is conducting an investigation into the explosion in mine No. 25, of the Pennsylvania Coal & Coke Corporation, in which Ferdinand Behe and Paul Steffus, both of this place, were killed, Jan. 23.

WEST VIRGINIA

Bluefield—The visit of D. A. Thomas, head of the Cambrian Syndicate, and one of the most prominent men in the coal trade, has aroused much interest and discussion among coal men here as well as elsewhere. Those who are in a position to know best believe that the interests represented by Mr. Thomas are about to take over the ownership of a considerable portion of the New River-Pocahontas coal fields and that the deal, whatever it is, is already consummated.

Boomer—A vigorous membership campaign has been waged during the past month by the Boomer local of the United Mine Workers. As a result the membership roll has been increased by 3500. At Boomer from 8000 to 10,000 miners are employed in the various mines, who have never had any trouble with the Kanawaha Coal Operators' Association. The union believes that if the Paint and Cabin Creek sections were unionized, the operators in those districts would have no trouble.

Charleston—Delegate W. W. Wertz, of Kanawha, has introduced a bill in the House, changing the present system of privately-employed guards, and prescribing the appointment of special police by the governor.

ALABAMA

Birmingham—A number of the largest coal operators in the district have announced wage increases effective in the near future. Included in these are the Tennessee Coal, Iron & R.R. Co., Pratt Consolidated Coal Co., Alabama Fuel & Iron Co., Eldorado Coal Co., Little Cahaba Coal Co., Blocton Cahaba Coal Co., and others.

The properties of the Southern Iron & Steel o., bankrupt, were sold on Jan. 31 to the bondholders who will reorganize under the name of the Standard Steel Co. James Bowron, trustee of the bankrupt concern, will be president of the new company.

TENNESSEE

Knoxville—Kentucky operators are interested in the mee ing of the Southern Appalachian Coal Operators' Association, which is to be held Feb. 11, at Knoxville. Several addresses of unusual interest are on the program, among them, probably one by Dr. Joseph A. Holmes, of Washington, D. C., head of the U. S. Bureau of Mines.

The association, while an organization now only in its third year, numbers among its members operators who expect during the current calendar year to mine between six and seven million tons of coal, which is much the largest tonnage it has ever enrolled before.

KENTUCKY

Louisville—The slowness of the domestic demand has given rise during the current season to somewhat extensive resort on the part of some operators to the practice of consigning unsold coal to the various markets to their own account. An agent is sent on to sell it or some dealer handles it for them, and, in event of failure to accomplish this, the coal is thrown on the market as demurrage coal. The practice is often followed by tieing up of railroad equipment for an unduly long time, and the demoralization of the market.

OHIO

St. Clairsville—Fully 3000 men are out of work as the result of the car shortage. Mines which have box-car loaders are able to operate in full; on the other hand, few mines in Belmont County which cannot load box cars are operating in full. The shortage of flats and gondolas on the railroads has reached a climax during the past two weeks.

Bridgeport—President John Moore, of the Ohio Mine Workers, has arrived to take up the strike of the 400 miners at the Crescent mine of the Lorain Coal & Dock Co. The miners claimed that they were being cheated by the scales. Mr. Moore will also look into other strikes in Belmont County, involving 1500 men.

Coshocton—At a recent meeting of the board of trade of Coshocton, strong resolutions were adopted opposing the proposed anti-screen law, pending in the Ohio General Assembly. It is said that the law, if enacted, would be "inimical to the best public interests of our community."

The resolutions call attention to the fact that Professor Edward Orton, of the department of geology of the Ohio State University, is opposed to the bill.

INDIANA

Terre Haute—On account of high waters, 450 miners are idle in the Clinton field. The Chicago & Eastern Illinois R.R. has been compelled to abandon its mine trains and the men will be compelled to remain idle until the water subsides.

The entire area of the great coal fields west of this city is covered with water.

ILLINOIS

Lincoln—Two miners were killed, two injured and 34 had a narrow escape from being buried alive recently by a huge fall of slate at the Latham mine, near Lincoln.

Benton—The strike of the miners at the Benton Coal Co.'s mine here, which lasted for over a week, ended when the charter of the Miners' Local was revoked by the state organization. The strike was caused by the coal company fining the employees for refusing to work one day in December last, and the miners' state officials upheld the mining company.

COLORADO

Boulder—The House of Representatives has adopted the Ardourel resolution calling for the appointment of a joint committee from both branches of the legislature to investigate the labor conditions in the north Colorado coal fields. The resolution now awaits the action of the senate.

FOREIGN NEWS

England—English coal trade is extremely unsettled, owing to the fact that it is feared that the miners will cease operations in March.

Alaska—Officials of the Department of the Interior were at Anna, Ill., Jan. 25, to investigate the Hartline coal claims in the Controller Bay region of Alaska. They are in the same section as the Cunningham claims, the title to which has been invalidated by that department.

PERSONALS

H. L. Findlay has been appointed general sales manager of the Youghiogheny & Ohio Coal Co., Cleveland, Ohio, to take effect Feb. 1.

F. R. Wadleigh has opened an office at 1013 Bank of Commerce Building, Norfolk, Va., as consulting engineer. He will specialize on mining reports, purchase and use of railway fuel, coal markets, both here and abroad, handling and analysis of fuel. Mr. Wadleigh has had a rather unusual experience in certain branches of the coal industry, which places him in a position to speak authoritatively on these.

BOOK REVIEW

SIXTEENTH BIENNIAL REPORT OF STATE MINE INSPECTORS TO THE GOVERNOR OF THE STATE OF IOWA. 110 pp., including index; 6x9 in. Cloth bound.

There are only three mines using mules and these are all in Appanoose County. Iowa is one of the safest mining districts in the United States. There are few which can show an accident rate lower than 1.85 per thousand men employed, as Iowa did in the year ending June 30, 1912. The year before, the loss was 2.13. The best record was in 1905, when it was 1.4, and the worst in 1902, when it was 4.2.

The mines are for the most part small. For the first fiscal year of the two considered, only 242 mines were working; the tonnage was 7,729,674, or about 32,000 tons to each mine, that is about 125 tons per day. In the second fiscal year, the number of mines working increased to 260, and the tonnage fell to 6,820,828, but the mines were idle for 60 days, owing to a strike, and after that the work was quite slow for a whole month.

This report covers the coal-mining industry in Iowa for the two years ending June 30, 1912. Marked features in Iowa mines are the frequent use of longwall and the rare use of mules. Laboriously totaling the record, we find that 90 mines have longwall workings and 190 are worked on the room-and-pillar system. The former method of mining is used in eleven counties, well scattered over the state, and of these Appanoose is the chief, 38 mines being worked by longwall in that county and 34 having rooms and pillars.

GOB FIRES, ETC., MET WITH IN COAL MINES. By Arthur Brealey. Certificated mine manager. 55 pp., 5¾x8¾, 5 ill. Chronicle Printing & Publishing Co., Ltd. Leatherette boards. 1912. Price, 1s.

This pamphlet makes no great pretensions, and this fact makes us little disposed to criticise it severely. It is written in a somewhat disjointed and obscure style, does not contain anything which is at once new and true, and contains quite a few misstatements.

We miss many interesting and valuable features of gob-fire fighting. There is, for instance, no reference to the

French method of mudding coal to extinguish fires. There is no discussion as to the best method of approaching a mine fire, nor is anything said about using animals to guard against carbon-monoxide poisoning. The author has nothing to say about drowning the fire with carbonic or sulphuric dioxide.

He believes that an exhausting fan is to be avoided, because it draws gas out of the coal and says that "if a piece of coal is inclosed in a vacuum, a high temperature can be procured very quickly, thus assimulating it to coal left in the gob and inclosed in a space containing a warm atmosphere, the oxygen being used by the coal absorbing it and also by the surrounding strata producing a warm atmosphere similar to that of a vacuum." It is obvious that had we quoted this at the head of the review, no further criticism would have been necessary.

For instance, we read "Water will boil in a vacuum at 67 deg. F." After this statement, which, by the way, places the temperature too high, the author states inconsequentially that "the above facts show that any substance will burn at a very low temperature if the air pressure be sufficiently reduced." This is neither true nor apropos of anything which precedes. We are not surprised, therefore, to find that the author is capable of announcing that the expansion of the gases on the fall of the barometer "causes a rise of the temperature of the goaves."

CONSTRUCTION NEWS

Danville, Ill.—The new mine of the Bunsen Coal Co. will be located ½ mile west of this city. The company has over 25,000 acres of land in this vicinity. Clay Lynch, formerly of the Connellsville region, is general manager.

Johnstown, Penn.—M. Sheeley & Sons, the well known contractors, have landed the contract for 1900 ft. of tunnel work and a lot of shaft work at a mine being opened by the Loyalhanna Coal Co., in Shade Township, Somerset County.

Youngstown, Ohio—The Republic Iron & Steel Co. will build a new coking plant on 15 acres purchased between the Canfield branch of the Pennsylvania R.R. and the Lake Erie & Eastern right-of-way. The plant will have a 1000-ton capacity.

Somerset, Penn.—The Quemahoning Creek Coal Co. is rushing work on a new opening at their operations at Harrison. It is expected that when this second opening has been completed the number of men as well as the output will be trebled.

Bessemer, Ala.—A large sum of money will be expended this year by the Tennessee Coal & Iron Co. in developing the mines at Potter, on Red Mountain. Several hundred miners will be employed at this mine when working with a full force and full time.

Washington, Penn.—The opening up and development of untouched coal fields of Washington and Greene Counties is forecast in the report that the Pennsylvania R.R. is at work preparing to make an extension of its lines from northern Washington County south into Greene County. It is likely that work will be begun on the new extension within a few months.

Connellsville, Penn.—The contract for the boiler house to be erected at Trotter works of the H. C. Frick Coke Co. is to be let this month. The structure is to be of brick, steel and concrete, and to have a length of 118 ft., with ends 43 and 75 ft. wide. The height is to be 35 ft.

The new structure is to be built over the old one without stopping operations in the latter.

Connellsville, Penn.—Two contracts have been awarded for new coke-oven plants in this section. One plant of 100 ovens is to be built in the Ligonier Valley, on 300 acres of upper Connellsville coal land.

The other will consist of 200 ovens, to be built near Du Bois, Penn., by the Sykesville Coke Co. The ovens are to be of the rectangular type with mechanical pushers. The plans for this plant have been completed and it is to be built this summer.

St. Louis, Mo.—According to dispatches from New York, a syndicate has been formed to build byproduct coke plants in different portions of the country. These plants are to use adjacent coals for coking them. It is proposed to build plants suitable for different localities, and no special type of oven will be used.

The concern will establish one plant at St. Louis, with an annual coal consumption of over 400,000 tons. Another, at Newark Bay, N. J., will have an annual consumption of 200,000 tons.

Charleroi, Penn.—Contracts are to be awarded in a short time for important extensions to the little coal road owned by the Pittsburgh Coal Co., known as the Montour railroad, which will connect that road with the Bessemer & Lake Erie R.R., near Homestead. In all, 40 miles of new road will be built. Cost, $4,000,000.

Kosmosdale, Ky.—The St. Bernard Mining Co., one of the largest of the western Kentucky operators, has just closed a five-year contract for the full supply of the Kosmos Portland Cement Co., of Kosmosdale, Ky. The company's requirements average about 3000 tons a month. A former five-year contract between the two companies has just expired.

NEW INCORPORATIONS

Cincinnati, Ohio—The C. G. Blake Coal Co.; to change its name to the C. C. Blake Co.

Arvonia, Va.—National Slate Corporation; capital stock, $25,000; to develop slate property.

Hamilton, Ohio—The Hamilton-Otto Coke Co.; capital stock, $700,000. Incorporators: J. C. Thomas and others.

Richmond, Va.—Maryland Coal Corporation; increased capital from $250,000 to $600,000 for continued development of its properties.

Spokane, Wash.—British Columbia Coal Co.; capital stock, $500,000. Incorporators: Henry Rising, managing editor of the "Spokane Chronicle," and J. H. Tilsley.

Cambridge, Ohio—The Economic Coal Co.; capital stock, $10,000; to deal in coal and coke. Incorporators: C. B. McCoy, J. L. Secrest, J. A. Thrasher, Homer Witten and F. W. Tobin.

Cleveland, Ohio—The Albert E. Ward Coal Co.; capital stock, $5000; to mine and deal in coal. Incorporators: Albert E. Ward, C. V. Ward, M. W. Shetter, Fred J. Axel, and J. Stacel.

Cushing, Okla.—The W. T. Fields Oil, Gas, Coal & Investment Co.; capital stock, $25,000. Incorporators: W. T. Fields, Guthrie; William W. Cuthbertson, El Reno and Pete Hanraty, McAlester.

Salt Lake City, Utah—Thomas Knox Coal Co.; capital stock, $10,000; shares $100 each. A. R. Thomas, president; Athol Rawlins, vice-president; George S. Knox, secretary and treasurer.

Fairmont, W. Va.—Milan Coal & Coke Co.; to develop coal lands in Harts Creek district, of Lincoln County, West Virginia; capital stock, $100,000. Incorporators: Milan N. Glumicich, Julius Hoffman, Marvin L. Linn, Thomas W. Powell and Richard Hoffman, all of Fairmont, W. Va.

Clarksburg, W. Va.—Francois Coal & Coke Co.; to develop coal lands, manufacture lumber, coke, and drill for oil and gas in Harrison County, West Virginia; capital stock, $100,000. Incorporators: V. E. Gocke, J. M. Francois, J. C. Williams, E. J. Francois and E. L. Spraker, all of Clarksburg, W. Va.

Roundup, Mont.—Articles of incorporation were filed Jan. 9 by the McCleary Coal Co., which will have a capitalization of $500,000. V. C. McCleary is secretary. Active work will be started on a spur which will be built from the main line of the Milwaukee, up Carpenter Creek to the mine, a distance of about five miles. Work will also be started at the mine early in the spring, and they expect to be able to load 300 tons of coal daily.

INDUSTRIAL NEWS

Rivesville, W. Va.—According to reports, active preparations are being made to develop the Pittsburgh seam, along the western side of the Monongahela River.

Plains, Penn.—M. J. Healey has concluded negotiations for the transfer of his interests in the Stark holdings, recently purchased by the Madeira Hill Co., to that concern.

Fairmont, W. Va.—The National Consolidated Coal Co. will develop a large tract of coal in Barbour County, West Virginia. It is proposed to erect coke ovens and enter that trade as well.

Cleveland, Ohio—The largest purely gravity coal-handling plant in this city is now in practically complete operation at

the yards of the Cuyahoga Coal Co. The bins have a capacity of 3000 tons.

San Francisco, Calif.—The Taylor-Wharton Iron & Steel Co. announce that they have moved their Western sales office from 203 Mills Building, San Francisco, Calif., to 504 Newhouse Building, Salt Lake City, Utah.

Prescott, Iowa—An 8-in. seam of bituminous coal has been struck during the past week at a depth of 104 ft. The drillers are still going down in the hope that they will strike the second seam which they believe to be close.

Connellsville, Penn.—The mines of the Latrobe-Connellsville Coke Co., near Latrobe, are partially flooded from old workings which take surface drainage. The company has found it necessary to order a pump installed in the mine.

Morgantown, Ky.—G. L. Drury, J. A. Watkins, C. E. Sullivan and J. C. Haney, of Union County, Ky., have purchased the West Aberdeen Coal Co.'s property and are now repairing the mines with a view to putting them in operation.

Lovington, Ill.—Up to last week the Lovington mine has been taking on new men almost every day, until the entire works are now nearly full. All told, the company has now employed about 145 men. They are hoisting from 500 to 700 tons of coal a day.

Washington, Ind.—Judge Ogden has appointed John Dosch, a real-estate dealer, as receiver of the Riverside Coal Co., owning one of the largest mines in this section. The receivership was brought about by trouble existing between the miners and operators.

Pittsburg, Kan.—State Mine Inspector Leon Bessen has ordered mine No. 6 of the Dixie Coal Co. to be closed down, owing to the failure of the company to make certain alteration in the equipment. The mine is the largest in the district and employs 300 men.

Waynesburg, Penn.—E. F. Baily has just completed the sale of 1000 acres of coal located in Braxton County, West Virginia, to some Greene County business men. The sale included both the Pittsburgh and Freeport seams. The consideration has not been made public.

Whitesburg, Ky.—It is announced that an eastern syndicate has purchased the Sam J. Wright and John Osborne tracts of coal and mineral land near that city, consisting of about 1200 acres. Early development is planned, in connection with which a four-mile branch will be built.

Middlesboro, Ky.—It is reported that a company composed of West Virginia mining men has obtained control of the Mary Moore coal property in that vicinity, which has been idle for some time, and will shortly reopen the mines for operation. Ray Moss, of Middlesboro, will act as manager for the company.

Camden, Ark.— A fluid extracted from lignite coal, which is mined near here, is being successfully used for tanning purposes. The discovery was made by Dr. Geo. W. Kimball, who has offered to sell his patent to the Morris Packing Co., for $20,000, with the stipulation that the company install a tanning plant here.

Sycamore, Kan.—A 5-ft. bed of anthracite coal has been discovered by a test drill, 7 miles from Independence. Experts declare that the coal is first class in quality. The anthracite coal was struck at a depth of 800 ft. Additional ore drills have been ordered to test the field further and ascertain its extent.

Fairmont, W. Va.—The holdings of the Southwestern Coal Co., consisting of 8000 acres of land, are to be transferred to the Excelsior-West Virginia Colliery Co., which has just been incorporated with a capital stock of $2,000,000. The land will be developed at once. The principal offices of the company will be in this city.

Fayetteville, W. Va.—The Marsh Fork Splint & Gas Coal Co. began loading coal from their new mine, near Jarrolds Valley, a few weeks ago. They are just out of the strike zone, the men seem well satisfied and indications bid fair to make this one of the most important operations in this section of the country.

Norfolk, Va.—The Norfolk & Western has just placed an order for 40 more Mallet locomotives and 2250 cars while the Virginian is now receiving the 7000 coal cars ordered last fall and the delivery of the 2000 cars ordered by the Chesapeake & Ohio will soon begin. The ordering of the additional equipment is assurance that the railroads look for a most prosperous coal year in both domestic and export business.

St. Louis, Mo.—James Campbell, a local capitalist, and others, are reported organizing a company, with capital $5,000,000, to build byproduct coke plants in various cities, including St. Louis. The local plant, it is proposed, shall have a capacity of 1000 tons of coal per day, with plans that will permit expansion. Everything pertaining to the proposed corporation as yet is somewhat indefinite.

Birmingham, Ala.—Between four hundred and five hundred men will be put to work Monday in the Searles mines, Tuscoloosa County. Harry Coffin, trustee of the Alabama Consolidated Coal & Iron Co., with permission of Referee in Bankruptcy Dryer, has made a contract with the Tennessee Coal, Iron & Railway Co. for 1000 tons of coal daily. The coal will be used in making coke at Corey.

Fairmont, W. Va.—Filing of 87 coal deeds with the county clerk brought a big coal deal to light recently. Eighty-six of these deeds conveyed various parcels of the Sewickley or Mapletown coal vein underlying parcels of land in Paw Paw, Lincoln and Fairmont districts to the Southwestern Coal Co. from the individual owners, and the other conveyed the tract from the Southwestern company to E. H. Thompson, of Chicago. It is said the coal would not be worked, but was bought by Mr. Thompson as an investment.

Waynesburg, Penn.—E. F. Bailey, of Cumberland Township, has just completed a sale of 1000 acres of coal, situated in Braxton County, W. Va., to a party of business men in the eastern part of the county. The coal comprises the Pittsburgh and Freeport veins. Since Greene County coal is passing into the hands of operators, the eyes of investors are being turned toward West Virginia, where coal may still be had at prices which may double themselves in a short time if the present rate of advancement is maintained.

Chicago, Ill.—The Link-Belt Co., of Philadelphia and Chicago, designers and manufacturers of coal-tipple equipments and other conveying machinery, announce that hereafter the contract work in the West Virginia and Virginia coal fields will be in charge of their engineer, F. F. Waechter, replacing A. Kauffman, who has been transferred to the Chicago plant.

Mr. Waechter has been in the company's employ for the last 15 years, having spent a great part of his time in the engineering department, where he held the position of chief draftsman. The last two years he has spent in the sales department. This combination of experience fits him admirably for his new duties in the coal field.

Pittsburgh, Penn.—Orenstein-Arthur Koppel Co., general offices, Machesney Building, Pittsburgh, Penn.; works, Koppel, Penn., advise that their general manager, A. Reiche, is now in Berlin, Germany, where the head office of this company is located, in consultation with the executive officials regarding the extensive improvements to be made during the coming year at their American plant, Koppel, Penn. It is of interest to know that the entire executive department of the American organization, which is now located in the Machesney Building, in Pittsburgh, is to be moved to their plant, at Koppel. They are having a new office building erected, which will be two stories high, and will cover a plot 100x160 ft. This shows the tendency of the larger manufacturers toward avoiding the heavy expense of the rents in cities and getting closer to their mechanical and operating departments.

Development of the telephone

The telephone, though but a bit over 37 years of age, and therefore still young, has probably developed more in that short time than any of its humanity-helping contemporaries. In fact, writers have termed the development of the telephone a "romance of science." The story of this romance has been put forward in what is perhaps the most understandable and, at the same time, the most interesting way, in the exhibit of historical and modern telephone apparatus and electrical supplies recently inaugurated at New York by the Western Electric Co. The exhibit is in three sections.

The historical section shows the development of the telephone from its earliest stages up to the present time. The smoked-glass records of sound waves, made by Alexander Graham Bell, in 1874, using the human ear as a transmitting diaphragm, and thus proving that diaphragms would transmit sound waves; parts of Bell's original telephone of 1876, mounted to make a complete model, and numerous instruments showing the gradual improvement in design, are exhibited to great advantage in large glass cabinets with placards, giving a description of each article. Included in the historical collection, which is composed partly of apparatus loaned by the American Telephone & Telegraph Co., and partly of the Western Electric apparatus, are the switchboard used by Mr. Bell in opening the New York-Chicago line in 1892, and the receivers and transmitters used at the opening of the New York-Denver line in 1911.

The modern apparatus section contains switchboards, magneto and central battery, each switchboard having wired to it a number of telephone sets, so that service demonstrations may be made to visitors.

COAL TRADE REVIEWS

GENERAL REVIEW

It is generally conceded by all that the hard-coal trade has passed the high point for the season, and is now definitely on the decline. Premium coals have almost entirely disappeared and concessions on various sizes are being freely offered. Some operators are attempting to enforce restrictions as to allotments of various sizes, but consumers are showing an independence of any such regulation on their orders. Middlemen who contracted heavily at high prices over February are being forced to sell at liberal concessions below contract prices.

There is a general slump apparent in the Eastern coastwise trade. Shippers are pressed by cars standing in the yards, with the result that they are eager to make sales, and it is evident that there will have to be a curtailment in mining, or the trade will shortly be demoralized. Only a few contracts are being closed; prices are off, and the trade is finding it difficult to contract as buyers appear confident that quotations will ultimately reach the low level of last year. Consumers of Pittsburgh coal are, as a rule, taking full allotments on their contracts, although some are asking for curtailment in shipments; spot prices are down to the contract level, and operators are actively seeking business. The car and labor supply are sufficient to meet all requirements, but mining is only under a moderate pressure. Ordinarily, such a winter as the present one would make the marketing of coal difficult if not impossible, and Eastern dealers generally are surprised at the ease with which the heavy tonnages are being moved; however, prices are weak and unsteady, and operators are finding it difficult to contract.

The Ohio market is showing more strength but is still far from normal for this period. Domestic continues the weak feature in the market, with steam still showing a tendency to act in sympathy with it; cars are plentiful and production is down to a lower point than at any time during the season. There are some forced sales at reduced prices to avoid demurrage on speculative coal, and the general tendency is toward lower prices; however, producers are holding firm for higher quotations on contracts. Dumping at Hampton Roads is heavier than usual and close to the record, but the market is weak, due to heavy accumulations, as a result of a good car supply and warm weather. There is still a good healthy tone to steam in the Southern market, although domestic has weakened and operators are finding it difficult to dispose of their output.

An abrupt change in weather conditions has avoided what would certainly have developed into a complete demoralization of the Middle Western trade had it not appeared. Immense tonnages of unsold coal were standing on track and it is difficult to say what would have been the result had the same unseasonable weather continued. Prices still rule low, and operators are finding it difficult to contract at reasonable figures, but it is expected that the zero weather will effect a rapid change in the existing conditions. The improvement is confined mostly to domestic grades, but it is also having a stimulating effect on the steam sizes. In the Rocky Mountain region and on the Pacific Coast severe weather has been prevailing, and there were temporary fears of a coal famine, but the situation appears to be well in hand now.

BOSTON, MASS.

The slump is apparent in every direction. The shippers of the Southern coals are pressed with cars standing and so eager are they to make sales that prices are now down to the level of last summer; $2.70 has been the current price for nearly a week, f.o.b. Hampton Roads, for Pocahontas and New River. The off-shore market seems a little better than along the coast, but there will have to be a restriction in mining or things will be demoralized. The Pennsylvania grades are off to $2.70@2.80 f.o.b. New York, and even Georges Creek is beginning to come down freely on orders, both at Philadelphia and New York as well as at Baltimore.

A week ago there was talk of contracts, but the agencies realize now that it would be next to impossible to close a season's business at $2.85@3 when the market is 15@25c. less than that for current shipment. Some business is rumored to have been closed, but the volume is relatively small. Buyers are confident prices will rule at least as low as last year, and February is too early to get them interested, in view of present conditions.

The market all-rail is as dull as at tidewater. Prices for spot coal are not much in excess of $1.25 at the mines for the ordinary grades and purchases are small and less frequent. Some of the railroads which were down to two and three days' supply several weeks ago are now apparently well stocked and there is no life to the situation. Car supply is improving, and practically all the mines are enjoying a reasonably good allotment.

Current quotations at wholesale are as follows:

Clearfields, f.o.b. mine	$1 25@$1 40
Clearfields, f.o.b. Philadelphia	2 50@ 2 65
Clearfields, f.o.b. New York	2.75@ 2 95
Cambrias and Somersets, f.o.b. mine	1.40@ 1.60
Pocahontas, New River, f.o.b. Hampton Roads	2.60@ 2 70
Pocahontas, New River, on cars Providence	3.90@ 4 10
Pocahontas, New River, on cars Boston	3 95@ 4 10

NEW YORK

Bituminous—A fall in temperature the last of the preceding week which continued over the first of the current one, had a somewhat steadying effect on the local market, but did not entirely check the decline which the trade has been experiencing over the last few weeks. But even though prices have fallen off, there is a slight increase in the demand and some of the operators are of the opinion that the market is in a stronger position. As a reason for this belief, they state that, owing to the high price level prevailing in the spot market over the last few weeks, shippers generally have been curtailing allotments on contracts in order to take the greatest posible advantage of the high quotations for prompt coal. Now that this demand has been partially satisfied, thus causing an easing off in prices, consumers having contracts are finding their supplies at an unusually low point.

The railroads are again beginning to appear in the market after having been out over the last two or three weeks. The heavy buying on their part has been one of the best features in the trade, this season, and the new inquiries from them will do as much to steady up the market as anything that could occur, with the possible exception of an abrupt change in weather conditions. This latter has been so entirely adverse to a heavy consumption, that it is rather remarkable that the soft-coal market has held so well as it has.

We quote the local market as follows; with bituminous prices somewhat reduced, but quite strong at the new level:

	Anthracite		Bituminous	
	Circular	Individual		
Broken*	$5 00	$4 50	West Virginia, steam	$2 80
Chestnut†	5.50	5 45	Fair grades, Penna	$2 90@2 95
Pea*	2 75	$3.75@4 10	Good grade, Penna	2.90@3 00
Buckwheat**	2 75	2.25@2.70	Best miller, Penna	3.00@3 05
Buckwheat†	2 50	2 00@2 40	Georges Creek	3.25@3.30
Rice**	2 25	1 80@1.95		
Rice†	1.95	1.50@1.65		
Barley†	1 75	1 20@1 70		

* Scranton and Lehigh. ** Scranton † Lehigh and Schuykill.

Anthracite—While weather conditions have experienced an abrupt change locally, it has not as yet been of sufficient duration or severity to effect any difference in the hard-coal situation. The result is that prices have slumped off still further, orders are quite scarce, and the trade is at an unusually low ebb. There is some slight demand for stove and pea, and chestnut is becoming noticeahly easier; egg is so plentiful, that concessions are readily obtained on it, and consumers generally are becoming particular about sizes and grades. Cancelations are coming in at a rate that is alarming the companies and new orders are almost impossible to obtain.

It is evident that the speculators stand to lose heavily the coming season. In view of the shortage of some 6,000,000 tons in production, many of these anticipated an acute famine in hard coal during the winter and contracted liberally for February tonnages at relatively high prices. Consumption has been so low, due to the unseasonable weather, that the heavy demand failed to materialize, with the result that quotations are low and the speculators will be forced to sell this high-priced product at circular or lower.

PHILADELPHIA, PENN.

A slight fall of snow, followed by a comparatively low thermometer, stimulated the retail coal market, but unfortunately, it centered on the two sizes which were already short of the current demand, that is stove and pea. During the previous week, these sizes had been slightly easier, but the cooler weather, tightened them up again. Egg and nut are in a comparatively easy supply, orders being filled with promptness, but the dealers are still short on stove and pea.

Tidewater business still continues good, and while it is understood there are some cancelations, large numbers of barges are going out weekly, consigned to down east points, although it is admitted that the trade in the east is taking as little as possible of egg size. This is used almost exclusively in large residences, and assuming that it is purchased in large quantities, the supplies now on hand, due to the unseasonable weather, have been ample so far this winter, and unless conditions change, there is likely to be a surplus of this grade until the spring or opening prices are announced. It is a fact that egg is invariably active, only when prices are the lowest, in the spring, some dealers at that time taking almost their entire requirements.

Complaints are heard that, inasmuch as the supply of coal is easier, prices should recede or be reduced. Considerable coal was brought in this city, for which the dealers paid quite handsome premiums, but it is doubtful if the householder paid any advance over the current prices. The individual operators, finding it impossible to market their egg coal at current figures, are conceding anywhere from 25 to 30c. per ton to move it, and in some cases, are breaking it down at the mines into the smaller sizes, for which there is still a ready market.

PITTSBURGH, PENN.

Bituminous—Mining is being conducted under only moderate pressure. Car supply is adequate and so is labor, while demand is less than was expected. Contract consumers are taking full shipments as a rule, but there are cases of requests for curtailment in shipments, owing to accumulation of stocks. Prompt demand is relatively light, and some of the operators are rather actively seeking such orders, though, as a rule, not at the expense of prices, which recently dropped, for prompt coal, to the contract level. In exceptional cases it is possible the contract prices have been shaded slightly on small prompt lots, but generally speaking, the market is firm. This is for mine-run and screened coal. Slack continues to command a good premium above the circular or general price for the season, 90c., and is rather readily sold at $1.10.

There is more sounding of the market on contract coal for the year beginning Apr. 1, and some buyers evidently have hopes of breaking the regular prices, but thus far there has been practically no encouragement for this position. Regular contract prices are as follows: Slack, 90c.; nut and slack, $1.05; nut, $1.25; mine-run, $1.30; ¾-in., $1.40; 1¼-in., $1.55 per ton at mine, Pittsburgh district.

Connellsville Coke—The coke market has been soft since the decline noted a week ago, and prices are quotable still lower. There has been an almost entire absence of demand for both prompt and contract coke. This has been partly the cause of the market weakening, but of equal moment has been the increased production since the celebration of the various holidays was completed. In the past three weeks the output has averaged about 425,000 tons weekly, against 400,000 tons maintained for many weeks previous. Sales of prompt furnace coke have been made in the past week at $3.25, and while $3.50 is asked by many operators the price seems to be entirely nominal. There has been scarcely any negotiation for contract coke, and the full measure of the decline is not disclosed, but enough is known to make it quite certain that $3.50, formerly the minimum asking price, is entirely out of the question, and $3.25 would doubtless be shaded for many good brands. Foundry coke has also declined, but not so markedly as regards price, the change rather being that better grades of coke can now be secured. For many weeks really standard foundry coke was out of the market. We quote: Prompt furnace, $3.25; contract furnace, $3.10@3.20; prompt foundry, $3.50@3.75; contract foundry, $3.25@3.50, per ton at ovens.

BALTIMORE, MD.

A sharp break in prices occurred during the week, occasioned by the prolonged open weather. Operators reported sales at prices from 50c. to 60c. lower than were obtained 10 days or two weeks ago; some offered low-grade fuel as low as $1 per ton, and found consumers were not overanxious to enter the market even at these low quotations. The market is weaker than it has been for three or four weeks, and does not show any signs of improvement, especially in spot business. There has not been such a mild January, according to reports issued by the weather bureau, for nearly eighty years. Naturally such weather would affect the anthracite trade the most, but the bituminous dealer, too, has found the demand gradually falling off until but little or no coal is moving except on contracts.

The only activity is in contracting; one of the largest companies has closed up three contracts during the week at prices from 10c. to 15c. higher than the old quotations. It is expected that contracts will be closed spasmodically until the general renewals which will take place two months hence. There is a slight shortage of labor and some little complaint was heard of the car supply during the week, but it is not causing the trouble that it would were the demand for fuel greater.

BUFFALO, N. Y.

The anthracite shippers are agreed that the mild winter has been a good thing for them, as otherwise the demand for coal would have been so far in excess of the supply that the situation would have been acute. As it is the anthracite supply is now about up to the demand.

Ordinarily such a winter would have obliged the bituminous trade to use every possible means to sell coal at a profit Prices are, of course, what they were a month ago, though it is difficult to quote accurately just now, as buyers and sellers are far apart. There are many rumors of coal offering at sacrifice prices, but at the same time jobbers are expressing surprise that their sales are going through so well. Even the railroads, which bought considerable high-priced coal during December, are generally taking it without grumbling. Sellers are finding it difficult to contract because of prevailing low prices. The car situation is easier than it has been for some time, as all the railroads have to contend with is some high water and landslides. Quotations are weak and unsteady on the following basis: $2.75 for Pittsburgh select lump; $2.65 for three-quarter; $2.50 for mine-run and $2.40 for slack. In some instances slack is so much stronger than sizes that it sells on a par with mine-run. The price of coke is about as formerly, being based on $6 for best Connellsville foundry. Allegheny Valley coal is quite as strong and active as Pittsburgh, at about 25c. less.

The sellers of independent anthracite are getting little premium now, and will get none at all soon, if warm weather continues. The Buffalo retail anthracite trestles are running only about half as strong as they usually do in midwinter, and orders from outside are no longer urgent.

COLUMBUS, OHIO

While steam trade is holding up well, it is sharing in the general weakness which has taken possession of the market. Manufacturing plants are taking large tonnages, although they are not inclined to stock up for the future, only taking what is temporarily needed. There is now no complaint from a lack of cars, they being plentiful in every section and shipments are coming out promptly. The high waters, which interfered with the movement from West Virginia, have not subsided and a considerable tonnage is coming from that state.

The first day of the low temperature caused a rush of telegrams asking to start shipments on orders placed previously. Production has been lower than at any time during the winter, most of the mining districts reporting between 40 and 50 per cent. of normal. In the strictly domestic fields the production was even below those figures. In the Pomeroy Bend district most of mines have been placed in commission and a considerable output is reported. Consumers have a fair supply and unless continued winter weather comes the retail business will be slack from this time on; retail prices have weakened materially.

Quotations in the Ohio fields are as follows:

	Hocking	Pittsburgh	Pomeroy	Kanawha
Domestic lump	$1 50		$1 65	$1 50
4-inch	1 35	$1 20	1 40	1 30
Nut	1 50		1 50	
Mine-run	1 20	1 10	1 25	1 15
Nut, pea and slack	1 15		1 00	1 05
Coarse slack	1 05	1 00	1 05	0 95

CLEVELAND, OHIO

The large speculative movement of coal to this district had a tendency to reduce prices during the past week. Shippers continue to report a scarcity of orders and in many cases, unconsigned coal is being held at the mines. Some operators have shipped large quantities for distribution in the city retail trade, and this has weakened the market and companies have been forced to sell their product at reduced prices to avoid demurrage.

Shippers of Pittsburgh No. 8 coal report a general curtailment of railroad fuel. Orders to discontinue shipments

temporarily were received from the Pennsylvania, Baltimore & Ohio, Lake Shore & Michigan Southern and the Ann Arbor railroads. Shippers, however, are assured of a resumption of fuel shipments as soon as the present accumulation is cleared away.

Wholesale quotations per short ton f.o.b. cars at the mines are as follows:

District.	Freight rate	¾-in lump	Mine-run	Slack
Youghiogheny	$1.00	$1 40	$1 30	$0 95
Pittsburgh No. 8	0.90	1 20	1.10	1 00
Goshen No. 6	0.70	1.35	1.25	1 05
Coshocton	0.70	1.70	1 45	1 05

Pocahontas lump and egg is quoted at $2, run-of-mine $1.25, and slack 90c., f.o.b. mines. Massillon $2.50 and Hocking $1.50 mines. Furnace coke is bringing $3.50 f.o.b. ovens, while foundry grades are going at $4 for spot shipment. While the prices for spot coal are below normal, shippers are quoting high prices on contract business, believing that the market will improve in the near future.

Railroad equipment is arriving with regularity especially in the Youghiogheny field; in fact, cars are too plentiful for the good of the market. Some difficulty is reported in receiving exactly the class of equipment wanted, but shippers believe this condition will gradually improve.

HAMPTON ROADS, VA.

The spot market is rather weak just now, owing to the temporary accumulation of coal at tidewater; the Virginian Railway has about 56,000 tons at its terminal today with about 45,000 tons more along the line, while the Norfolk & Western also has quite a large tonnage here and the Chesapeake & Ohio about 38,000 tons at Newport News. This accumulation of coal, caused by heavy loading at the mines, quick movement and abnormal weather conditions, has brought quotations down to $2.90 to $3 f.o.b. with few buyers even for the best grades.

The dumping at the piers has been heavier than usual, close to the record figures and there has been no scarcity of bottoms. During January the Norfolk & Western dumped 484,843 tons at Lamberts Point, the Virginian Railway 260,544 tons at Sewalls Point and the Chesapeake & Ohio 243,571 tons at Newport News. The week's exports of coal have shown a slight increase over the preceding week; January exports were 173,706 tons as compared with 109,325 tons in the same month last year.

Two new tidewater agencies have been established here. The United States Coal Co., a new concern, handling New River and Pocahontas coals and the Flat Top Fuel Co., operating and owning properties in the Pocahontas fields. The latter is an old company, owned by the Thomas-Cooper interests, but has not been in the tidewater market. A new sales agency has also been chartered, the West Virginia Coal Co., with headquarters at Richmond, Va. They are to handle New River and Kanawha coals, and will be a factor in tidewater business.

BIRMINGHAM, ALA.

The market on domestic coals has weakened considerably during the current week and mines producing this grade are finding it a hard task to dispose of their output; prices have eased off to some extent. The much-longed-for cold weather has not arrived and many of the dealers still have good stocks in their yards. Not much more winter is expected and it is probable that considerable domestic coal will be thrown into the steam trade during the next few weeks. Fortunately, there is a healthy demand for steam grades and any surplus is not likely to materially effect prices until well in the spring, when automatic reductions are made on all grades.

Domestic coke is less active, the market on this product being directly subject to conditions controlling the domestic coal situation.

LOUISVILLE, KY.

The first day of February brought with it the beginning of about the only really cold snap of the present winter and gave some strength to the trade. Some of the more pessimistic have taken the ground that the present cold wave, unless quite prolonged, is not likely to benefit operators to any extent. They believe that the retailers will take advantage of the stimulated demand to get rid of the stocks laid in during December and earlier, and chance the possibility of a late spring, rather than buy in any considerable quantities at this time.

Owing to the conditions outlined, the domestic market has been really no market at all. The only quotations made to the trade on high-grade Jellico and other good domestic coal, are in the neighborhood of $2.25, with second-grades from $1.50@2, and there have been practically no sales at these figures. Steam coal is scarce, and the market stiff. Eastern Kentucky nut and slack is quoted at 80c.@$1; No. 2 run-of-mine, $1@1.15, and straight run-of-mine, $1.25.

INDIANAPOLIS, IND.

About the only change in the situation here this week is a spell of cold weather that took the temperature down around zero and greatly increased sales of domestic grades, adding also to the steam consumption. But buyers are well stocked and will not be in the market to any material extent until their piles have been reduced; mines caught up some time ago with the heavy demand of November and early December, caused by buyers trying to get all the coal possible.

Factories are busier than they have been for years, but the mild weather of the first two months of winter has resulted in a comparatively light consumption. Prices at the mines are at the summer level. Operators are making, or trying to make, contracts for next winter, the earliest in the year they have ever done this.

DETROIT, MICH.

Owing to this uncertainty, and after an investigation covering a period of about three months, which has been extended into a number of other cities, a special committee of the city's common council has submitted its report recommending the establishment of a municipal coal yard as the means of regulating the local prices on hard coal. The committee announces that in other cities, less accessible to the mining regions than Detroit, hard coal is being sold at $7.50 per ton while local consumers have had to pay from $8 to $9.

It is feared that the balance of the season will continue to show an over supply of domestic coal, and that there will be no demand, in this market, for that kind of fuel.

	W. Va. Splint	Gas	Hocking	Cambridge	Pitts. No. 8	Pocahontas	Jackson Hill.
Lump	1.50		$1.50			$2.00	$2 25
Egg	1.50		1.50			2.00	2 25
Nut	1 40		1 50				
1¼-in. lump	1 25						
¾ lump	1 10	$1 10	1 10	$1.10	$1.10		
Mine-run	1 00	1 00	1 00	1.00	1.00	1.25	
Slack	1.05	1.05	1 05	1.05	1.05	1.25	

CHICAGO

With the advent of zero weather, Chicago coal dealers are anticipating a change in business conditions that will bring better prices and a greater volume of sales.

There has been such a slump in the local market that a curtailment in production has been advocated on almost every hand. As a result of this, a number of mine operators in Illinois and Indiana have been planning to close down two or three days each week until conditions improve. The storage space of retail dealers has been taxed to capacity, but the forecast for continued low temperatures is expected to result in a comparatively buoyant market.

An index of recent conditions is seen in the statement that at a distributing point in northwestern Illinois a few days ago, 250 cars were awaiting reconsignment orders, with no demand for the coal. So far as anthracite is concerned, egg and chestnut are abundant. Prices of steam-lump and mine-run have weakened to some extent, but there has been some advance in screenings.

Prevailing prices in Chicago are:

	Springfield	Franklin Co.	Clinton	W. Va.
Domestic lump	$2 07@2 17	$2.45@2 55	$2.27	
Egg		2 45@2 55		3 55@3.80
Steam lump	2.02		2 17	
Mine-run	1 97	2 20@2 30	1 97	3.30@3.55
Screenings	1.67	1 90@2.05	1.62	

Coke—Connellsville and Wise County, $6.50@6.75; by-product, egg, stove and nut, $5.75@6; gas house, $5.85.

MINNEAPOLIS, ST. PAUL

The long-sought-for cold spell has at last made its appearance and while it is too late in making its appearance to save prices, yet it will clean up the market in general.

The soft-coal situation remains practically the same as heretofore, much coal is in demurrage and is being sold at any old price. One case is shown of a car of the best Illinois grade of coal taken in by a city council in a southern Minnesota town for the freight and railroad charges, but when the books were balanced they showed the shipper owed the buyer $8.

ST. LOUIS, MO.

The cold wave helped local conditions considerably. If this had not occurred to move the coal, it is hard to say what would have become of the hundreds of cars at the different points. At the different railroad centers in the South and in Illinois, Iowa and Missouri, it is estimated there were between 3000 and 5000 cars, of unsold coal, and because of this, there has been practically no market, as a general thing. It has been a case of everybody trying to get as much as

they could, but taking what they were offered. This applies to the high-grade field, both Franklin County and Carterville, with the former in perhaps a more precarious condition than the latter.

In the Mount Olive district prices are being maintained by curtailing the output and keeping the mines working on a short schedule. In the Standard field coal has been going for less than the cost of production, and many mines have shut down until the market gets better. As a rule, the selling price in all districts has been below the cost of production, and in many instances mines have suspended operations, except in the Standard field. The present cold wave, if it lasts long enough, may bring about a condition that will enable these operations to start up within a few days.

In anthracite, chestnut is still scarce, but the other sizes are moving freely, and as a matter of fact, are coming in too fast. Smokeless business is just holding its own at the present time, and the demand for coke is exceedingly good, ranging from $5.25 to $5.50 on the better grades of gas house and byproduct.

OGDEN, UTAH

The car shortage and congestion that has prevailed on the Denver & Rio Grande railroad has been somewhat relieved, although traffic conditions are far from normal. The mines in Utah tributary to the Rio Grande have suffered greatly, and at present are not able to work full time, due to the shortage. In Wyoming the Union Pacific is able to furnish sufficient cars to keep the mines running full time. Box cars are scarce and a large percentage of the commercial coal must be loaded in open equipment; again the railroad places instructions that certain cars must go East or West.

In the Northwest there are no large stocks of coal on hand and shipments during February should continue normal, providing the usual weather conditions prevail.

Both Utah and Wyoming prices continue strong as follows: Lump, $2.75; nut, $2.25; mine-run, $1.85. Wyoming slack brings $1, with Utah 25c. higher.

PORTLAND, ORE.

After two weeks of cold weather the temperature is again higher through all parts of the Pacific Northwest and the worst of winter is believed to be over. A great deal of snow fell during January in the mountainous sections and in many instances traffic was badly crippled. The Great Northern and Northern Pacific lines through the Cascades, have been more or less tied up for the greater part of three weeks, but on the Columbia River, out of Portland, they have been open as usual. There has been no advance in coal prices this winter and there is little probability of any now. The volume of business has been fair.

SAN FRANCISCO

For the past month there has been an exceptional cold snap, and the supply of coal in wholesale yards is practically nil. Owing to large bunkering engagements in the north there is but little Wellington available for this market; in fact, the deliveries of this coal here were only 24,537 tons in the past four months. Tonnage en route from Australia is small, probably not to exceed 12,000 tons for arrival during the next three months. There is one steamer cargo of Japanese house coal on the way, due to arrive the end of this month, and it will be much needed when it comes in.

Whilst nominally rates remain unchanged, in many cases dealers are charging consumers $13 in place of $12, the regular price.

PRODUCTION AND TRANSPORTATION STATISTICS

Pennsylvania Railroad

Statement of coal and coke carried on the P. R.R. Co.'s lines east of Pittsburgh and Erie during December and the 12 months, with the increase or decrease over the same period last year, in short tons:

	December	Difference	12 Months	Difference
Anthracite	1,036,717	— 178,088	10,312,348	—1,644,801
Bituminous	4,271,702	+ 290,216	46,434,187	+4,011,742
Coke	1,242,882	+ 331,911	13,371,345	+2,732,238
Total	6,551,301	+ 444,039	70,117,880	+5,102,179

Baltimore & Ohio R.R.

Coal tonnage moved over the B. & O. R.R. and affiliated lines during December, 1912, was 2,648,429, as compared with 2,468,943 for December, 1911; coke tonnages for same periods were 416,296 and 313,821, respectively, making gross of 3,064,725 tons in 1912 as compared with 2,782,764 in 1911.

CONNELLSVILLE COKE

The "Courier" reports production and shipments in the Connellsville region for the week ended Feb. 1, as follows:

Production (tons)	Week	5 weeks	*Shipments (cars)*	Week	5 weeks
Connellsville	233,550	1,237,225	Pittsburgh	4,445	21,767
Lower Connellsv'le	189,203	931,503	W. of Pittsburgh	7,136	34,484
			E. of Region	901	4,483
Total	422,753	2,168,728	Total	12,482	60,734
Same period 1912	360,153	1,755,273	Same period 1912	10,623	51,543

NORFOLK & WESTERN RY.

The following is a statement of tonnages shipped over this road from mines in West Virginia and the commercial and company coal, for the month of December, in short tons:

Field	Shipped	Tipple	Total	Commercial	Company
Pocahontas	1,038,432	17,364	1,055,796	993,357	121,246
Tug River	167,355	3,824	171,179	137,786	33,393
Thacker	222,188	6,979	229,167	165,923	63,244
Kenova	71,032	086	71,118	65,025	6,093
Clinch Valley				104,531	6,890
	1,499,007	28,253	1,527,260	1,466,622	230,866

Shipments of coke, entirely from the Pocahontas field, were 100,848.

Norfolk & Western Ry.

The following is a comparative statement of the coal and coke shipments over the lines of the N. & W. Ry. for the month of December and the 12 months of the years 1911-12, in short tons:

	December		12 Months	
Destination	1911	1912	1911	1912
Coal				
Tidewater, foreign	101,118	84,083	995,400	1,343,311
Tidewater, coastwise	293,850	258,216	3,084,674	3,583,283
Domestic	1,413,644	1,355,189	15,363,913	17,716,575
Coke				
Tidewater, foreign	5,713		75,867	52,762
Domestic	116,988	134,763	1,434,985	1,416,856
Total	1,931,313	1,832,251	20,954,839	24,112,787

LAKE COAL SHIPMENTS

Coal passing through Sault Ste. Marie Canals for the full season of navigation was, in short tons:

	1911	1912	Changes
Anthracite	2,060,209	2,142,485	+82,276
Bituminous	13,272,667	12,789,109	—483,557
Total	15,332,876	14,931,594	—401,282

Total shipments of coal from Lake Erie ports for the Lake trade and steamship consumption for three seasons past, in short tons:

	1910	1911	1912
Pittsburgh district	11,911,900	10,611,941	11,300,000
Ohio	4,297,300	4,019,544	4,676,000
West Virginia	6,629,500	7,151,200	7,360,000
Total	22,838,700	21,782,685	23,336,000

In 1912 the Pittsburgh district furnished 48.4%; Ohio, 20%, and West Virginia, 31.6% of the total.

VIRGINIAN RAILWAY

The total shipments of coal over this road for December of 1912 were 317,405 net tons, as compared with 316,564 for the month previous.

FOREIGN MARKETS

GREAT BRITAIN

Jan. 24—Market conditions show irregularity for prompt shipment, on account of delay to tonnage caused by stormy weather. Colliery owners appear to be heavily booked "on paper," and for forward shipments quotations are steadily upheld:

Best Welsh steam	$4 56	Best Monmouthshires	$4 20
Best seconds	4 32	Seconds	4 08
Seconds	4 32	Best Cardiff smalls	3 60
Best dry coals	4 62	Seconds	3 36

The prices for Cardiff coals are f.o.b. Cardiff, Penarth or Barry, while those for Monmouthshire descriptions are f.o.b. Newport; both exclusive of wharfage, and for cash in 30 days —less 2½%.

FINANCIAL DEPARTMENT

The Four States Coal and Coke Co.

At a special meeting of the stockholders, held on Jan. 18, the preferred stock of the company was increased from $1,500,000 to $2,500,000 of which increase $250,000 is to be issued at once for additional working capital. The company has been organized slightly over two years, and for the year ending June 30, 1912, is eleventh in production in the state of West Virginia, and at the present rate of production will be fifth during the coming year.

It is the judgment of the management that by the installation of two additional plants the earnings will be at least 15%, based on the present selling price of coal and the average cost for the past two years. As of May 1, 1913, after deducting all operating and fixed charges, the earnings are estimated at 6% on the preferred stock and about 7% on the common.

Reports have recently been made on the properties of the company by Dr. I. C. White, State Geologist of West Virginia, and W. H. Coverdale, Consulting Engineer, of No. 66 Broadway, New York City. Mr. Coverdale's report reads in part as follows:

The Four States Coal & Coke Company owns 37,000 acres of coal seams, of which 6110 acres of low sulphur Pittsburgh coal are located in Marion County, West Virginia and on which are located the Annabelle mines.

Annabelle is a shaft mine operated by air with a past life of only two years, as it was opened late in 1910. It produced 189,579 net tons during the year ending June 30, 1911, and 390,521 tons during the year ending June 30, 1912. This mine is now developed to the point where it can produce its normal tonnage of 750,000 tons.

Dorothy and Sarita are drift mines, electrically operated. Dorothy has been shipping coal for six years, and Sarita for three. Together, they produced about 300,000 tons during the year ending June 30, 1910; about 578,000 tons for 1911, and 534,819 tons in 1912.

After the additional preferred stock referred to shall be issued, balance sheet of the company, which follows, will be in all other respects as per report of certified public accountant under date of Oct. 31, 1912.

Assets:			
Cash in banks and at works		$300,748	
Accounts receivable		118,733	
Supplies on hand and coal not billed		31,794	
Development and equipment of mines.			
Annabelle	$1,061,716		
Dorothy	385,488		
Sarita	341,473		
Marshall No. 1 and 2 Dev	763	$1,789,442	
Houses, Annabelle	209,254		
Dorothy	84,425		
Sarita	56,203	349,883	
Coal Lands	7,110,711		
Surface lands	919,702	8,030,413	
Stocks and securities in other companies		25,000	
Amount advanced to B. & O to build I R.R.		62,280	
Total assets			$10,708,296
Liabilities:			
Accounts payable and pay rolls	$ 163,720		
Due to Big Supply Company	39,867		
Due to U. S. Sewer Pipe Co.	2,000		
Bills payable	99,299		
Bonds	3,500,000	$3,804,888	
Interest and taxes prov fund	55,815		
Insurance	764		
Sinking fund	71,446	$128,025	
Total liabilities			$3,932,914
Assets in excess of liabilities			$6,775,382
Capital stock, preferred	$1,750,000		
Capital stock, common	5,000,000		
General profit and loss, less dividends paid	25,382		

Dr. I. C. White estimates the value of the Four States property to be at least $9,125,760; and sound value after full depreciation is charged off to date may be taken as $10,185,669.

By setting aside 5c. per ton for a sinking fund, it will return to the investors the total amount of the bonds, preferred stock and common stock, when 70% of the present coal is mined out and the total investment returned to the stockholders. The remaining 30% left unmined will be worth much more than the total value of the property at the present time, on account of the increase in value of coal lands from time to time.

SUMMARY OF ACREAGE, TONNAGE AND VALUES

	Acres Coal	Acres Surface	Available Tonnage	Total Value Including Equipment
Annabelle Mines,				
Pittsburg	6,109.975	666 279	62,264,922	
Sewickley	249.730		2,356,192	
Dorothy and Sarita Mines	31,454.000	86.455	194,279,451	$9,125,760
Totals	37,813.705	752.734	258,900,565	

For the period of twenty-two months from Oct. 1, 1910 to July 31, 1912, profits after deducting administrative expense, taxes and sinking fund show as follows:

	Net Profits
Nine months ending June 30, 1911 (Production 409,830 tons)	$118,836.51
Thirteen months ending July 31, 1912 (Production 955,376 tons)	257,715.84

Total production for twenty-two months 1,365,206 tons
Average net profit per ton 28 cents equal to $376,552.35

The average net price received for coal in December, 1912 is 0.1386c. per ton in excess of the price for twenty-two months which increase, based upon the same cost of production as in the twenty-two months referred to with mines in full operation and producing their normal output of 1,500,000 tons per annum would show a profit as follows:

1,500,000 tons @ $0.4186		$627,900 00
Less:		
Interest on bonds issued	$182,500.00	
Dividend on preferred stock	105,000 00	
		287,500 00
Estimated net profit after paying interest on bonds and dividends on preferred stock		$340,400.00

COAL SECURITIES

The following table gives the range of various active coal securities and dividends paid during the week ending Feb. 1:

Stocks	Week's Range High	Low	Last	Year's Range High	Low
American Coal Products	90	90	90		
American Coal Products Pref	111	111	111		
Colorado Fuel & Iron	40⅜	34¼	40⅜	40⅜	31
Colorado Fuel & Iron Pref	155	151	155	155	150
Consolidation Coal of Maryland	102⅛	102⅛	102⅛	102⅛	102⅛
Island Creek Coal Pref	86	85	85		
Lehigh Valley Coal Sales	240	204	204		
Pittsburgh Coal	22½	22	23⅛	24⅛	21½
Pittsburgh Coal Pref	92	89⅜	97½	95	87
Pond Creek	26½	24⅛	25	28¼	24⅛
Reading	166⅛	162⅛	165⅛	168⅛	160⅛
Reading 1st Pref	91½	90⅛	90⅛	91⅛	90
Reading 2nd Pref	92	92	92	93	91
Virginia Iron, Coal & Coke	54	52½	54	54	52

Bonds	Closing Bid	Asked	Week's Range or Last Sale		Year's Range	
Colo. F. & I. gen. s.f.g 5s	99	101	98	Jan. '13	98	98
Colo. F. & I. gen. 6s	107½		107½	June '12		
Col. Ind. 1st & coll. 5s. gu	84	Sale	83½	84	83½	84
Cons. Ind. Coal Me. 1s 5s			85	June '11		
Cons. Coal 1st and ref. 5s		94	93	Oct. '12		
Gr. Riv. Coal & C. 1st g 6s	94	100	102½	Apr. '06		
K. & H. C. & C. 1st s f g 5s			98	Jan. '13	98	98
Pocah. Con. Coll. 1st s f 5s	87½	88	87½	Jan. '13	87½	87½
St. L. Rky. Mt. & Pac. 1st 5s	77½	Sale	77½	77¼	77½	80
Tenn. Coal gen. 5s	102	103	103	103	102⅛	103
Birm. Div. 1st consol. 6s	102⅜	102⅞	103	Jan. '13	103	103
Tenn. Div. 1st g 6s	101½	103¾	101¼	Dec. '12		
Va. C. M. Co. 1st g 6s			110	Jan. '09		
Utah Fuel 1st g 5s						
Victor Fuel 1st s f 5s	79⅜	84	85½	Oct '12		
Va. I. Coal & Coke 1st g 5s	97½	Sale	97½	97½	96½	97½

Lehigh Coal & Navigation Co.—Regular quarterly No. 137 of $1, payable Feb. 28 to holders of record Jan. 31.

PRICES OF MINING SUPPLIES

THE MARKET IN GENERAL

The edge of the boom is off. This does not mean that business conditions are deplorable or anything of the kind, but it does mean that, while trade was booming in October, November and December and merchants were competing with one another in placing their orders with jobbers and manufacturers, they have now settled down to a regular rate of business. Every manufacturer in the country, practically, has as much business as he can do, and orders on his books for months ahead, but new orders since the first of the year have come in rather slowly. This is by no means unusual. January is generally considered to be an excellent time for inventory, and many large concerns are taking stock and making preparations for another year's business.

Fundamental conditions appear to be unusually sound. There are numerous investigations going on in federal, state and municipal government. In fact, there seems to be an epidemic of them, and while some facts are brought out that are not at all to the liking of the projectors, still to the country at large it is doing a great deal of good. There are, however, not as many unsavory disclosures being made as was the case during the life insurance investigation in 1905 and 1906, which was followed by several years of depression. The open winter that has permitted outside construction work has aided some lines of trade, but for winter specialties there has been a decided lack of orders.

The steel market is steady and firm without any advances compared with last month, few orders being placed yet, with numerous contracts on the books of manufacturers.

Railways continue to plan large expenditures during the year, and the amount of money paid out in developments would be larger if it were possible to sell bond issues at more advantageous terms. Perhaps this method of doing things will be better in the end, for the Southern Ry. has just spent for improvements, out of surplus earnings, the sum of $5,000,000, and the Pennsylvania Line will probably spend about $16,000,000 for new freight equipment. Most pressing of all the needs of the railways are new yards at strategic points and large terminals at all points. The necessity for these will grow rather than diminish, and the demand seems to increase in all proportions to the amount of traffic.

LABOR

An important advance in wages was made by the Interborough Rapid Transit Co. of New York, which followed the advance made last month by the Public Service Ry. which operates in Newark, and in addition, the New York Operating Co. established a company store where employees may secure food, provisions, and other necessities at considerably lower prices than at ordinary stores in the city.

There is a very good demand for miners in Pennsylvania and West Virginia, and agencies for the most part are able to supply this demand at about $2.85 per day with transportation paid to New York by the employing company. Surface laborers when obtained from New York agencies are paid $1.80 per day and the same rate is demanded for other rough laborers.

Firemen on the railways now have grievances, and the Brotherhood of Local Firemen is now taking a vote regarding a strike. Both the employers and employees express themselves as willing to submit to arbitration, but differ over the form of arbitration being made.

Immigration has not shown up in the expected volume, and unless immigrants come into the country more rapidly in the next two months than they have, present indications show that there will be a dearth of labor this summer.

The new scale of wages announced by the Carnegie Steel Co. calls for a payment of 17½c. per hr. to common laborers in Allegheny County, Penn.

IRON AND STEEL PRODUCTS

A diminution in the volume of orders received by mills and selling agencies since the first of the year has been almost universally reported. No strenuous efforts have been made to book a large amount of business, but there is a noticeable hesitancy among men of large affairs to place orders for future delivery. As far as present contracts are concerned, there is no uneasiness, for all of the mills have as much work as they can do for three months to come, at least, and many of them have sold up until August.

Railway buying is of fair volume, and a recent inquiry sent out by the Pennsylvania R.R. for 16,000 cars indicates the confidence of this corporation in the continuance of this present era of prosperity. Other railroads have purchased freely, not only of cars but of rails, and these consumers have been the real mainstay of the market.

Building operations all over the country are not as active as it was hoped, and while the amount of building in 1912 aggregated a fair total, in New York, in particular, the outlook is not especially bright; for one reason, funds are not available for large operations, and furthermore building operations seem to have gone forward on too generous a scale for several years. This latter, however, is an opinion held by only a part of the community, while others firmly believe that building operations in the last few years have been on a very much restricted plan, and in the near future a marked expansion will take place.

The demand for scrap iron and steel is no better, and the amount of old material coming on the market is large. Prices are low, compared with quotations for iron, and this is especially disturbing, as many believe the scrap market is the most valuable index to the iron situation.

Steel Rails—New orders have been few. Some of the Western roads are inquiring for a large tonnage later in the year, but these cannot be taken by any of the Western mills and it is doubtful if the Eastern mills can make deliveries before July. Southern mills are shipping direct, and will do so for at least four months to come. The demand for standard sections has been very light and no large orders, either for domestic or foreign business, are reported.

Quotations continue unchanged as follows: Standard sections, 50 to 100 lb. per yd., 1.25c. per lb.; 40 to 50 lb., 1.21c.; 12 lb., 1.25c. Relaying rails in Chicago of standard sections are held at $24 per ton.

Track Supplies—The railroads in the West are specifying heavily on old contracts for all classes of track fastenings, and much work has gone forward by the railroads during the winter which would ordinarily be postponed until spring. This results in a scarcity of fastenings at mills, and quite a little delay is experienced in securing shipments. In Pittsburgh track bolts with square nuts are held at 2.05c., and splice bars at 1.50c. per lb.; spikes at 1.90c. for very large lots and spikes of large size. There has been a particularly active demand for small spikes, and these are sold as high as 2.25@2.40c. per lb. In Chicago, angle bars and splice bars are 1.50c.; track bolts with square nuts, 2.40@2.50c.; tie plates, $32@35 per net ton.

Structural Materials—Mills rolling structural shapes have had a large volume of business from the railroads, which was made up of plates and all kinds of shapes and some bridge work. The demand for cars has, of course, stimulated the inquiry for plates, and in addition there is a good deal of interest in the market for plates for shipbuilding work, and some large aqueduct work is prospected, which may, later in the year, call for a good tonnage of this material. The biggest piece of work in sight for the structural mill is the New York Subway, the interest in which was revived late in the month when there were reports that contracts would be signed. If these contracts go through, it will mean a great deal of structural work in New York City, and stimulate some business on the outskirts, which otherwise would not take place for several months. Structural shapes in Pittsburgh are 1.50 to 1.55c. for future delivery, and 1.75c. for prompt. In Chicago, quotations for future can be had at 1.68 to 1.78c., while prompt commands 1.88 to 1.93c. Plates are held at 1.55 to 1.60c. in Pittsburgh for future delivery, and 1.75 to 1.80c. for fairly prompt shipment. In Chicago, plates are 1.68 to 1.73c. for future shipment, and 1.88 to 1.93c. for fairly prompt shipment.

Pipe—This is practically the only line in which business booked during January shows an excess over that for December. All the mills in and around the Pittsburgh district report phenomenally heavy business. There is one inquiry in the market for 180 miles of 12-in. pipe, and the leading fuel company in Pittsburgh has sent out an inquiry for over 8000 tons of tubing and casing. New discounts on pipe are firmly held, and the demand for small sizes, particularly those formerly known as merchant sizes, is excellent. Discounts are as follows: Steel pipe, ½-in., large lots from mill, black, 77%

from list; galvanized, 66⅔%; ¾- to 3-in., black, 80%; galvanized, 71½%; 2½- to 6-in. black, 79%; galvanized, 70½%. Based on these discounts, the net prices of pipe per foot are as follows in carload lots Pittsburgh:

Size, inches	Cents Black	Cents Galvanized
¾	2.30	3.40
1	3.40	4.85
1¼	4.60	6.55
1½	5.50	7.70
2	7.40	10.30
2½	11.50	16.70
3	15.40	21.75

Sheets—The leading interest making black and galvanized sheets has advanced its quotation $2 per ton, and the new prices which are established are the maximum of the prices demanded for prompt shipment from independent sources for the last few weeks. Even at the higher prices, mills are securing some fairly good orders, and the sheet trade is more active than any other branch of the steel industry, with the exception of pipe. Not so much complaint is heard regarding deliveries, but makers are still from 12 to 16 weeks behind on their orders, and this will increase rather than diminish, for the sheet trade opens in the spring, and large orders placed during the winter are heavily specified against at that time.

The following table gives the price of sheets in Pittsburgh and also the price of small lots from store in Chicago:

	Cents per pound — Pittsburgh Black	Pittsburgh Galv.	Chicago Black	Chicago Galv.
Nos. 22 to 24	2.20	2.90	2.66	3.60
Nos. 25 and 26	2.25	3.10	2.70	3.65
No. 27	2.20	3.25	2.75	3.90
No. 28	2.25	3.40	2.90	4.15

WIRE PRODUCTS

Wire—Painted barb wire in large lots Pittsburgh is $1.75, and galvanized $2.15. Annealed fence wire in carload and larger lots is sold in Pittsburgh at $1.55, and galvanized at $1.05. In Chicago, annealed fence wire is $1.73; galvanized, $2.13. The supply of woven wire fencing is not at all large, and the mills are rushed to keep up with their specifications. Barbed wire in Chicago is $1.93 base, and galvanized, $2.33. All of these prices are per 100 lb.

Wire Rope—Net prices of the sizes in most general use are quoted f.o.b. Pittsburgh: 2 in., 57@76c. per ft., 1¼ in., 23@32c. per ft.; ¾ in., 10@13c. per ft. All of these prices are for large lots.

Telegraph Wire—The demand for telegraph wire has been large. For lots in fair size, the wire measured in Birmingham wire gage, prices are as follows: "Extra Size Best," Nos. 6 to 9 4¾c.; Nos. 10 and 11, 4¼c.; No. 12, 4¼c.; No. 14, 5¼c.; "Best Best," Nos. 6 to 9, 3¾c.; Nos. 10 and 11, 3¼c.; No. 12, 3¼c.; No. 14, 4c. Actual freight is allowed from basic points where it does not exceed 25c. per 100 pounds.

Copper Wire—The condition of the copper market is unsatisfactory to the holders of metal, and prices have declined within the last month. Copper wire which was sold at 18½c. per lb. a month ago can now be had at 17½c. Even at this concession, there is little or no demand.

MINE SUPPLIES

Bar Iron and Steel—Jobbers in New York and Chicago are demanding from $1@2 more a ton for refined iron and steel. The consumption is unusually large.

Quotations from jobbers' store, either New York or Chicago, are as follows:

	Per lb
Refined iron:	
1 to 1¾ in., round and square	2.15c.
1¾ to 4 in. x ¾ to 1 in.	2.15c.
1¾ to 4 in. x ¼ in. to — in.	2.35c.
Norway bars	3.60c.
Soft steel:	
¾ to 3 in., round and square	2.10c.
1 to 6 in. x ¾ to 1 in.	2.10c.
1 to 6 in. x ¼ and — in.	2.25c.
Rods—¾ and — in.	2.20c.
Bands—1¼ to 6x— in. to No. 8	2.40c.
Beams and channels—3 to 15 in.	2.25c.

Nails—The demand is fair, and the fact that prices advanced means that most of the orders for the time being have been taken. Consumers will not order from the mills, and are permitting their present stocks to run down. The minimum price to largest trade, in carload lots and over, is $1.75 Pittsburgh. In Chicago, carload lots to retailers are 1.98; less than carload lots, $2.03. In New York, wire nails from store are $2.05 per keg base. Cut nails are quoted at $1.70@1.75 in Pittsburgh and $2.05 New York. These prices are per 100 lb.

Packing—The demand for packing has been only fair, and while prices are high, there seems to be plenty of stock at the following unchanged quotations: Asbestos wick and rope, 13c. per lb.; sheet rubber, 11@13c.; pure gum rubber, 40@45c.; red sheet packing, 40@50c.; cotton packing, 16@25c.; jute, 5@6c.; Russian packing, 9@10c.

Brattice Cloth—Agents selling brattice cloth are unable to secure a stock in their warehouses, and mining companies are buying more freely, although they feel that present prices are too high. This is denied by those in close touch with the situation who point out that the world wide demand for all kinds of hemp products is phenomenal, and besides if there were anything artificial in the situation, it would have shown itself long before this in increased stocks, as prices have been high for at least eight months. Some buyers are purchasing more freely, not only because they have to, but for the reason that they think no lower prices will rule for some time, and there may be some difficulty in securing supplies.

Chain—Stocks of chain are not at all large, and consumers are buying freely. Prevailing prices are not high considering the rapid advance in the price of other steel products. Prevailing quotations per 100 lb., f.o.b. Pittsburgh, are as follows:

— in.	$7 50
¼ in.	4 95
— in.	3 95
⅜ in.	3 40
— in.	3 20
½ and — in	3 00
⅝ and — in.	2 90
¾ and — in	2 80
⅞ and — in.	2 70
1 to 1¼ in.	2 60
Extras for BB	
— in.	1 50
¼ in.	1 50
— in. and larger	1 25
Extras for BBB	
— and ¼ in.	2c.
— and larger	1.75c.

CONCRETE AGGREGATES

Portland Cement—Manufacturers of Portland cement are much pleased with the situation, prices are firm, and no concessions are made from the existing level of $1.30 per bbl. at the mill. This corresponds to a price of $1.58 in New York and Pittsburgh, with an allowance of 40c. for bags returned when shipped in cloth bags, or no allowance when wooden bbl. are used. Stocks at the mills are exceptionally small, probably smaller than any time since 1903, when there was a marked shortage of cement. Few of the mills are getting any large portion of the increase in price, and, in fact, most of them are tied up with long-time contracts which run well into February By early summer, however, all of these old contracts will have been filled, and the mills will commence to make all shipments on the basis of 90c. per bbl. in bulk.

Bars, Concrete Reinforcing—Shipments are being made a little more freely, and there is a larger stock at the warehouses. Contractors, however, have been able to use concrete most of the winter, and the supply has not increased as rapidly as was hoped.

Quotations are $1 per ton higher as follows:

PITTSBURGH PRICES IN CENTS PER POUND

	Mill Shipments	Warehouse Stock
¾-in. and large	1.50@1.55	2.00@2.10
½-in.	1.55@2.15	2.05@2.15
⅜-in.	1.60@1.70	2.10@2.20
¼-in.	1.70@1.80	2.25@2.35

Triangular Mesh—Makers of this material report a very good volume of business, considering the winter months, and, moreover, the fact that they can make shipments promptly has aided them to a marked degree.

From mill in De Kalb, Ill., quotations are 18c. per 100 lb higher. Prices are as follows per 100 sq.ft., f.o.b. Pittsburgh district, for less than carload lots and lots of more than 10,000 sq.ft.:

No. 4	$1.23	No. 32	$2 62
No. 23	2.05	No. 36	1.05
No. 26	1.42	No. 40	3.25
No. 28	1.97	No. 41	2 48

MISCELLANEOUS

Kentucky Mule Market—Reports from Louisville, Ky., and Nashville, Tenn., are to the effect that prices of mules continue high, good mules bringing from $175 to $180 and some very good stock has been disposed of at considerably higher figures. Matched and mated teams sell at around $500. Most sales have been exceptionally well attended, and practically all of the offerings have been cleaned up. The farmers of southern Kentucky who are raising mules are being paid anywhere from $110 to $160, but at the low figures, farmers are quietly dropping out of the market, and refusing to make sales.

Castings, Gray Iron—Foundries are making more of an effort to secure orders than they were a month ago, and prices are somewhat cheaper on particularly large orders. For the general run of orders, however, quotations are established as follows: Building castings, 1.75@2.25c. per lb.; rough castings, such as are used for footings, manhole covers, and similar work, 1.75@2c. per lb.; castings for machinery, lock gates and similar work, 2½@4c. per lb., depending on the size of the order and the intricacy of the pattern.

COAL AGE

Vol. 3 NEW YORK, FEBRUARY 15, 1913 No. 7

There are many different ways of performing most any task, no matter how simple, but there is generally one way that is far superior to any of the others; often the best way is not the one adopted.

The cycle of operations carried out by some coal-mine managers when they decide to purchase new mine equipment, should convince any one that the last statement above is not extravagant.

If a man does not know himself what he wants, it ought to be reasonably evident that no one else can know, and yet every day mining men buy machinery under just such conditions and then cuss the maker thereof ever after. There is only one satisfactory way to purchase mine equipment—require your office force to prepare plans and specifications to cover the exact machine wanted (when we say exact, we mean exact) and then be sure that the machine furnished is precisely the one specified.

But, objects someone, that would require the services of an engineer, and we have worked out a plan that relieves us of that expense. When we need a new hoisting engine, coal washer or what not, we get up a circular letter giving in a general way our requirements and then let the various manufacturers prepare plans and estimates of what they recommend; from these we choose the one that looks the best to us.

US. No engineer within forty miles. Get on the other side of the fence and see what these manufacturers are up against. Most mine equipment is such that each piece of machinery has to be built special, and if complete and intelligent data are not at hand, the manufacturer has about as much chance of furnishing a suitable machine as a tailor would have of fitting a man whom he had never seen and whose order contained only a picture of the would-be customer and a note stating that he wished the suit to be brown.

Under such conditions the purchaser is furnished with proposals that cover wide variations in design and price, and these proposals are soon followed by the salesmen of the various companies competing for the business. When the decision is finally reached, it often occurs that the manufacturer who offered the lowest-priced machine, through the highest-priced salesman, carried off theprize.

What is the result?

1. Some six or seven manufacturers have prepared, at considerable expense, plans and specifications for which they receive no compensation. Frequently, the more conscientious ones send their own engineers to the mine to pick up the missing links; however, if the final plans are not passed on by an engineer in the employ of the purchaser, this work is never noticed.

2. One manufacturer has succeeded in selling a machine which will not give satisfaction and eventually his reputation as a builder will suffer because of its performance. You've heard the proverb about "give a dog a bad name;" well, he's the dog.

3. A purchaser has received a machine which will do everything except produce dividends and general satisfaction.

These facts cause us to believe that if some of the more promising of our young mining engineers, who are now earning their livelihood by time keeping and similar occupations, should be allowed to carry on investigations covering present and future requirements in mine equipment, the pay rolls of both the coal-mine operators and the manufacturers of machinery would eventually absorb the young engineers' salaries and still have room for the usual current charges.

Coal Mining Investments

By Eli T. Conner

Men in all ages have felt and responded to the lure of the "mines." The fascination of winning from Nature's store of wealth a great prize, by some "lucky strike," has always attracted the layman as well as those who are well informed in mining matters. Were it not for this optimism—the belief of the *prospector* in ultimate success that will bring him wealth; of the *operator*, in the turn of the market that will convert apparent failure into a profitable venture—the wonderful expansion in the mining activities of recent years would not have been witnessed.

Were mining ventures susceptible of the accurate forecast that is possible in most other lines of business, they would lose some of their attractions; and the well known risks would deter many from making similar investments. On account of the risks and uncertainties of coal mining, much larger profits are necessary and legitimate in *that* industry than in other well-established enterprises.

It is important, however, in all mining investments, to remember that each ton of mineral extracted requires a proportionate depletion charge; so that by the time the whole deposit is removed the entire capitalization will have been amortized, as regards the value of the mineral deposit. This fundamental principle is often lost sight of and, in consequence, many disappointments result.

Coal operators too often put off charging to their monthly or annual cost, an item for the depletion of coal reserves. This should be done as regularly, if not as often, as the actual payroll outlay; because, if it is not regularly shown, the operator is deceiving himself as to his actual cost of production; and when the margin between operating expense and net price realized is as narrow as it has been during recent years in bituminous mining, an apparent profit may really represent instead, an actual loss.

The amortization charge should not only provide for the ultimate extinction of the capital account, in respect to coal reserves, but should preferably include an item that will cover certain possible mining risks, such as floods, fires, explosions, faults, creeps or caveins, labor strikes, car shortage, shrinkage of shipments and other interruptions to regular production and losses. Lastly, but quite as important, the industry should bear its fair proportion of compensation to workmen who may be injured in the discharge of their duties, or to the families of any who may be killed by unavoidable accident.

Reference to these matters incident to coal mining, need not be taken as indicating that, when properly conducted, coal mining is relatively a less stable and profitable investment than the average business venture, in normal times. In considering a coal-mining proposition, however, it is not enough to know that coal exists under certain lands. To insure success, it is absolutely essential to ascertain the quantity and quality of the coal and to compare the facts ascertained, with the same facts in regard to other coals supplying the same market and with which the property to be developed must compete.

The cost of building and equipping a plant of economic capacity together with the cost of the coal lands will constitute the capital to be invested. The cost of producing the expected daily capacity, including depreciation and depletion, must be offset by the proposed daily tonnage and the average price per ton that may be realized for the product. It is also necessary to consider well the labor conditions in the region where the property is located; so that when all of these elements are carefully estimated the amount of capitalization necessary can be determined.

The mistake is often made that the cost of development is underestimated (at times perhaps intentionally, in order to get the work started); and the attempt is made later to make up the deficiency from the earnings. While there are some instances of this being successfully accomplished, it is hazardous to attempt to conduct a business on an insufficient working capital; as any interruption, such as is liable to occur in mining, may result in wrecking the project. On the other hand, it is almost as great a mistake to provide too much money for a given project, as this tends to extravagance on the part of the construction engineer, whose tendency is naturally toward incorporating features that may be desirable from an engineering point of view but are not justified from a commercial standpoint.

In addition to the matters mentioned, it is essential that the market conditions, transportation facilities, freight rates, etc., be well considered to insure a fair competitive chance for the disposal of the output. I have thus tried to make clear that to estimate correctly the value of a mining venture requires painstaking study and careful weighing of many factors any one of which, if ignored, may seriously cripple the scheme. After the project is launched, it should be evident to anybody that men trained by education and experience should be put in charge as officers, superintendents and managers. It seems unnecessary to make this statement but for the fact that so many instances are known of manufacturers, druggists, doctors, lawyers, preachers and others equally uninformed, are constantly venturing into mining investments without competent advice and attempting to direct and manage the operations, with the usual result of partial or complete failure.

It is almost unaccountable why men of good business acumen in their own lines, will essay to go into a business as complex and exacting in its requirements for success as coal mining; or allow themselves to be persuaded by some smooth-talking seller of so called mining securities, into purchasing stock that if subjected to the most elementary analysis by experienced mining men would be found wanting in the essentials of a paying proposition. The only explanation for this credulity is the gambling spirit, which most men possess to a greater or less extent. The willingness to "take a chance" in a mining venture is found in many women also, who fall easy victims to the glittering prospects held out by the vendor of insecure mining securities.

The points to be investigated *before* making an investment in coal mining seem so obvious that it appears needless to emphasize them. Nevertheless, many instances are daily occurring that show the gullibility of uninformed investors, in their readiness to buy worthless mining stocks; and it is hoped this article may both benefit meritorious projects and help to expose worthless ones. Do not wait until part or all of the investment is made before fully investigating the project. *Do it first.*

Central Washer of the Ala. F. & I. Co.—I

By Edw. H. Coxe*

SYNOPSIS—The first of a series of two articles on this interesting plant. A description of the extensive holdings of the company are given here and some preliminary remarks on the methods of washing.

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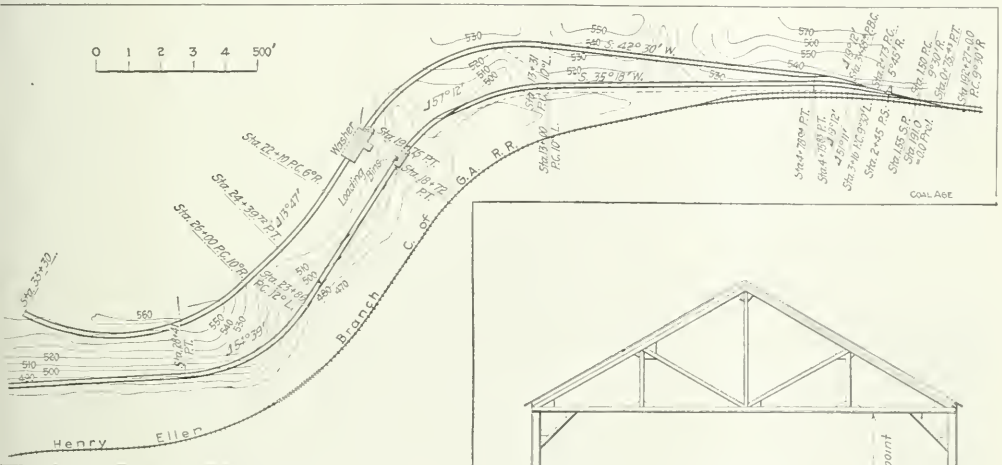
This company was organized in 1906 by the late Henry F. DeBardalaben, one of the pioneers of mining and furnace building in the Birmingham district. Their coal holdings consist of 24,660 acres in the Cahaba field, lying about 20 miles south of Birmingham, Ala.; 12,660 acres of this is in what is known as the Henry Ellen Basin, 10,000 acres of which surround their Margaret operations, which are mining the Harkness seam, the bottom workable coal of the Cahaba measures. These mines, three in number, opened in 1906, produce 2500 tons per day. Their Acmar mine has about 2600 acres and was opened in 1911; it is working the Mammoth seam, which is about the middle of the Cahaba measures, and produces about 1800 tons per day. At their Acton mines, opened in 1907, they have 6000 acres. The Helena seam, one of the highest grade coals in the state, is mined; it is next to the top seam in the Cahaba measures, and production at the two mines is 1000 tons a day. Large holdings in the Water-Works and the Scottsville basins are, as yet, undeveloped.

In addition they own 2500 acres of red-ore land in Shade's Valley, across Red Mountain from Birmingham, which are also undeveloped, but which test borings show to be underlaid with 8½ to 9 ft. of self-fluxing ore, carry-



ing 36 to 38 per cent. metallic iron, and 2500 acres of brown-ore land in Franklin County.

All the operations, including the central washer, are on the Central of Georgia Ry., except the Acton mines, which are on the Louisville & Nashville R.R. The officers of the company are J. M. Overton, president, Nashville, Tenn.; Charles F. DeBardelaben, vice-president and general manager; Overton Fullton, secretary and treasurer, Birmingham, Ala., and I. C. Delony, general superintendent, Margaret, Alabama.

The coal at all the operations is screened over shaking screens with 4-in. perforations, the lump being handing. It was built in 1911 by the American Concentrator Co. The main washer building, bins and tanks are of reinforced concrete, except the shed over the unloading platform, which is a steel frame covered with corrugated iron, and the belt galleries and shed over the washed-coal bins which are frame.

The map, Fig. 1, shows the general track arrangement at the washer, all cars being handled altogether by gravity. The loaded cars from the mines are placed at the south end of the tracks, the coal from the Margaret mines on one track and that from Acmar mine on the other. The loads are dropped over the bins and unloaded,

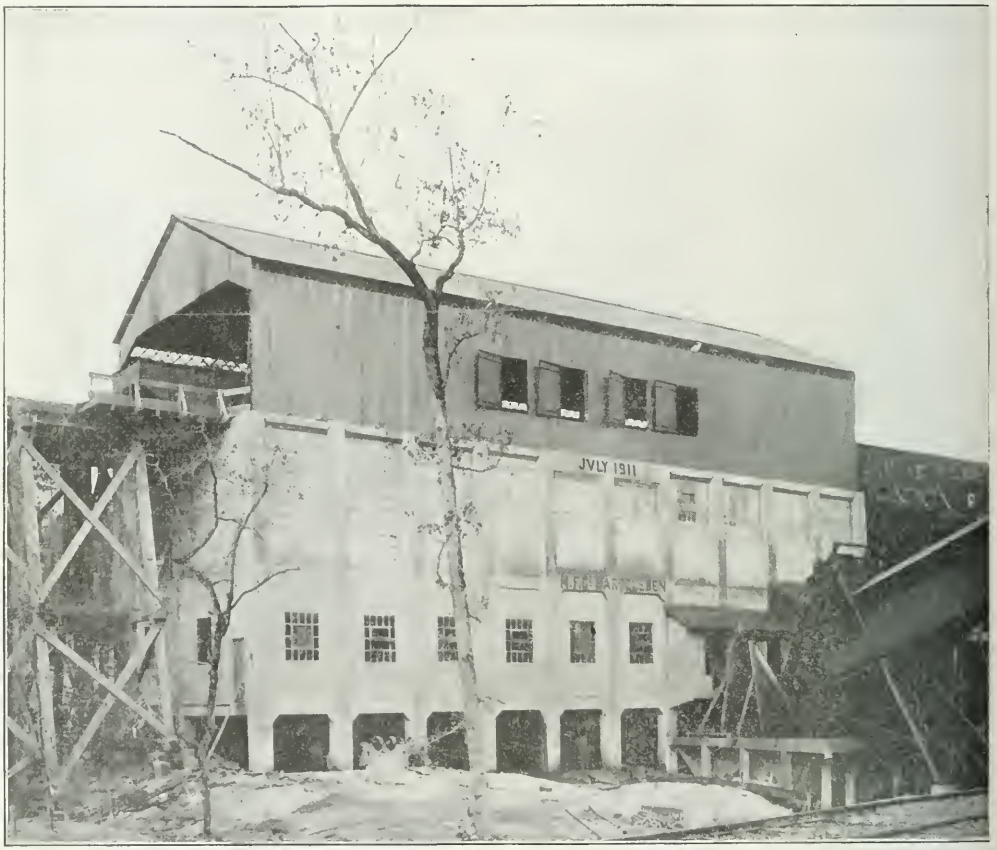


Fig. 4. Complete View of the Washer, Looking North, Showing Trestle

picked after passing over the screens. What passes through the 4-in. screen in carried over a 2-in. screen, the nut and slack being loaded and washed separately, after which they are again mixed; that at Acton is washed at a small local washer, and that from the Margaret and Acmar mines is sent to the central washer for treatment.

The Central Coal Washer

This washer is located at Colgate station, 2½ miles from the Acmar mine and 7 miles from the Margaret mines, from which points coal is shipped to it for washafter which the empties run to the switchback at the point marked A on the map, and thence under the washed-coal loading bins; after being loaded there, they run to the storage yard ready to be removed by the railroad company. The coal from the two operations is kept separate throughout. The photograph, Fig. 4, of the complete plant, looking north, shows on the left the loaded-car trestle approach to the washer. On the extreme right is shown the empty cars leaving the washer, below which are other empties which, having passed through the switchback, are approaching the washed-coal bin, the building on the right. Between it and the washer

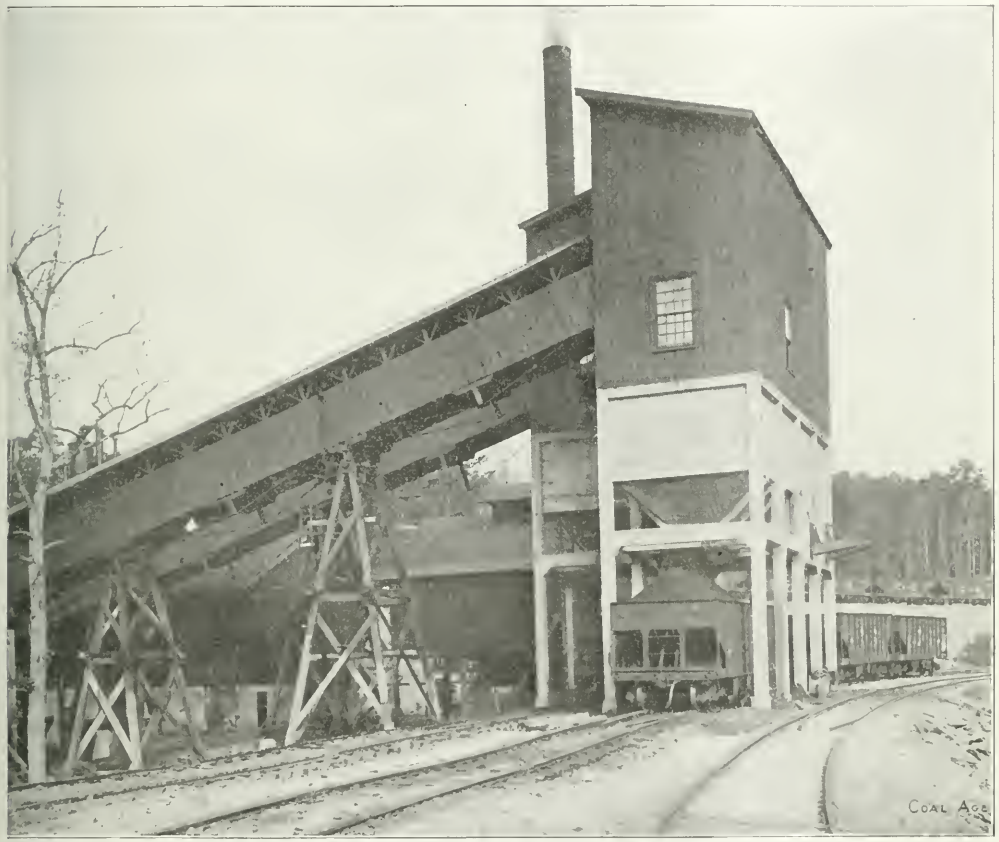
building are shown the two washed-coal inclined belt conveyors.

A foundation plan of the washer is given in Fig. 2. This shows the supports for the columns carrying the jigs and bins, also the location of the refuse conveyor, settling tanks, water tanks and circulating pumps. The refuse is carried to the conveyor by another cross belt conveyor between the two center rows of supports. These two rows of supports are arched together just below the jig floor line supporting one row of pillars from there up. A cross-section of the washer is given in Fig. 3, and Fig. 5 is a view of the jig floor taken before the curtain walls were put in, showing jigs, line shaft and sprocket drives for refuse elevators. It will be seen from these that there are two sets of tracks, jigs, settling tanks and washed-coal elevators, so that the treatment and loading of the coal from each of the two operations is kept entirely separate.

By referring again to Fig. 4, it will be seen that the main washer building consists of four floors, the top or corrugated-iron section being the raw-coal dumping floor, where eight cars (three of each kind of slack and two of each kind of nut) can be dumped at one time, four cars on each track. Under this are the bins, eight in number, four under each track, three for slack and one for nut; these were figured for 100 tons capacity each, but will actually hold 150 tons. Directly under the bins is the jig floor, and under this are the washed-coal sluiceways and refuse cross-conveyor belt. On the jig floor are the two rows of jigs, 10 on each side, six for slack 3-in. and under, and four for nut from 3 in. to 4 in. in size, the capacity of the whole being intended for 250 tons per hour, though they have washed 3500 tons in a 10-hour day.

The coal is dropped directly to the top of the jigs through round pipes or feeders. From the jigs it is sluiced, nut and slack together, to the two settling tanks from which it is lifted by short perforated bucket elevators and discharged onto two 24-in. inclined-belt conveyors, 190 and 220 ft. long, respectively, which discharge into the washed-coal bins.

The jigs are arranged in pairs and the refuse discharged by automatic slate gates which drop it into bins or tanks under each pair of jigs. From there it is lifted by short bucket elevators, one for each pair of jigs, and discharged onto the cross-horizontal belt conveyor running under the floor and from which it is discharged onto the final refuse 22-in. belt conveyor 1050 ft., run-



APPROACH ON LEFT AND TWO ELEVATORS TO WASHED-COAL STORAGE BIN ON RIGHT

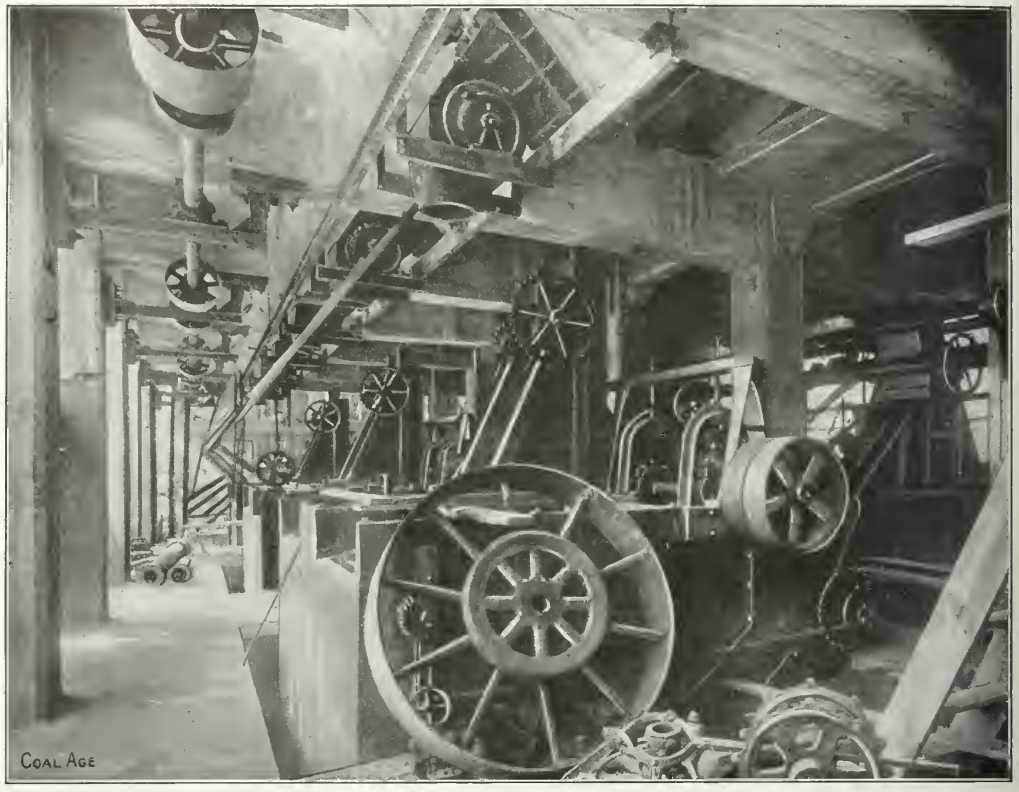


FIG. 5. JIG FLOOR, SHOWING JIGS, LINE SHAFT AND SPROCKET DRIVES FOR REFUSE ELEVATORS.—NOTE THE SUBSTANTIAL CONCRETE AND STEEL CONSTRUCTION OF THE MAIN BUILDING

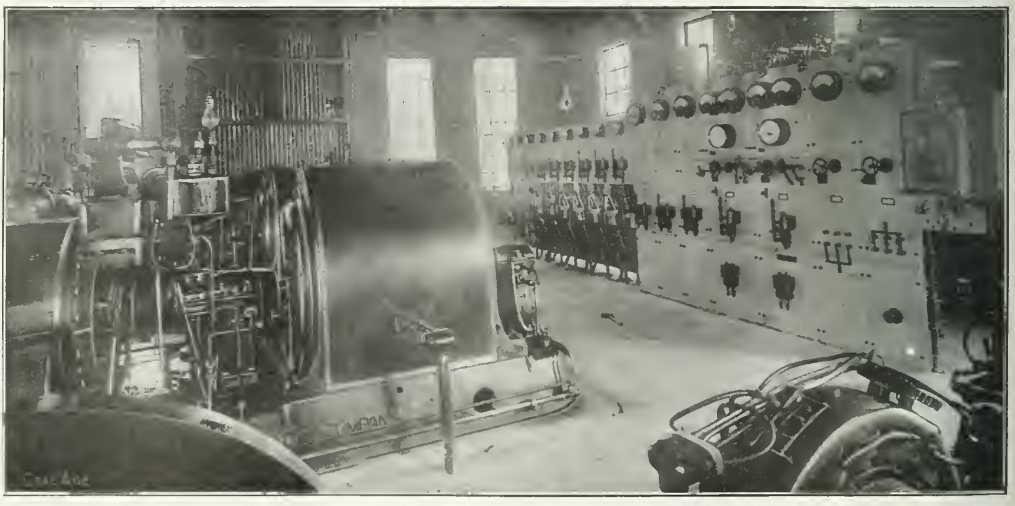


FIG. 6. INTERIOR OF POWER HOUSE, SHOWING SWITCHBOARD, ONE GENERATOR AND EXCITER. THE BUILDING IS WELL LIGHTED AND HAS CONCRETE FLOOR

ning at a slight elevation, which discharges over a ridge west of the washer where it is washed down the hill. A photograph of this last mentioned conveyor is shown in Fig. 7.

The water is pumped from Black Creek by an Alberger, single-stage, centrifugal pump through the condenser to a well or cistern. From here it is picked up by two De Laval single-stage centrifugal pumps, running at 1800 r.p.m., driven by 35-hp. General Electric induction motors, and having a capacity of 2300 gal. per minute.

The boiler plant consists of two batteries, each of two Sterling water-tube boilers, the total rated horsepower being 1000. These run two General Electric, turbine-driven, horizontal, 500-kw., 3-phase, 60-cycle, 2300-volt A.C. generators, which supply power for the whole washing plant, as well as the pumping and ventilating at the

FIG. 7. A 22-IN. BELT CONVEYOR 1050 FT. LONG

Acmar and Margaret mines; they will also furnish power for hoisting at the Margaret mines, where they are now installing a General Electric, 350-hp., 2300-volt, water rheostat, induction-motor gear, connected to the drum-shaft by cut-steel herring-bone gears.

An interior of the power house, showing switchboard, one generator and one exciter is shown in Fig. 6. The power for operating the jigs is furnished by two General Electric, 75-hp., 900-r.p.m., 2300-volt, induction motors, belt-connected, by toggle-clutch pullies to the two line shafts. Each jig is belted through tight and loose pullies to the line shaft, so that any one jig can be cut out at any time without disturbing any other operations. The washed-coal elevators are driven by cut-steel sprockets from the line shafts. The refuse conveyor is driven 100 ft. per minute by a General Electric, 25-hp. induction motor. The speed of the washed-coal conveyor is 450 ft. per minute.

The American concentrator type of jig consists of a fine mesh, stationary screen over the front half of the jig tank with a square wooden plunger which acts as a valve, the water being introduced on the upper side and drawn into the tank on the up stroke. This type of plunger was unsatisfactory, being difficult to keep in repair and the maintenance cost was also high. Hence a cast-iron circular plunger was designed especially for the work, with eccentrics running in oil, the oil casing being of cast iron bolted to the top of the plunger. Detail of this plunger is shown in Fig. 8. This plunger is giving excellent results, the wear being almost entirely eliminated.

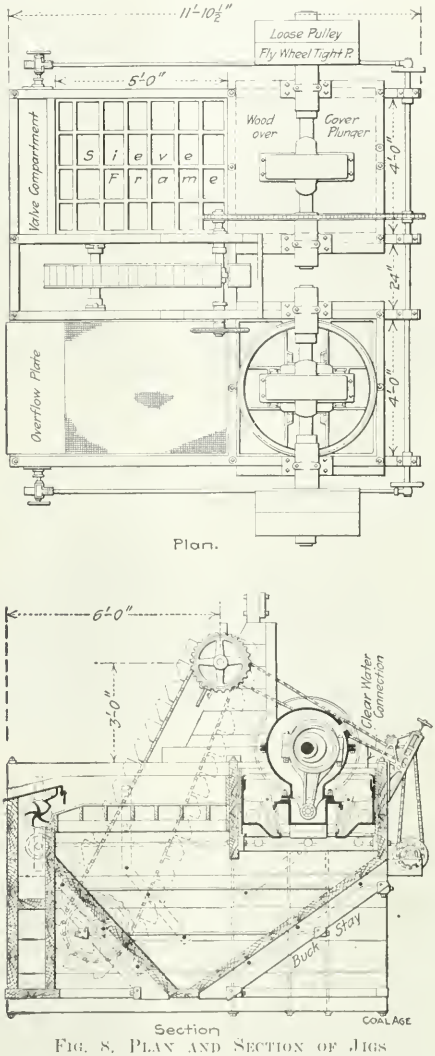
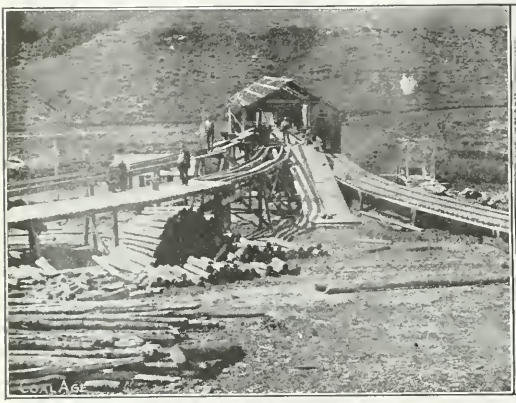


FIG. 8. PLAN AND SECTION OF JIGS

A crusher and rewashing jig with independent motor drive were provided for rewashing the refuse to save the fine coal lost in the primary washing, but the refuse is only 5 per cent. good coal and the rewashing of the refuse was abandoned, not being considered worth the cost and annoyance it entailed.

The custom of whitewashing the surface of loaded coal wagons has been inaugurated in Germany as a security against coal pilfering during transportation. Where the experiment has been tried it is said to have been successful.

SNAP SHOTS IN COAL MINING



MONTANA COAL & IRON CO.'S MINE, IN BEAR CREEK FIELD

THE ANACONDA COPPER MINING CO.'S COAL MINE, AT BELT, MONT.

TIPPLE, COKE OVENS AND COAL BREAKER, ELKINS COAL & COKE CO., BRETZ, W. VA.

ANOTHER VIEW OF THE ELKINS COAL & COKE CO.'S BEEHIVE OVENS AT THEIR BRETZ PLANT

NORTHWESTERN IMPROVEMENT CO.'S TIPPLE, AT SUNSET MINE, RED LODGE, MONT. ALSO SHOWS HIGH TIPPLE APPROACH

MINE FAN AT NO. 1 PLANT OF DIAMOND COAL & COKE CO., DIAMONDVILLE, WYO. AN OLD-TIME INSTALLATION

Tipple and Power House, Clear Fork Coal Co., Jarrolds Valley, W. Va.

British Sovereigns Visit English Colliery

General View of Dalton Main Collieries

Queen Mary Inspects the Plant

The Queen Rides on Hand Car

King George Viewing Memorial

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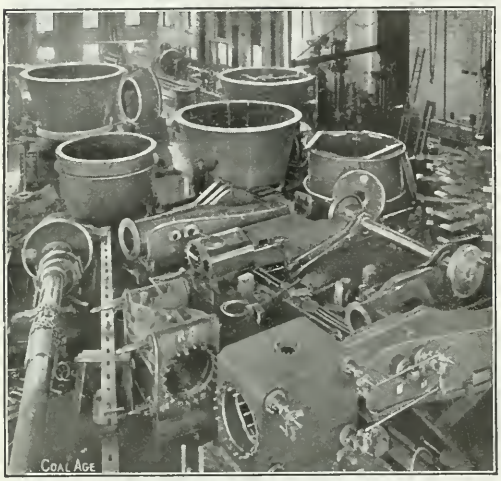
A Large Steam Mine Hoist

By L. F. Mitten

SYNOPSIS—The drums of this machine are conical, 10 to 14 ft. in diameter and 8 ft. long, weighing 40 tons each. The valve gear is so arranged that the engines may be started on the throttle, but when up to speed, the steam is used expansively.

The Delaware, Lackawanna & Western R.R. Co., coal-mining department, is now installing at the Loomis colliery, Plymouth, Penn., two pairs of 34x48-in. first-motion, link-reversing, heavy-duty, Corliss-type hoisting engines, which were built by the Vulcan Iron Works, of Wilkes-Barre, Penn. Engines of this kind are, to a certain extent, an innovation in the anthracite region, and a description of them will, no doubt, be of general interest.



Hoist on Assembling Floor. Note Man beside Hoisting Drum

The engines are equipped with two conical drums, each tapering from 14 ft. to 10 ft. in diameter, and are spirally grooved for 1½-in. wire rope. One drum is securely keyed to the engine shaft, while the other is brass bushed and driven by a toothed clutch-wheel, to allow for changing for different levels. The engines are reversed by an independent steam cylinder, while the brakes on each drum are also operated by this same type of mechanism.

In addition to the steam brakes auxiliary hand brakes are provided. The engines are equipped with tail cross-heads provided with guards. Sheet-steel crank or splash shields are also furnished, which cover entirely the crank disk.

The arrangement of throttles is also different from the general practice as followed in the coal regions. On top of each cylinder is placed a vertical throttle-valve, surmounted by a steam separator. These valves are operated simultaneously by a cross shaft.

In the overhead steam pipe is mounted an auxiliary throttle, which is used in emergency. The valve motion is of full Corliss type, provided with dash pots. The cylinders are fitted with Vulcan improved releasing-valve gear. The actuating forces of the catches are a combination of hand-adjusted springs and gravity. The trips or releasing motion instead of being controlled by the ordinary type of Corliss governor, are operated from the throttle lever.

The first two or three revolutions of the engines are with a long cutoff, the throttle being only partially opened. A complete advance of the throttle lever, after the engines have gotten up to their full speed, throws into gear the trip motion, and the engines use steam expansively for the balance of the hoist. The cylinders are also fitted with a bypass arrangement, allowing the engineer to lower a load under compression. A foot treadle is conveniently located for this service.

These engines are to handle 100 cars per hour in a vertical shaft. Each hoist will be used for raising coal from lower levels up into the tower by means of self-dumping cages. The maximum depth of shaft at present is 900 ft., but this will ultimately be increased to about 1575 ft. The cages weigh approximately 13,000 lb. each, the empty car 3000 lb. and the coal 8000 lb.

We illustrate the conical drums that are used on these engines. As previously stated, they are 10 ft. to 14 ft. in diameter, and have a face of about 8 ft. Some idea as to their size can be formed by comparison with the man who stands alongside. Each section of these drums, together with its spider, weighs approximately 40 tons.

Coal Mining in Southern Shantung

The most successful coal mine in all Shantung Province is that of the Shangtung Chung Hsing Mining Co., a Chinese concern operating in the vicinity of Yi-Hsien, southern Shantung. In fact, these mines seem to have been the only ones operated in Shantung at a profit. The capital of this concern is $2,450,000 gold. The company is operating eight shafts and has just equipped its newest operation with modern machinery.

The machinery for this mine was supplied entirely by German manufacturers, who advanced a loan of 80,000 marks (about $19,000) to the company in connection with the installation of the machinery. The plant includes 10 boilers, pumps, elevators, electric machinery and cars. The company operates 27 miles of railway in connection with the mine, and for the construction and equipment of this railway German capital and materials were used.

Previous to the construction of the Tientsin-Pukow Ry., the company's products were shipped via the Grand Canal, but now practically all of its coal is shipped over this railroad. The company states that shipping over the canal costs 3c. Mexican a ton-mile, while shipping over the railroad costs but 2c. The coal, which sells at the mine for $2.25 gold a ton, is a first-class bituminous.

The chief engineer and the first assistant of this company are Cantonese who were trained at Tong Shan in Chihli. They have had no foreign assistance in the construction and operation of the company's plant. The chief engineer receivers $120 gold a month and his assistant one-half this sum. All of the labor in the mine is on a contract basis, the native miner making an average daily wage of about 10c. gold. There are about 800 men employed on the company's premises.

Compressed Air Trouble in English Mine

By Frank Richards*

SYNOPSIS—Extracts from a recent letter describing, briefly, trouble experienced in transmitting power by compressed air long distances, in an English coal mine. Pressure drop quoted as being 80 per cent. The situation carefully analyzed on assumed conditions. The importance of high initial pressure and ample pipe capacity clearly demonstrated. The pipe capacity does not increase in the same ratio as the diameter of the pipe. Large pressure drop may be economical in certain work. It does not always indicate loss of power.

I am pleased to lay before the readers of Coal Age the essential portions of an interesting letter recently received from the manager of a large English coal mine. The writer says:

We have at this colliery a large compressed-air installation. The compressor consists of a cross-compound condensing steam engine and a two-stage air compressor with a capacity of 9000 cu.ft. of free air per minute. We have about 13 miles of pipe, which comprises two mains, each 4 miles long; two mains, each 2 miles long; and various lengths of tappings, making a total of about 13 miles.

The air pressure, at the compressor situated on the surface, is 52 lb. gage, while at the two ends of the 4-mile mains (especially in the winter time, or in cold weather), the pressure varies from 10 to 14 lb. gage, which shows a loss of from 73 to 80 per cent. As the entire colliery depends on compressed air for driving the hauling engines and pumps (not coal cutters), this great loss is an important item. If you can suggest a way to reduce this loss of power it will be welcome information.

The shaft is 1690 ft. deep. Would covering the pipes leading down the shaft, with some nonconducting material, such as boiler covering, be of any use? The temperature of the air leaving the compressor is 250 deg. and at the shaft bottom it is only 90 deg. F.

A Suggested Analysis

In answer to the question asked in this letter, allow me to say nothing could be gained by covering the pipes. When air is transmitted to such distances, it invariably attains, more or less closely, the temperature of the surroundings. This is quite plainly the case here where the temperature of the air, in going only a third of a mile or so down the shaft, has fallen 160 deg. F.

It would seem, at once, that this is a case of too low initial pressure, very common in English mining practice, and an insufficient pipe capacity. It is much to be regretted that no information is given regarding the size of the pipes, which is a most important particular.

In the absence of any statement to the contrary, we may assume, at first, that the pipes are without leakage, which may or may not be the case. Air pipes with proper attention are less likely to leak than steam pipes; but often they do leak more, because the air leak does not sizzle and drip and compel attention, as do steam leaks. That air-pipe lines may be made tight is attested by the many long pipe lines in use and kept at full pressure in switch and signal service; and by the many-jointed and valved air-brake pipes, in service on trains.

We would, in the present case, shut off everything, at the extremities of the lines or wherever the air is used; and pump up to maximum pressure, at the compressor; and observe how this pressure holds. If the pressure continuously drops there are, of course, leaks and these must be found and stopped. If the pipe is properly laid at first, there should be no leaks and none are likely to develop later. But leaks, however small, will grow bigger and become more and more difficult to stop. It is unfortunate for anyone who has to do with compressed air to assume that leaks are a legitimate part of the game. On the contrary, they show a poor installation.

Pipe Capacities

The Johnson formula, for the flow of air in pipes, which is quite generally used, for sea level, with a slight change of the constant, is as follows:

$$p_1^2 - p_2^2 = \frac{V^2 l}{2000\, d^5} \qquad (A)$$

Here, V is the volume of free air, in cubic feet per minute; l is the length of pipe, in feet; d the diameter of the pipe, in inches; p_1 the initial absolute pressure (gage pressure + 14.7, for sea level); and p_2 terminal absolute pressure.

The formula (A) may be transformed as follows, according to the purpose for which it may be used:

$$l = \frac{2000\, d^5\, (p_1^2 - p_2^2)}{V^2} \qquad (B)$$

$$V = \sqrt{\frac{2000\, d^5\, (p_1^2 - p_2^2)}{l}} \qquad (C)$$

$$d = \sqrt[5]{\frac{V^2 l}{2000\, (p_1^2 - p_2^2)}} \qquad (D)$$

In the case before us, the absolute pressure, at the compressor, is 52 + 14.7 = 66.7 lb. per sq.in.; and the pressure at the end is, say 14 + 14.7 = 28.7 lb. per sq.in., the difference or drop being 66.7 — 28.7 = 38 lb. This terminal pressure, by the way, is 43 per cent. of the initial pressure, and the percentage of pressure "loss" is only 57, instead of 80 per cent., as stated.

We are told that there are two 4-mile lines; and we may assume that each transmits about one-half of the air, so as to enable us to estimate the possible conditions. Say, then, that we have a 9-in. pipe (which we are aware is not a common commercial size), 4 miles long, transmitting, say 4500 cu.ft. of free air per minute, at the initial pressure of 66.7 lb. absolute.

By formula A, we have,

$$p_1^2 - p_2^2 = \frac{4500^2 \times 4 \times 5280}{2000 \times 9^5} = 3621$$

which gives the difference between the squares of the initial and terminal absolute pressures. But, $66.7^2 = 4449$, and $4449 - 3621 = 828$; and $\sqrt{828} = 28.7$, which is, therefore, the terminal absolute pressure. This shows a drop of 66.7 — 28.7 = 38 lb.

Noting the above result, obtained from formula A, taking the initial pressure at 52 lb. gage; let us now assume that the initial pressure was, say 100 lb. gage, or 100 + 14.7 = 114.7 absolute; and observe the difference. Now, since $114.7^2 = 13{,}156$, we have $13{,}156 - 3621 = 9535$; and $\sqrt{9535} = 97.65$, which is then the terminal absolute pressure. The pressure drop in this case is 114.7 — 97.65 = say 17 lb.

*Ingersoll-Rand Co., New York City.

This shows clearly what an increase of initial pressure will do toward reducing the pressure drop, in transmission. Without giving further figures, it may be stated that if, in the last case, the pipe had been 10 instead of 9 in. in diameter, the theoretical terminal absolute pressure would have been 105 instead of 97.65 lb., and the drop would then be only 114.7 — 105 = 9.7 lb. Thus, by adopting a suitable diameter of pipe the pressure drop, in transmission, may be whatever we choose.

Relative Capacities of Small Pipes

In many installations where the *mains* are of sufficient size, there is still a considerable final drop of pressure in branches and extensions that are too small. It is not sufficient to have the sum of the sectional areas of the smaller pipes equal to that of the main pipe that supplies them. The pipe areas are, of course, directly as the squares of the diameters. For example, a 2-in. pipe has one-fourth the area of a 4-in. pipe; but, for the same pressure drop, four 2-in. pipes, though having the same total area, will transmit much less air than the single 4-in. pipe, because of the greater rubbing surface of the former. If the four 2-in. pipes were required to transmit the same quantity of air, per unit of time, the pressure drop would have to be much greater.

It has been found, in practice, that the square root of the fifth power of the diameter approximates the relation of pipe capacities for delivering air. For example, as stated previously, a pipe of one-half the diameter of another has only one-fourth the area of the larger pipe; but it will not transmit one-fourth as much air, under the same pressure drop. For the same pressure drop, the ratio of air volume, in this case, will be

$$\frac{V_1}{V_2} = \sqrt{\left(\frac{1}{2}\right)^5} = \sqrt{\frac{1}{32}} = \sqrt{0.03125} = 0.176$$

Then, to transmit the same volume of free air, under the same drop of pressure, will require $\frac{1}{0.176} = 5.65$ of the smaller pipes. Or, say a pipe of twice the diameter of another will transmit 5.65 times the volume of air, with the same pressure drop, for any given distance and initial pressure. This difference becomes greater as the difference in pipe diameters increases. A pipe of only one-fourth the diameter of another will transmit not $\frac{1}{16}$, but $\sqrt{\left(\frac{1}{4}\right)^5} = \frac{1}{32}$ of the air volume, for the same initial pressure, pressure drop and distance.

Air Saved by Pressure Loss

It must not be supposed, however, that this drop of pressure, in transmission, always, means a loss of power. That will depend on the way in which the air is used in doing its work, after transmission. There might be cases where the pressure drop outlined in the above letter would mean a gain in actual power or a saving in air consumption, rather than the reverse; and, in that case, the loss of pressure mentioned might prove to be the most economical feature of the proposition.

The wasteful habit of the ordinary steam pump when driven by compressed air is notorious. Not only is the air used without cutoff for expansion while doing its work, and there are excessive clearances to fill; but, at the end of the stroke, the entire cylinder will fill with air at a pressure perhaps considerably above the required working pressure, equalizing the pressure in the pipe line. The greater this excess of pipe pressure, therefore, over that required for the pump, the greater will be the loss of air.

It is always desirable to transmit air at high pressures, for the sake of pipe-line cost, if long distances are to be traversed. While the air is at a high pressure, the opportunity is presented for draining the air, so that the later freezing of exhausts must be minimized. If the air is to be used at high pressure, as usually it should be, it ought to be used expansively and reheated, if possible. The various types of rock drills now in use call for pressures approximating 100 lb. gage, in order to develop the highest efficiency in the drills.

The indications are that, in the above colliery, the pumps and the haulage apparatus mentioned would be amply supplied, so far as pressure is concerned, if a 20-lb. pressure could be maintained. If the air were to be used at that pressure but reached the work, at a pressure considerably higher; pressure reducers should be employed at that point; and after reducing the pressure, the air should be reheated as near to the work as possible. In this case, the pipe line mentioned serves as a pressure reducer; but it seems to overdo the business. It is also, to a certain extent, a reheater; as the air, notwithstanding the drop in pressure, will generally reach the point where the work is to be performed, at a temperature close to that of its surroundings.

We may say that the case in hand is a bad one and cannot be improved without redesigning and reconstructing the entire system, the cost of which would probably be prohibitive. Leaks should be sought and stopped. With two-stage compression, the delivery pressure should approximate 100 lb. gage, or, say, at least, not less than 80 lb. gage. In the present case, however, this would prove of little advantage, unless arrangements were made to use the air economically. It seems quite evident that the "loss" of pressure, in transmission, in this colliery, is only an item that is by no means the chief element of inefficiency.

Survey Spads

For a number of years the standard spad for underground surveying was a horseshoe nail with the head flattened and punched or slotted to receive the plumb-bob cord. The *Engineering and Mining Journal* states that a few years ago, a substitute was proposed consisting of a wire nail with a triangular file-cut halfway through the rim of the head, the nail being inclined when driven, so as to bring the notch on the upper edge of the head. Considerable experience with both types has brought out the following points:

(1) The wire nail is stronger and better resists chance blows or blasting, if set near the face.

(2) It is cheaper and easier to make.

(3) It makes the plumb-bob easier to hang in the first place, but slower to adjust for height.

(4) It is more accurate. Any one size of plumb-bob cord can occupy but one position, whereas in a hole the cord can climb the side and be off-center by a small fraction of an inch.

(5) It is not suitable when it must be set in a position difficult to reach. In such cases, it is customary, with the old-style spad, to hang a permanent loop of cord down to a point within easy access. This is not possible with the wire nail.

The Gas and Oil Well Problem

By R. Dawson Hall

SYNOPSIS—The Bureau of Mines called a conference of those interested in the drilling of gas and oil wells through coal beds. The Federal authorities opened the discussion but did not try to influence the decision of the meeting. However they presented some extremely helpful suggestions.

It was my amiable intention to praise the admirable suggestions made by the engineers of the Bureau of Mines in relation to the protection of mines from gas and oil wells. Unfortunately, I was enjoined to say that the Bureau really had no suggestions, nor even any working hypotheses; that all which was said at the Pittsburgh conference was intended simply as a quickener of interest to awaken discussion. It was darkly hinted that the Bureau secreted its judgment "*in petto*," so to speak; everything was unauthorized and inchoate.

The Attitude of the Bureau

I confess that I could hardly credit that G. S. Rice and O. P. Hood did not really feel their solutions were the best which they could devise, and any attempt to shake their confidence in the cures suggested met with their spirited, though courteous dissent. It did not appear that they were presenting merely the consensus of ideas urged at the various ex-parte conferences. The suggestions did not seem a composite of jarring interests, but rather the personal preferences of those presenting them.

Naturally the Bureau does not desire to appear to be coercive and would not like to have its working hypotheses used as expert testimony in a court of law. Moreover there are only too many worthy people who desire to see a pallid, limp institution, rather than a Bureau of fearless initiative. In fact, in this country little is less free than our governmental bureaus.

The Representatives Present

The meeting was held in the auditorium of the Western Pennsylvania Society of Engineers in the Oliver Building, Pittsburgh, Penn., commencing Friday morning, Feb. 7 at 10 a.m. W. E. Fohl was made presiding officer and O. P. Wood, secretary. The meeting was not largely attended, but was fairly representative, and those present were of sufficient importance in their various fields to make their judgment felt widely. A few may be mentioned:

E. J. Taylor, Pittsburgh, Penn., chief engineer, Pittsburgh Coal Co.; W. C. Neill, Pittsburgh, Penn., attorney, Manufacturers Light & Heat Co.; F. W. DeWolf, Urbana, Ill., director State Geological Survey; Richard R. Hice, Beaver, Penn., state geologist; A. P. Cameron, Irwin, Penn., general superintendent, Westmoreland Coal Co.; A. C. Beeson, Pittsburgh, Penn., chief engineer, Wm. A. Weldin, Pittsburgh, Penn., assistant chief engineer, Pittsburgh-Buffalo Co.; B. H. Canon, Pittsburgh, Penn., United Coal Co.; George W. Schluederberg, Pittsburgh, Penn., general manager, Pittsburgh Coal Co.; A. J. Moorshead, St. Louis, Mo., president, Madison Coal Corporation, representing Illinois Coal Operators' Association; E. B. Moore, Fairmont, W. Va., chief engineer, Consolidation Coal Co.; John W. Boileau, Pittsburgh, Penn., coal operator, David Young, Freeport, Penn., state mine inspector, and George S. Rice, chief mining engineer; O. P. Hood, chief mechanical engineer; H. M. Wilson, engineer in charge, and Irving C. Allen, petroleum chemist, all of the United State Bureau of Mines, Pittsburgh, Penn.

A paper was read by G. S. Rice entitled "Gas and Oil Wells in Coal Fields." The most novel feature in this paper was its reference—I had almost said its "advocacy" of the withdrawal of coal around gas wells. But it did not arouse any discussion because neither this paper nor the one which followed, nor even the preamble of the third paper, was presented for criticism.

Why Leave Well Pillars?

The proposal that coal around wells should be extracted has some merit as a suggestion, but as presented it cannot be regarded as without serious objection. The parent of the idea—for Mr. Rice acknowledges that he suggested it—calls attention to the success with which pillars have been drawn around shafts by the longwall process both in England and America.

But I may be pardoned if I call attention to an essential difference in the plans presented. The workings around such shafts proceeded from the axis of the shaft as a center, but the illustration of Mr. Rice exhibited a well in a room from which the pillars were being extracted back toward the borehole. Thus the well lay in a piece of rock unsupported at one end. Even before fracture would take place, the borehole would be tilted out of plumb and a partial breakage of the rock might distort the hole so that gas or oil tubing would be broken.

Where Well Pillars Might Be Extracted

There is a method of action providing strains more closely analogous to those sustained by a pillarless shaft in longwall. A plan known as the "double-entry system" in America, and I believe as the "wicket" system in England consists of rooms driven from two headings to meet at the center line between them. A hole sunk on that center line would be free from warping provided that the ribs were withdrawn to the right and left, beginning at the room where the hole was located.

The plan would be successful only where it is arranged that the borehole will be at the center of excavation at all times prior to final collapse. One cannot feel confident that even with careful scheming such a result could be attained, unless the privilege to drill were immensely restricted.

Even though the discussion did not take up this essential consideration on the ground that it formed no part of the proposed legislation, E. B. Moore, chief engineer of the Fairmont division of the Consolidation Coal Co., declared himself unchanged in his views on the importance of pillars.

To Fight Legislation with Legislation

A paper followed by L. M. Jones on "Some Troubles Experienced by Mines Resulting from Proximity to Gas and Oil Wells." This paper reviewed the unfortunate experiences which have already occurred. It can only be said that they justify the Bureau in taking up this subject. What do the stand-patters want? Are they anxious that the mining public wait and learn their lesson from a disaster of a magnitude equal to that at Monongah or Harwick, before any preventive action is taken?

A third paper by O. P. Hood and A. S. Heggem made

"Suggestions for Laws and Regulations in the Matter of Boreholes Passing Through Workable Seams of Coal." The actual draft of law with which that paper concluded was read clause by clause and criticized carefully till the close of the meeting shortly after noon on Saturday, the 8th.

The Attitude to the Proposed Department

Richard R. Hice opposed the suggested creation of any more departments in the various states. He thought there were already too many. O. P. Hood conceded that all the services of state geologist, mining and fuel-well inspector might be grouped under one and the same head. F. W. DeWolfe speaking for Illinois, regarded it well not to put the authority in the hands of the mine inspectors because many parts of his state, underlaid by unworked coal, were being drilled for gas and oil. The inspectors already appointed could not supervise these drillings. G. W. Schluederberg favored leaving the matter to the Department of Mines.

Discussing notification to parties interested before locating a borehole, it seemed generally conceded that a certain period of notice—a week or ten days—should be sufficient. In the event of the coal operator failing to arrange to be present or represented in that time, his absence should not act as a stay to prevent location and license. It was suggested that the mine owner, fuel-well inspector and mine inspector should not be the only persons notified, but that the lessor of the coal and of the oil right was entitled to a notification and hearing.

To Reduce Surveying Inaccuracies

It was asserted that the demand for an accurate survey was deficient in several points. It calls for a connection with two property lines. This gives an assurance that the meridian of the survey can be accurately determined if the corners of the property are obvious and undisputed, and if the survey is correct. But from experience, it is unlikely that either need will be fulfilled. Fuel-well surveying, with some noteworthy exceptions, is grievously inaccurate, and land lines are in nearly every case indeterminate.

Consequently, it was suggested that all surveys be made to connect with the U. S. Geological monuments, or with certain arbitrary monuments set in new fields in cases of "wildcatting." There is a strong objection to reliance on a survey connected by long lines from some distant monument, no matter how permanent it may be or how carefully recorded.

Essential, it seems to me, is a requirement that all surveys be carefully duplicated along separate lines, not only because a competent surveyor will thereby discover his error, but because a novice and ignorant practitioner can be unmasked infallibly by a careful traverse of his survey. A diligent traverser at headquarters working in dubious cases could make it extremely unpleasant for such a man and his employers.

Are Churn and Diamond Drill Holes a Menace?

Exception was taken, and I believe rightly, to the requirements that "any borehole drilled for gas, oil or other mineral shall be drilled at least 20 ft. below any workable seam of coal which may be penetrated," and be double cased and mudded and so forth. This would include churn and diamond drillings, and only for the inadequate reason that gas or oil might be struck.

Surely the gas and oil inspector ought to be the judge of the matter. It should not be required that such test holes be extended 20 ft. beyond their needed length. Water and elevator wells possibly should so extend to protect the pipe from breakage when mining reaches the well but test holes if immediately plugged and filled should be safe, and made free from all such unreasonable requirements.

The Clay Packing

The proposition advanced by G. S. Rice and O. P. Hood that above the workable coal and for a certain distance thereunder, two casings should be provided and the space between them filled with clay is as sane and sound a proposition as has yet been heard. Fault can be found with it but criticise it freely as you will, it is based on correct prineiples:

The scheme as outlined is probably insufficient; it is hard to place the clay and difficult to retain it in place; the plan has not been submitted to test and sufficient emphasis has not been laid on the ductility of the casing or of the tubes within the well, and the method involves a larger hole than has been hitherto provided. These are important objections it is true, but as an indication of the right lines for future progress, no better suggestions have so far been made.

Make no question but that all the specifications of all the coal companies have been worse than useless as have been the orders of the court. How can any number of casings laboriously placed and diligently concreted be expected to resist the movements of millions of tons of rock. Our final "caves" frequently involve not less than a million tons, and often five million tons tilt over in one body. Against this we oppose a miserable pipe stem incapable of upholding an axial load of a few hundred tons.

The Elastic Casing

It has always been marevelous that such a false protection received almost the unanimous approval of the coal-mining fraternity, and Mr. Hood is to be congratulated that he is leading what, at first sight, appears to be a forlorn hope against it. Yet his ideas are sure to succeed for nothing is more certain than that casings should be elastic.

What chance has a casing with its joints imbedded in concrete or cement mortar, with that material hanging doggedly to the roughnesses and recesses of the borehole, when the rock to which it thus adheres falls, subsides or take a tilt?

Surely none whatever, but if the pipe rested on supports from the surface or stood on the unyielding measures below, without restraint from the environing walls, it could be relied upon to slide up and down the hole as the movement of the measures rendered that motion necessary, provided always that the distortion of the hole did not suffice to bind the pipe.

It is true that the concrete has been provided to keep corrosive waters from destroying the casing. This it may do in some instances. As Mr. Hood pointed out, the rapidity of the corrosion is a function of the frequency with which the corrosive waters are replenished and cement mortar or concrete may well serve to reduce the frequency of that change, even when porous and filled with air holes.

Imperfections in Cement Mortar

But it is notoriously hard to keep airbubbles and resulting voids out of concrete, even when the material is deposited in large bulk and the air is given a vent by a shovel, a paddle or some form of tamping tool. In the depths of the well, the only hope is that the increased pressure will make the air bubbles smaller.

The quantity of air introduced with cement mortar in a deep well must be larger because as it falls down the annular space, the air has less chance of escape. It may be reduced in quantity by the use of a lowered pipe by which the mortar is conveyed in an almost continuous stream to the point of deposit. It is impossible to make this continuous, however, and some air must enter.

But there is probably a solution of this difficulty. The clay in the alternative clay filling could be ground somewhat coarsely so that there would be plenty of granular material for settlement. The pressure of the water in the hole would probably serve to make a complete fill.

Vented Pipe Lines

The suggestions presented by the bureau officials laid particular emphasis on the providing of a vent around the pipes. It was stated that it was customary to convey gas from sands of low pressure between the casing and the outermost gas tube. Should the gas traveling this pipe be closed off, a heavy gas pressure would soon result. This gas is likely to escape from the casing if that pipe should be corroded or torn apart. Of course a gas company might leave all manner of instructions forbidding the shutting off of the gas from the line without opening a vent to the surface but such instructions might well be forgotten or disobeyed.

The gas and oil men who showed all through the meeting a disposition which does them no little credit seemed at this point prepared for opposition. The representative of the gas interests near Fairmont, W. Va., stated that there were 11 sands making gas in that section. He said that this involved the placing of a great number of pipes in the well as the pressures from the different strata did not permit of the use of a single tube. He concluded by saying that the hole would be rendered so large, if a vent were provided, that a heavy burden would be put on the gas companies.

Mr. Hood answered his criticisms with much justice stating that perhaps the gas men demanded too much from one hole. If there are so many profitable sands, the necessary steps for their safe tapping should be provided and if it could not be done satisfactorily by one hole, two could be drilled in close proximity.

Plugging Abandoned Wells

The question of abandonment was warmly debated. It was thought by some of the coal men that it was impossible to plug a gas well satisfactorily if the rock pressure was extremely high. A well having a negligible gas flow may develop a rock pressure of 1000 or 1200 lb. per sq.in. Such a well is hard to plug even with lead.

As Mr. Hice pointed out, a lead plug, however tight, may fail to keep back the gas by reason of leakage through the strata as the plug cannot be made sufficiently long to prevent such by-passing of the gas. The consensus of opinion seemed to favor the idea that the method of plugging should be settled by the inspector.

(To be continued in the next issue)

The Bohunk

Written Expressly for Coal Age.

By Berton Braley

[In several coal-mining camps the term "bohunk" is applied to the men of any race, who live in herds, speak no English, and have no independence, no pride, no desire apparently, to be human beings. In short, the lowest class of European Labor is the Bohunk.]

We never loved the Bohunk an' I guess we never will,
He ain't the sort of person you kin cheer for,
He hasn't got no decency ner self respect, ner skill
An' a job at any price is what he's here for.
He lives in dirt an' squalor, sleepin' seven to a bed,
In a tumble-down old shack that was a cabin,
An' work an' sleep an' eatin' is the thoughts that fill his head,
While his favorite amusement is a stabbin'.

We do not love the bohunk,
We never liked his style,
He hasn't got no winnin' ways,
He don't know how to smile,
He often pays to git his job,
A fact that's plain for seein',
But we don't like the bohunk, for
He ain't a human bein'!

The husky guy from Tuscany is just as good as us,
The proper sort of Finn is all the candy,
An' the Frenchy an' the German an' the Spanish an' the Russ,
You take 'em as a rule an' they are dandy.
But the Bohunk is a dummy an' a rummy an' a clam,
He's a lowly beast of burden like a mule is,
An' I'd rather be a comrade of a native of Siam
Or the chum of any yellow brand of coolies.

We do not love the Bohunk,
Which doubtless is a sin,
It ain't the ugly face of him
Ner the color of his skin,
But he doesn't love his feller man
Ner yet his feller woman,
An' he ain't a decent animal
Ner yet a decent human!

The bohunk takes his money an' he sends it over sea,
He never goes an' spends it where he makes it,
He comes to get his wages in this country of the free,
An' when the land has paid him—why he shakes it!
An' though he joins the union, he's a crooked scab at heart,
There ain't a single soul he seems to care for,
I kin like a decent *nigger*—but I found out at the start
That the Bohunk I ain't any love to spare for!

We do not love the Bohunk,
No matter what his race,
We never want to shake his hand,
We want to break his face,
For when all is said an' spoken,
It is plain for any seein'
That the Bohunk may have feelin's,
But he ain't a human bein'!

CURRENT COAL LITERATURE

Motor Truck Coal Shoveler*

A mechanical shoveler mounted on a motor truck and suitable for loading coal at a storage pile is described in Glückauf, Dec. 14, 1912, by O. Dobbelstein, a mine assessor, of Essen, Germany. It is built by the Pohling Aktien Gesellschaft, of Cologne, Germany.

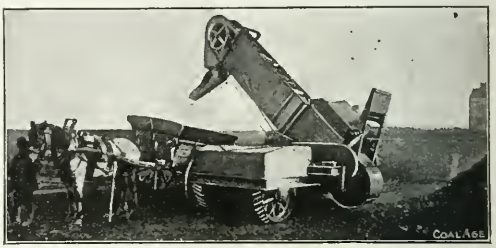
The shoveler is mounted on a strong platform truck having wheels of wide tread roughened as is customary for traction-motor service. The machine proper consists of an inclined bucket conveyor which is supplied with coal by a mechanically operated shovel. This is shown in the cut, lifted clear of the ground into the discharging position. The coal is dumped by a chute into a railroad car, wagon or dump cart.

The truck, conveyor and shovel proper are driven by a benzine or electric motor situated at the front end of the truck. This is covered by a hood, but even that is concealed in the illustration by the side boards of the conveyor. A differential gear acts upon the rear driving axle, and the front axle of the truck as in automobiles has a knuckle joint.

Shovel Actuated as by a Man

The shovel is actuated by a crank drive which causes it to move in a manner similar to that of a hand shovel. It is first slowly crowded into the pile close to the ground, then it rises and throws the coal backward into the conveyor. The scoop is not fixed solidly in its frame but is so arranged that when it emerges from the pile it tilts back and so retains the coal which would otherwise spill at its edges.

The conveyor, with shovel and drive, is mounted on a carriage which can be moved at right angles to the path of the truck, so that as removal of the coal progresses, the shoveling outfit can be shifted to the extent of about 40 inches.



A Motor Truck with a Shoveling Attachment and a Conveyor for Loading Wagons with Coal

Where the shovel is to be moved long distances and the ground which it must traverse is irregular, the conveyor which is 17½ ft. high, may be swung around till lengthwise of the truck. The gage of the vehicle is about 5 ft. 6 in.; the wheel pressure behind is 2.2 tons and in front 2.9 tons.

The consumption of power by the motors averages from 12 to 15 hp. with a maximum of 20 hp. The shoveler costs about $5000 and will handle from 39 to 65 cu.yd. per hour.

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Why Proximate Coal Analyses Differ†

By A. C. Fieldner‡

SYNOPSIS—Proximate analyses of coal samples of identical composition may vary greatly even when made by chemists of undoubted ability and according to recognized standards. Thus the moisture content found may vary with the chemist, and the ash percentage of two determinations of one coal may vary 1 per cent. The content of fixed carbon and volatile matter found by two chemists with identical samples may differ by 4 per cent. If samples can be taken which accurately represent the coal in the bed, the sulphur percentage as determined by two chemists will usually agree within 0.05 per cent. Oxidation is the cause of errors in the moisture determination. Inequality of the heat applied, in the ascertaining of fixed carbon, volatile matter and ash, occasion the irregularities found in estimating their percentages.

In recent years, chemical and physical tests have come into use in connection with the mining and utilization of coal. Within certain limits these tests are useful, not only in establishing the fuel value, but in directing the coal into the market for which it is best adapted, and of maintaining the standard of the output to meet the requirements of this market.

Proximate Analyses of the Same Coal Vary

The growing practice of buying on specifications demands accuracy and strict uniformity in the methods of sampling and analysis. Chemists who make only occasional examinations of coal do not, as a rule, realize the empirical nature of the proximate analysis, and while they may obtain concordant results, as far as their own laboratories are concerned, their determinations may not agree with those obtained in another laboratory.

These discrepancies, which are more likely to occur in some determinations like those of volatile matter or of fixed carbon, tend to discredit the whole analysis in the eyes of those engineers who are not familiar with the difficulties peculiar to each individual determination. The object of this paper is to call attention to the fact that some constituents may be determined much more accurately than others, and to present some experimental

*Abstracted by E. P. Buffet, from the German.

†Part of paper entitled "Accuracy and Limitations of Coal Analysis," read before the Coal Mining Institute of America, at the winter meeting, Dec. 19, 1912.

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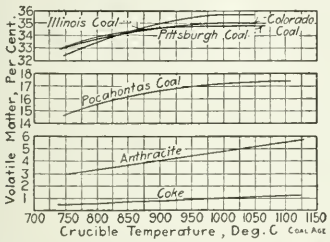
data bearing on the variations which are likely to occur in good laboratory practice.

Tests Vary with Nature of Service to Be Rendered

Coal is used principally for fuel purposes; hence its value, other things being equal, is proportional to its calorific power. The different kinds of coal, however, vary greatly in character, so much so that each has its own particular field of usefulness. For instance, a Pittsburgh steam coal cannot be burned efficiently in an anthracite furnace, nor can a coal high in sulphur or phosphorus be used for the manufacture of foundry coke.

Certain other tests, then, are also required, and for this purpose, we have the conventional proximate analysis and the sulphur or phosphorus determinations. While these tests may be sufficient for most industrial purposes, it is desirable at times to know the elementary composition of the coal as shown in an ultimate analysis, and to ascertain its clinkering properties as indicated in the relative fusibility of the ash. No doubt other tests more suitable for individual needs will come into use as the chemist learns what coal really is.

For fuel purposes the constituents of coal may be grouped into the following three classes: 1. Water or moisture. 2. The mineral impurities which remain in a



Curves Showing Variation of Volatile Matter with Temperature

somewhat altered condition, as ash on burning the coal. 3. The organic or combustible matter, which, like the original vegetable matter, is composed mainly of the elements carbon, hydrogen, oxygen and nitrogen.

The Empirical Substitute for a True Moisture Determination

Moisture may be accurately determined in an inorganic substance like iron ore by drying the material at a temperature slightly above the boiling point of water and noting the loss in weight. The same method when applied to coal is complicated by the oxidizing tendencies of the organic compounds, and the possibility of loss of some water of composition at the temperature of drying.

The present methods of analytical chemistry do not distinguish with certainty between added moisture, that is water which is simply mechanically held by the coal particles, and water which may be in some unstable chemical combination in the coal substance. The usual method of drying a pulverized sample for one hour at 105° C. (221° F.) is, therefore, somewhat arbitrary, and to secure uniform results a strict adherence to a standard method of procedure is necessary.

In the Bureau of Mines method[1] the moisture is determined in two stages: (1) The coarse sample received by the laboratory is pulverized to ¼-in. size and then air-dried at 30° to 35° C. (86° to 95° F.). The loss in weight, which is called the air-drying loss, includes all the superficial and a large portion of the loosely retained moisture.

(2) The air-dried sample is then pulverized in a closed ball mill to avoid loss of moisture, mixed and sampled down to a small, powdered sample in which the residual moisture is determined, by heating 1 gram for 1 hour at 105° C. (221° F.) in an oven through which dry air is being circulated. By this method duplicate results in the same powdered sample seldom vary more than 0.15 per cent.

Intrinsic and Extraneous Ash

Ash is the incombustible residue left on burning coal. It is derived from the mineral impurities in the fuel and is largely composed of silica, alumina, lime and iron compounds, together with smaller quantities of magnesia, titanium and alkali compounds. The silica, alumina and titanium are derived from sand, clay, shale and slate; the iron oxide mainly from iron pyrite; and the lime and magnesia from their corresponding carbonates and sulphates.

The ash-forming constituents of coal may be classified in two groups:

1. Mineral matter present in an intimate mixture with the coal substance, derived either from the vegetable structure or from earthy matter intermixed as silt during the process of coal formation.

2. Mineral matter occurring in the form of thin bands and nodules of shale, bone and pyrites; in this class are also the fragments of roof and floor that become mixed with the coal in mining.

Mineral matter from the first source cannot be removed by washing; it is sometimes called the "intrinsic ash" of the coal. Mineral matter of the second class, sometimes called "extraneous ash," may be removed by washing, screening and picking. In the laboratory a similar separation can be made by the float-and-sink test.

Coal has a specific gravity somewhat less than 1.35; the impurities are heavier; hence a separation may be made by placing the coal, crushed to a suitable size, in a solution of calcium or zinc chloride of 1.35 specific gravity. The coal will float, while the shale, bone, pyrite, etc., will sink. In this way the possibility of improving the quality of coal by washing can be determined.

Presence of Carbonates and Pyrite Make Ash Determination Variable

The determination of ash, although one of the simplest operations, is also beset with certain difficulties, which lead to disagreement between different laboratories, more especially with coals containing notable quantities of calcium carbonate and iron pyrites.

On ignition the calcium carbonate is decomposed, and carbon dioxide driven off, either partially or completely, depending on the duration and temperature of ignition. The iron pyrite is changed to ferric oxide, while more or less of the sulphur combines with the lime to form $CaSO_4$.

For example, in certain experiments with Illinois coals, which contained notable quantities of calcium carbonate and sulphur, 14 per cent. ash was obtained by ignition to constant weight at a low-red, and 13 per cent. ash was obtained by ignition at a bright-red heat. To secure con-

[1] Stanton, F. M., and Fieldner, A. C., "Methods of Mining Coal and Coke." Technical paper 8, Bureau of Mines.

cordant results a standard temperature should be adopted. If this is done duplicate determinations on the same powdered sample will agree to within 0.2 per cent.

Usually More Ash in Coal Than Any Analysis Will Show

Coal ash, as determined, usually weighs less than the mineral matter from which it is produced. This is due mainly to the loss of volatile constituents during ignition; the shale and clay will lose their water of composition; the carbonates will be more or less decomposed, giving off carbon dioxide, and the iron pyrites will be changed to ferric oxide, giving off sulphur.

Several methods have been proposed to compute the weight of original mineral matter in the coal, by adding corrections to the weight of ash obtained by ignition. These methods are, however, too complicated and uncertain in their general application to all classes of coal to be used in technical work.

The Percentages Described as "Volatile Matter" and "Fixed Carbon"

The volatile matter and fixed carbon represent the relative proportions of gaseous and solid combustible matter which may be obtained from the coal by heating it in a closed vessel. This is done by heating, for exactly seven minutes, a finely powdered sample in a small, covered platinum crucible, supported in the flame of a bunsen or Meker burner. The volatile matter consists mainly of the combustible gases—hydrogen, carbon monoxide, methane and other hydrocarbons—and some noncombustible gases as carbon dioxide and water vapor. The volatile matter does not include that part of the water present in the coal which can be driven off as moisture at 105° C. (221° F.) or lower.

The residue of coke left in the crucible after deducting the ash is reported as "fixed carbon." That term does not represent the total carbon in the coal, as a portion of this element is driven out in combination with hydrogen in the volatile matter; furthermore, fixed carbon is not pure carbon, but still contains several tenths per cent. of each of the three elements, carbon, hydrogen and oxygen; from 0.4 to 1.0 per cent. of nitrogen; and about half the sulphur which was in the coal.

It should be clearly understood that the terms "volatile matter" or "volatile combustible matter" and "fixed carbon" do not represent any definite compounds which existed in the coal before heating. The method of determination is purely arbitrary, and variations in temperature and rate of heating will cause variations amounting to several per cent. Even with a strict adherence to the method recommended by the American Chemical Society, variations of 3 and 4 per cent. in both the volatile matter and fixed carbon may occur in different laboratories.

Variations of 3 per Cent. Which Are Not Errors

One of the most prominent factors in causing variations is the temperature at which the crucible is heated. This is especially pronounced in anthracite and semibituminous coal. It is not improbable that one laboratory would report 4 per cent. and another 7 per cent. volatile matter on the same sample of anthracite, or 14 per cent. and 17 per cent., respectively, on the same sample of Pocahontas coal. These different percentages of volatile matter were actually produced by different conditions of heat treatment. Caution must therefore be observed in making comparisons of the volatile matter and fixed carbon in proximate analyses made in different laboratories. Even determinations made at the same laboratory by the same analyst may vary to the extent of 0.5 per cent.

Recently a series of experiments were made at the Pittsburgh station of the Bureau of Mines to provide data on which to base a temperature specification at which the most uniform analytical results could be obtained.* A series of determinations at temperatures varying from 750° C. (1382° F.) to 1100° C. (2012° F.) were made on five different types of coal and one sample of foundry coke. These determinations were made in a 30 c.c. platinum crucible, which was heated in an electric furnace under uniform conditions. Oxidation was prevented by passing nitrogen into the crucible. The results obtained are illustrated in the accompanying figure and set forth in detail in the table.

MATTER VOLATILIZED AT DIFFERENT TEMPERATURES

Volatile matter as percentage of whole coal sample

Temperatures	Coke	Anthracite	Pocahontas	Pittsburgh	Colorado	Illinois
740-745	0.40	....	.....	32.86	32.99	....
745-750	....	2.84 2.96	14.66	.....	....	32.38
750-755	0.51	...	14.80	33.13	33.00	...
755-760	0.56	...	.....	.....	...	32.51
765-770	...	2.93	.....	...	.	....
770-775	....	....	.....	33.68	...	...
785-790	....	....	.....	33.69	.	...
790-795	....	....	.....	.....	33.70	...
795-800	....	3.25	.....	33.89	...	...
805-810	0.55 0.54	....	15.85	34.05	34.07	...
810-815	0.60	3.33	.....	34.11	....	33.60
815-820	....	3.23	.....	.....	.	...
825-830	....	....	15.17	.....	...	33.98
835-840	63	....	.....	.....	....	.....
840-845	...	.57	.....	.....	.	.....
850-855	....	3.59	.....	.....	34.12	.....
855-860	0.53	....	.....	34.70	....	34.54
860-865	0.44	....	.....	34.75	....	34.63
865-870	....	3.70	.....	.....	....	....
870-875	0.53	....	.....	.....	.....	...
885-890	....	...	16.49	.....	.....	...
890-895	....	....	16.45	.....	.....	...
895-900	....	....	.....	.....	....	34.99
905-910	....	....	.....	34.57	...	...
910-915	0.68	3.93 4.15	.....	.....	34.62	...
915-920	....	....	16.70 16.92	34.75	34.80	....
920-925	....	....	.....	.....	.....	35.18
935-940	0.71	....	.....	.....	.....	...
955-960	....	....	.....	.....	34.93	...
960-965	....	....	17.03	35.00	34.94	35.60 35.70
965-970	0.80	....	.....	34.92	....	....
970-975	0.85	....	17.13	.....	.....	.....
975-980	....	4.63 4.63	.....	.....	.....	.....
1000-1005	....	....	.....	34.87	....	....
1005-1010	0.95	...	17.10	34.82	34.97	.....
1010-1015	0.91	4.86	...	.....	35.02	35.55 35.86
1015-1020	....	5.00	.....	.....	.....	.....
1025-1030	....	....	17.30	.....	.....	.....
1050-1055	1.02	....	...	....	....	35.63
1055-1060	1.02	....	...	...	...	35.89
1060-1065	....	...	...	...	34.89	.....
1065-1070	....	5.19	17.21 17.33	34.72 34.82	34.97	.....
1075-1080	....	5.36	...	...	.	.....
1085-1090	....	....	17.35	.	.	..
1110-1115	....	5.60	17.49	.	.	..
1120-1125	1.22	....	.	.	.	.
1125-1130	..	5.71	.	....	....	.
1130-1135	1.25	....	.....	.....	...	.

It will be seen that more volatile matter is obtained at the higher temperature, although the ratio between temperature and volatile matter varies in the different coals tested. The curve for anthracite is remarkable in that it is practically a straight line. Those for the three bituminous coals become horizontal at about 950° C. (1742° F.). The Pocahontas curve retains a slight upward inclination even at the higher temperatures.

From the analytical standpoint, 950° to 1000° C.

*Fieldner, A. C., and Hall, A. E. Influence of temperature on the determination of volatile matter in coal. Eighth International Congress of Applied Chemistry, vol. X, p. 139 (1912).

(1742° to 1832° F.) appears to be the best temperature for the determination of volatile matter, as slight variations in temperature on the upper end of the curve produce less deviation in results.

Sulphur Determination Correct to 0.05 per Cent.

Sulphur is usually determined in connection with the proximate analysis. It is classified with the impurities and undesirable constituents of coal, although it usually exists in a combustible form and contributes to the heating value. Commonly sulphur is present as iron pyrite, either in brassy lumps and bands or in very fine particles uniformly distributed throughout the coal. Sulphur may also occur in combination with iron and lime as sulphates and in combination with the coal substance as organic compounds.

Duplicate determinations by the "Eschka" method on the same powdered sample will usually agree to within 0.05 per cent. Where much sulphur is present in visible form, as pyrites, difficulty is experienced in obtaining a representative powdered sample from the coarse aggregate, and somewhat greater errors, due to inaccuracies in sampling, may occur.

(To be continued)

Ventilating Mammoth and Skidmore Beds

By H. M. Crankshaw*

The Mammoth bed is customarily worked from the Skidmore bed by rock chutes spaced at 120-ft. centers. Air tunnels are driven from the Skidmore bed up to the Mammoth, every 360 ft., at which point a crosscut is also made between the gangway and airway in the Skidmore.

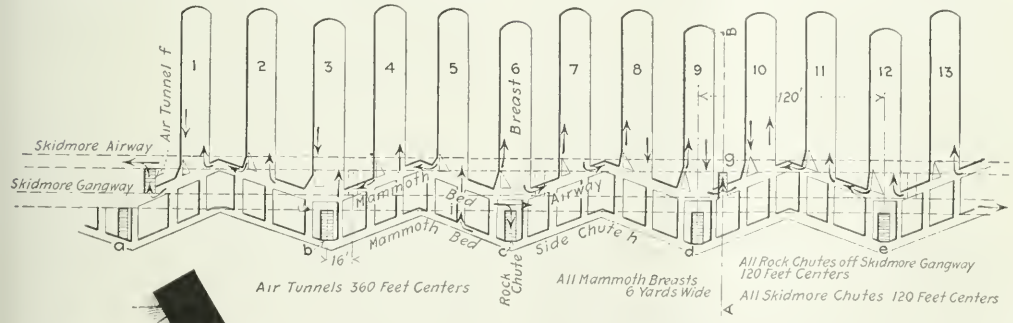
We can arrange to split the air passing through the live workings by taking it up through a rock chute and passing it up and down the chambers and through the airway connecting them till the next air tunnel is reached. At this point, the air returns to the Skidmore airway.

In the accompanying plan the rock chutes from the gangway in the Skidmore to the side chute in the Mammoth are marked *a, b, c, d* and *e*. The air tunnels from the airway in the Skidmore to the airway in the Mammoth are *f* and *g*. It is obvious that all the rock chutes from the gangway will not be needed as intakes but all the tunnels from the airway will act as returns.

For example, consider the section between air tunnels *f* and *g*, as shown by the arrows, the air travels up the rock chute *c*, up the side chute or slant *h* and the traveling way *i*, reaching the second slant chute or airway. Here the air is split. Part goes up breast No. 5 and part to the right along the airway. That traveling up the breast returns after reaching the face and passes along the airway ventilating successively breasts Nos. 4, 3, 2 and 1. Eventually it returns to the Skidmore airway by the air tunnel *f*.

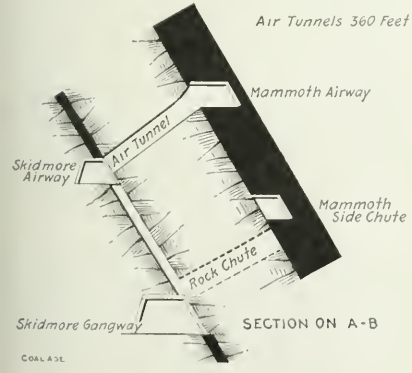
The other split passes up to the faces of breasts Nos. 6, 7, 8 and 9 respectively and descends by air tunnel *g* to the airway in the Skidmore. In this way, there are never more than five breasts on one air split, so if one breast makes gas freely, it can be isolated with the other breasts on that split without shutting down the whole gangway.

Also when breasts Nos. 1 to 5 are worked out, a cement stopping can be placed in air tunnel *f* and the whole



How the Mammoth Bed Can Be Ventilated by Splits from the Skidmore Headings

section can be entirely abandoned, thus saving the cost of maintaining extensive airways, chutes, etc. It is also possible to work any section separately or as desired, and the same system applies equally well to any size of breasts or any system of chutes we may care to use.



*District superintendent, Lehigh Coal & Navigation Co., Lansford, Penn.

Note—Abstract of article read at meeting of Panther Valley Mining Institute, Dec. 7, 1912.

The important points to be kept in mind during the manufacture of briquettes are: (1) The percentage of moisture should be kept as low as possible. (2) The binding agent should not add largely to the percentage of ash. When possible only organic substances should be used in binding materials, as the use of inorganic substances adds to the incombustible part of the briquette and correspondingly decreases the calorific power. (3) For domestic purposes the shape of the briquette should be modified to suit the demands of the consumer.

Regulation of Boreholes through Coal

By O. P. Hood* and A. S. Heggem†

SYNOPSIS—A rough draft of a bill to cover the relations between mine owners and oil and gas operators. The objects sought in the regulations governing the wells themselves are: To supply a free vent for all gas escaping from the packers, a casing which is free to slide past the measures in case of any movement of the same, the protection of the casing by a coating of clay, impervious to corrosive waters and plastic enough to remain uncracked after deformation and capable of transmitting side pressures in such a way that the strain on the inner casing may not be local in character.

The following suggestions are an attempt to harmonize as far as possible the information and advice which has so far been available to the bureau. Suggestions have come from those interested in the safety of miners; those interested in mining operations and the boring of gas and oil wells; and those interested in geology and the conservation of the coal, gas, oil and other mineral resources of the country. There has been no attempt to put these suggestions in proper legal phrases nor to make them entirely complete, but only to frame them so as to form a basis for discussion and further suggestion at this conference. It is hoped that as a result of this consideration, suitable laws may be suggested to the various states which will make mining more safe and prevent mineral waste.

Appointment of Gas- and Oil-well Inspectors

It seemed to be the general opinion that some form of inspection is necessary in order to make operative any laws which may be enacted, and which required specific methods or results. It is, therefore, suggested that there be a chief inspector of gas and oil wells; that he have sufficient help of a permanent and temporary character to meet the exigencies of the well-drilling business and that these officers shall have certain duties prescribed.

Licenses Required before Drilling

In order that it may be possible to locate a well, with accuracy, which goes through a workable coal seam, and which may at some time be within a mine area, it seems desirable to require a license to drill, this license depending upon the filing of proper maps and records. In case a location is proposed which may be detrimental to a coal mine, from the standpoint of either safety to the miner, or economy in the working of the mine, a conference between the three parties interested in such location is provided, these parties being the mine owner, the well owner and the miner, as represented by the state mine inspector.

The gas- and oil-well inspector is given power to change the proposed location within reasonable limits in order to insure a safe and equitable condition. It is also required that the inspector shall keep records of his office, so that at any subsequent time it may be possible for a mine operator to locate abandoned wells with accuracy. He should not be obliged to proceed in ignorance of their existence.

Abandonment of Wells

In order that the wells shall be properly plugged when they are abandoned, it has been suggested that the well driller shall furnish a bond which is to be returned to him when the plugging has been properly done. The inspector is required to supervise this plugging, so that a record becomes available of the method employed and the satisfactory accomplishment of this operation.

In making a provision, that wells which have suspended operation shall be maintained in a safe condition by the well owner, it is believed that formal abandonment will naturally follow rather than neglect.

What Is a Workable Coal Seam?

These suggestions cover only those wells which are put down through workable coal seams. A definition of this term "workable coal seam" is so difficult that it has not been attempted, and the responsibility for a reasonable interpretation of this phrase is placed on the state geologist whenever the matter becomes one of dispute. It is believed that some such official would interpret this phrase in view of the intention of this act, namely, to protect the miner while working seams of coal that may be used during the reasonable life of any well. It is not the intent to require special protection for all seams of coal which are physically workable. The exploitation of some of these will probably not be attempted before the well is abandoned and plugged.

Survey Requirements

It is believed that the location of a borehole should be so accurately determined that it could at any time be relocated, even after all surface indications have disappeared; and for this purpose it seems necessary to have the survey made by competent persons and reference made to established boundaries. These must be located by reference to at least three monuments or reference points. It is also desirable that all maps should be on the same scale.

In order that gas may not be drawn into the ventilating system of any mine, a minimum distance from a mine opening has been provided, and a similar minimum distance to those buildings which are vital to safety in the operation of a mine, so that in case of fire, of either wells or mine buildings, the risk shall not be increased.

Location Relative to Haulage Ways

It seems evident that a borehole should not go through any mine haulage or airway, and in order to insure this a distance of 15 ft. from such mine haulage or airway is required. It is believed that if pillars are considered necessary about such a borehole that the supporting power of the haulage-way ribs will be sufficient, as it seems to be generally admitted that such a pillar does not serve the purpose of keeping out gas which may leak around the casing.

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Note—A paper read before a conference called to determine proper legislation covering the drilling of gas and oil wells in the coal regions, held at Pittsburgh, Feb. 7 and 8. The full title is "Suggestions for Laws and Regulations in the Matter of Boreholes Passing through Workable Seams of Coal."

In requiring casing from surface water, it is believed hat after the casing which goes through the coal seam s properly placed and packed as required that the one sed for excluding the surface water may be withdrawn. The double casing which is required through any coal eam is deemed necessary because should a mine be pened, the operation might be fraught with much danger if the casing had been exposed to corrosion or if the ipe were injured by a movement of the measures. In rder that the casing might be allowed a certain amount f play in conforming to the side strains resulting from uch movements, it is required that they be extended into he floor a sufficient distance, that they be surrounded y a clay pack and that the second casing shall be brought nto play through the pressure of a similar clay pack.

The Clay Filler

Clay was thought to be a more desirable material for acking than cement. It would not under strain be so ikely to develop cracks through which corrosive water night enter if the outer casing was penetrated. Moreover it was felt that the use of clay would prevent the ocalizing of stresses on the second casing in case of a novement of the measures. A hard connection would ransmit the stresses in such a manner that the casings ould have to break, not being able to bend. Clay is believed to be of such a nature that it will prevent leakage f gas even if the casings are deformed by a movement f the strata.

The second casing, which is provided through any coal eam, may extend downward to any depth, but in the vent that it is stopped 10 ft. below the first casing, when is cemented in place, this cement does not extend to he first or outer casing. This facilitates the drawing f the outer casing when the well is abandoned.

Where the casings pass through a mine excavation, a urther mechanical protection is provided by a suitable all and clay pack surrounding the casing, with the inent of preserving it from mechanical injury and corroion. Where such a casing passes through an inaccessible ine excavation a similar protection is attempted by aplying a cement covering held within an outer metal tube cting as a form.

The Free Vent to the Atmosphere

In the arrangement of casings and casing head, it is roposed to require a free vent to the atmosphere from point in the wall below any of the casing used and to emand that this vent shall be maintained by openings hich cannot be readily closed by ignorant or malicious ersons.

Where oil is allowed to rise within a casing above the oor of a mine, as it may during the disuse of a well, may find its way past the several casing seats and into ie mine, so that it seems necessary to keep the level of ny such oil below the mine floor.

How a Well Should Be Plugged

In suggesting a plugging method, it has been attempted keep the requirement as simple and as general as posble. The method is based on the theories that while clay one may make a good stopping, it is also apt to flow and ot be maintained where it is believed to be. Also, that ement mortar or concrete is apt to be porous, to deterorate in oil, and to form a plug of doubtful tightness.

It has, however, the quality of probably staying where it is put. To combine these two qualities, it is suggested that there be a body of cement on each plug and that a length of clay filling shall be placed above and below the cement, so that if there is any movement of fluids through the cement, the clay will be carried into small openings and eventually close them. It also seems desirable that there be a hard, solid portion through any coal seam, so that if struck by mining tools it is immediately disclosed.

We submit the following suggestions for laws and regulatons to control the drilling and abandoning of boreholes passing through workable seams of coal:

OFFICERS

Method of Appointment—A chief inspector of gas and oil wells shall be appointed by the governor from an eligible list of men who have passed a satisfactory examination showing technical fitness for the position.

Salary—The yearly salary of the chief inspector of gas and oil wells shall be —— dollars. Necessary traveling expenses to the amount of —— shall be borne by the state and an office equipped with suitable filing arrangements provided.

Assistants—Assistant inspectors of gas and oil wells, subject to the authority of the chief inspector, may be appointed by the governor.

Deputies—Competent men may in an emergency be deputized by the chief inspector to perform the duties of the position in the field, but an appeal from their decisions may be made to the chief inspector. Deputies may receive not over —— dollars per day and actual expenses not exceeding —— dollars per day.

DUTIES

Location—It shall be the duty of the inspector to receive applications for permission to drill boreholes and issue a license to drill to persons who comply with the law.

The inspector shall receive and file maps, giving the location of boreholes; shall determine the sufficiency of such maps, and shall cause a new survey of such location in case the maps shall be deemed insufficient.

It shall be the duty of the inspector or his assistant to examine the maps accompanying applications for permission to drill boreholes, and where the location is in the vicinity of a mine, he shall immediately proceed to the site and notify the district mine inspector and the coal operator to state whether the location on the map accompanying the application to drill is such as will interfere with the safe and economical operation of the mine.

The inspector shall issue a license when the proposed location of a borehole is such as not to interfere with the safe and economical operation of a mine, as determined by the mine owner, state mine inspector and himself. To this end he shall have the power to move the location of a proposed hole as hereafter specified.

After hearing and duly weighing the evidence he shall permit the borehole to be drilled at such point as will in his judgment permit the safe and economical operation of the mine.

Records—It shall be the duty of the inspector to keep a complete record and prepare for publication a yearly report of the number of wells drilled in his district together with their location; date of completion; depth; production; date of abandonment and name of owner.

Supervision—It shall be the duty of the inspector to examine each well in his district at frequent intervals, giving special attention to all wells containing gas in quantity which may be, in case of leakage, a menace to a mine, and to see that all the provisions of this act are observed and strictly carried out.

Complaints—He shall receive and investigate all complaints as to injury, present or impending, due to a lack of precaution on the part of any well owner or mine operator, and if he finds the complaints against the latter well founded he shall lay the facts before the state mine inspector.

Plugging Wells—Upon receiving notice of intention to abandon a well the inspector or his assistant shall proceed to such well and satisfy himself that the provisions of this act referring to plugging wells are complied with. He shall join the owner in making affidavit to the manner in which the well has been plugged.

Violations—If the inspector discovers any well being drilled, operated or plugged contrary to the requirements of this act, he shall order the workmen engaged upon such well to cease work at once and until the law is complied with.

Enforcement of Laws—To enable the inspector to perform the duties imposed upon him by this act, he shall have the right at all times to approach and examine any well in his district, and with the authority of the state mine inspector, enter any mine affected, and upon the discovery of any violation of this article or upon being informed of such violation, he shall institute proceedings against the person or persons at fault, under the provisions of the law provided for such cases.

In case of failure of the owner to properly plug an abandoned well, it shall be the duty of the inspector to have the work properly performed by contract and assess the cost against the well owner.

Penalties—There shall be adequate penalties provided to aid in obtaining the safer conditions here proposed.

LOCATION

Application—Any person (firm or corporation) purposing to drill a borehole through a workable seam of coal shall make application in writing to the chief inspector of gas and oil wells for permission so to do, and he shall not commence drilling until such permission, in writing, has been received by him. In case of dispute the state geologist shall determine whether a seam of coal is workable within the intent of this act.

Survey and Maps—Accompanying the application for permission to drill such borehole there shall be submitted a map showing the location of the proposed borehole with reference by course and distance to the boundaries.

Said map must be made on a scale of 200 ft. to one inch, and shall be based on surveys made by surveyors or engineers of recognized standing, and certified to by the surveyor or engineer making the same.

In case the inspector finds the map insufficient to enable him to locate the proposed well with accuracy, he shall require that another survey and map be made before permission to drill is granted.

If the original map is found to be correct the cost of the second survey and map shall be borne by the state.

Bond—Any person (firm or corporation) purposing to drill a borehole through any workable seam of coal shall be required to give bond in the amount of —— dollars to insure that the drilling and abandoning of such borehole shall be in accordance with the provisions of this act.

Distance from Buildings, etc.—No borehole penetrating a gas- or oil-bearing formation shall be located within 300 ft. of a shaft or entrance to a coal mine not definitely abandoned or sealed nor within 100 ft. of any mine shafthouse, boiler or engine house, or mine fan. No borehole shall be located to reach the coal bed within 15 ft. of any mine haulage way or airway.

License—Should the proposed borehole be so located as not to interfere with the safe and economical operation of any mine and the previous requirements of this act be complied with, a license shall be granted and said person (firm or corporation) may proceed to drill such borehole in accordance with the further provisions of this act.

PROTECTION OF COAL MEASURES

Casing from Surface Water—Any borehole penetrating any workable seam of coal shall be cased by the owner of the borehole with a suitable casing (conductor or drive pipe) so as to shut off all surface water from entering the coal seam.

Casing Through Any Coal Seam—Any borehole, drilled for gas, oil or other mineral shall be drilled to a point at least 20 ft. below any workable seam of coal which may be penetrated ,and receive a metal casing not less than ¼ in. in thickness and an outside diameter 4 in. less than the borehole. This casing shall be concentrically seated on the bottom of the hole and shall extend to the surface and shall be known as the first casing.

A second inner casing 4 in. less in diameter shall extend at least 10 ft. below the first casing and be seated in 1 to 2 cement mortar 9 ft. in depth. The inside of the second casing shall be open to the atmosphere its full length.

The intervening spaces between the second and the first casings and between the first casing and the borehole or outer wall shall be filled with puddled clay to a height 30 ft. above the coal seam.

Casing Through Accessible Mine Excavation—Casings which pass through a mine excavation shall be protected by a wall of concrete or of masonry or brick laid in cement mortar, extending from 2 ft. below the mine floor to the mine roof. Between the first casing and the wall thus constructed there shall be left an annular space of not less than 2 in., which must be filled with puddled clay. This work shall be done by the well owner.

Casings which are exposed by mining operations shall be covered as above by the mine operator.

Casing Through Inaccessible Mine Excavation—Where a borehole passes through an inaccessible mine excavation the outer casing shall be protected by cement mortar held within a metal tube 4 in. greater in diameter than the casing and extending from 4 ft. below the mine floor to 4 ft. above the mine roof or cave.

Casing to Exclude Water—Before drilling a borehole into a gas- or oil-bearing formation a string of casing shall be so set as to exclude all water from the lower borehole.

Tubing a Gas Well—To conduct gas from a gas-well tubing shall be inserted with a suitable packer located below the inner casing and in such manner as to prevent the escape of gas except through the tubing.

The inner casing shall be left open to the atmosphere throughout its full length.

Tubing an Oil Well—To conduct oil from an oil well, tubing shall be inserted and extend from the oil-bearing formation to the top of the well.

The inner casing shall be left open to the atmosphere throughout its full length.

Should gas be liberated in the well in sufficient volume to have commercial value it may be shut in by means of a packer placed below the inner casing and be conducted from the well through tubing inserted into the well parallel to the oil tubing.

Casing Heads—Casing heads must have at least one opening to the atmosphere to which a valve or plug cannot be attached, so as to insure ample vent in case of leakage into casing spaces.

Completion of Well—When a borehole has been drilled and put into operation the owner shall file with the inspector a statement of the total depth of the hole, the sizes and lengths of casing used and remaining in the hole, the depth and thickness of all coal seams penetrated and whether oil, gas or water is obtained.

Suspended Operation—When for any cause a borehole which passes through a workable seam of coal shall cease temporarily to be operated the inner string of casing shall be maintained open to the atmosphere. Should oil tend to rise in the well above the bottom of the first or outermost casing passing through the workable coal seam, such oil shall be pumped out by the owner and its level maintained below the bottom of this casing.

ABANDONMENT OF WELL

Notice of Intention—When any oil or gas well is to be abandoned the owner shall notify the chief inspector in writing of such intent to abandon and proceed with plugging methods only after complete arrangements for inspection shall have been made and permission granted.

Method of Plugging—In abandoning a well it must be entirely filled from bottom to surface. The lower hole must first be filled to a point 5 ft. above the lowest gas- or oil-bearing formation with sand, clay or rock sediment. Above each formation supplying gas, oil or water and immediately below any workable seam of coal there shall be a plug as hereafter described, and each well shall have not less than three such plugs whatever the formation.

This plug shall consist of 25 ft. of cement mortar made of 1 part portland cement and two parts of sand properly mixed and placed with a bottom dump bailer upon 5 ft. of clay resting on a seasoned wood plug 2 ft. long and of the same diameter as the hole. Five feet of clay shall also be placed on top of the cement section. The space between the plugs here called for must be filled solidly with puddled clay, sand or rock sediment, cement mortar or concrete. The filling shall be complete up to the bottom of a casing before such casing can be drawn and the filling shall continue length by length as the casing is withdrawn, using cement, mortar or concrete when passing through coal seams.

Log of Method of Plugging—When a borehole has been plugged an affidavit stating the method followed, the materials used, and the distances occupied by each material shall be certified to by the gas- and oil-well inspector and filed with the oil-well inspector and a duplicate with the county recorder.

Release of Bond—After, and not until these several requirements have been met, any bond which may have been given by the owner shall be returned.

Fees—Shall fees be charged for license and inspection?

EDITORIALS

Tax Valuations of Coal Property

At a recent meeting of the Mining and Metallurgical Society of America (New York Section), the subject for discussion was "Systems of Mine Taxation."

Interesting descriptions of methods of valuing mineral property in many different states and countries were brought out in the discussions of the principal paper of the evening, by J. R. Finlay; who, it will be remembered, was retained by the State of Michigan in 1911 to appraise the mineral properties of the state for this purpose.

This subject of taxation is being agitated in nearly all mineral-bearing states and countries, and the general public has come to believe that in the past, injustice has been done other property owners by reason of the valuation of mineral lands being too low.

There is, undoubtedly, ground for this feeling, as there are many instances known where the valuation of mineral property is relatively much below an equitable basis, as compared with other taxable real estate, and on the other hand, there are instances of excessive values when all the factors that make up the worth of mineral land are considered.

The subject of the taxable value of coal lands in Luzerne County, Penn., has recently been in the courts on an appeal by the Lehigh Valley Coal Co., from the assessment of 1907 on its Franklin colliery. Many other appeals are pending, but it was agreed by the County Commissioners and the Taxpayers Association to make a test case and apply the decision to other cases, not formally tried.

The trial of this case was long and tedious, and it is unnecessary to follow the details, but the striking feature brought out in the evidence is the wide difference between the expert mining engineers representing the two sides.

The average of the estimates of five engineers representing the company was $750 per acre, and of five engineers representing the county was about $3050 per acre. These two sets of engineers used the same maps, etc., to get at the content of the property. These figures are here quoted to bring out the fact that no logical method of determining the real value of coal-bearing lands for taxation purposes, appears to have been developed or adopted anywhere.

In most counties of Pennsylvania, and we believe in other states also, valuations are largely matters of compromise between the local assessor and the corporation representatives, subsequently revised by the county commissioners.

As a result, many instances of great inequality, entirely unjustified by the geologic or mining conditions of adjacent properties, are known.

We believe the time is ripe for the adoption of common-sense systematic methods of arriving at values for the purposes under discussion, and suggest a method not by any means new; but seldom considered by taxing authorities.

Appraisal of such property, in our opinion, should be based on the probable proportion of the original content of coal that can be *won and prepared into a marketable product.*

Under this method, the holders of the coal properties are to be considered as land owners, offering their lands for lease on a royalty basis; that is, on the basis of a fixed royalty per ton, of each size of coal, to be paid as the coal is mined. By this method, the calculated value of the lands as a present asset, is the present value of the money which, compounded at interest, will ultimately pay to the land owner or lessor the royalties (dividends or profits) receivable from the coal yet remaining to be mined therefrom.

In calculating the present worth, it is assumed that 5 per cent. is a reasonable interest for investments of this character.

We believe this is a fair method of valuation for the reason that rates of royalty for coal lying in beds of known thickness and quality are, in the older mining regions, well established; in fact, far better established than the valuation of the lands on an acreage basis, or a basis of future profits from operation. This method necessitates an approximate estimate of the date of ultimate exhaustion of the tract under consideration, which determines the annuity period.

The particular point we make is that mineral lands should be valued as a *present asset,* not speculatively, as would appear to be the case in the testimony of the engineers for the commissioners in the Luzerne County suit.

Weather Bureau Mine Service

Referring to the circular recently sent out by the U. S. Weather Bureau, from its several stations in the coal-mining districts of the country, notifying the mine operators of each district that if they so desire, information will be given them promptly, from time to time, of weather changes that are liable to affect conditions in the mines, a contemporary comments on the possible value of this service to mining.

Dr. Holmes, director of the U. S. Bureau of Mines, is quoted as expressing the fear that the warnings themselves may add to the risks and dangers in mines where gases occur in dangerous quantities. The investigations of the past two years, by the Bureau of Mines, are said not to have given conclusive results as to the influence of weather conditions, especially barometric pressure, on the condition of the mine atmosphere.

In the same connection, Dr. Holmes is quoted as using the old argument that such warnings may tend to make miners and operators less careful during the periods in which no warnings are given. He adds, however: "If they should serve to make miners and operators more careful at the time of danger, they will serve a good purpose, in gaseous mines."

COAL AGE referred to this mine service offered by the

Weather Bureau, in an editorial, Jan. 25, in which it expressed the hope that the service, being a responsible one, would be appreciated by those mine officials having no barometer at the shaft.

Mining men differ, to some extent, on the supposed influence of weather conditions on the atmosphere in the mines. It is sometimes stated that the indications of the barometer are too tardy to be of any value in giving warning of the change in conditions in the mine. For several years past, we have made a careful study of the relation existing between the indications of the barometer and the appearance of gas in mines generating gas, especially in mines having large abandoned areas.

We have barometric charts showing the changes of the barometer continuously during the past six years. During a portion of this time, we received reports from firebosses in different mines, in the same locality where the barometric readings were taken; and these showed continually that the indications of the barometer preceded the change in condition in the mine, from two to three hours.

In regard to the Weather Bureau's proffered service, we can endorse the statement of Dr. Holmes that "the value of the service will depend on the way in which it is used." We do not doubt for a moment that such warnings promptly given should prove of great value to the intelligent mine official; and if such warnings are freely offered to operators, they should be held the more responsible for not having availed themselves of the opportunity of forestalling a dangerous condition in the mine. In each case, the action to be taken after the warning is received will depend on the particular conditions existing in the mine, and this can be determined only by the officials in charge.

The Danger of the Outside Driver

The outside-wheel locomotive, either electric or gasoline, where connecting rods are not employed, is a fruitful source of minor accidents about mines. On these machines the brake mechanism between the drivers forms a possible foothold for the trip brakeman. In attempting to step aboard the moving motor, should this man's foot slip, it is almost certain to be caught and crushed by the rear wheel. Many of the crippled and one-footed men to be seen about the collieries can trace their misfortune to this cause.

It appears to be utterly useless for the management of any mine to forbid men from getting aboard the locomotives in this way. So long as the opportunity is there, and the man wishes to get upon the machine, the temptation to do so from the side is well-nigh irresistible.

So numerous have been the accidents from this cause that some companies refuse to buy any new motors of this type, while the machines which they already possess having outside wheels have been guarded by an auxiliary plate or sheet of steel, which is hinged at the top of the motor frame and secured at the bottom by two or three bolts. This plate completely incloses both driving wheels and brake mechanism and presents no projections whatever, that can possibly serve as a foothold.

If the outside-wheel locomotive possesses sufficient advantage over those of other types to warrant its manufacture or purchase, in the interest of humanity and our brakemen's feet, let us house in its dangerous drivers, and just so far as we are able, render it impossible for anyone to get caught beneath them even though such a misfortune might be only the logical outcome of a man's own carelessness, negligence or willful disobedience.

Conditions Favorable to the Coal Industry

In many parts of the United States the chief bugaboo of the coal industry has been oil and gas. The supplies of these natural fuels have been growing less each year, and as a consequence their price in the market has advanced materially.

The benefit to the industry brought about by this change has not been confined entirely to the Western states. Plants at various Eastern points, which for many years have been burning oil as fuel—notably at such places as Worcester, Mass., and Allentown, Penn.—have been compelled to return to the use of coal, owing to the fact that the oil producer will not contract with these consumers for a further supply of fuel oil.

The rapid dwindling of the natural-gas supply in most parts of the United States has already caused many manufacturers, who have been depending on gas for fuel, to install producer-gas plants. All of these conditions are tending to the betterment of the coal industry through bringing about an increased coal consumption. Adding to this favorable situation the improvement which prevails in our export business, which latter trade amounted to $78,000,000 last year, it does appear that the owners of coal mines should view the future with optimism.

British Indian Efficiency Methods

Resting during working hours and eliminating waste of time by reducing distances traversed are two principles carried to their conclusions in British India. J. R. R. Wilson, at the recent meeting of the National Association of Colliery Managers (Yorkshire, England, branch), stated that 24-hr. shifts are quite common in the Raniganj coal field. "Of course, the men are not working all the time; they eat, sleep and work at will. The system probably arises from the fact that numbers of them live a long way off and they do not care to and could not perhaps make the journey every day. Sleeping in the mines is quite common, both on the part of the piece-worker and of the day hand."

Reduction Gears

As turbines inherently involve high rotative speeds, many of their applications necessitate some means of transmitting their power at greatly reduced velocity. For this purpose a reduction gear provided with a floating frame so supported as to equalize tooth pressures, has been devised for large capacities.

An official test of a 6000-hp. set has shown an efficiency of 98½ per cent. over a wide range in load.

The reduction gear was primarily intended for marine practice, to permit the turbine and propeller to be operated at their most efficient speeds, but has been adopted for driving large direct-current generators, and may be used to interpolate between the high and low relative speeds of any two movers.

SOCIOLOGICAL DEPARTMENT

How the H. C. Frick Co. Eliminates Accidents at Its Mines

By Thomas W. Dawson*

The company has originated a device for automatically controlling high-pressure air compressors and has applied for a patent on the mechanism. When the temperature of the discharge air in the pipe reaches a predetermined point, showing that the air is being excessively compressed, it acts on the thermometer and the recording device, thus closing an electric circuit and energizing a solenoid. This in turn moves over a tripping device, which opens the pilot valve, releasing the steam pressure on one side of the regulating piston. Thereby the valve on the steam feed pipe is automatically closed, shutting off the flow of the steam to the compressor, thus stopping it and preventing an explosion.

Protection against Shaft Accidents

At all shafts where men are hoisted, the engines are equipped with an automatic device, which acts directly on the engine, cutting off the steam and applying the brakes, making it impossible to hoist the cage beyond a safety point.

At the bottom of shafts which have sumps, it is frequently necessary to remove fine coal which falls from the dumping platform above. During this removal, the cages are hoisted to a clearance height, and iron pins are placed in holes in the guides and on these the cage rests, making it impossible for the engineer or others to lower it into the sump. These pins are always in place, being attached to the guides by chains which prevent the removal of the pins when not in use.

There is a device installed at surface landings of all shafts to prevent gates from being opened when the cage is not in position at the landing. When the cage is at the right height, it serves as a fulcrum, so that the gate latch may be opened. This device also controls a spring switch on the track leading to the cage at the surface landing, which opens when the cage is in position, and is closed at all other times.

All hoisting compartments of shafts are lined at the cage ends. This provision with that of safety gates prevents workmen from being caught during the movement of the cage.

Inspections in Triplicate

All cages and safety catches are periodically inspected, tested, and a written report made of the inspection. In no case, is a hoisting rope kept in service longer than two and one-half years, even though apparently safe and in good condition.

Frequent inspection of air shafts must be made to keep them open and free at all times from ice and other obstructions. A fireboss must make this examination, and travel either up or down such shaft once each day, the mine foreman once each two weeks, and the superintendent once a month. It has been the practice for some years to pass exhaust or live steam into the air compartments of such shafts during the winter months, to prevent ice from forming therein.

More Air Provided than Law Requires

Article No. 2 of the general rules of the company states that: "Mines generating explosive gas must have, at the intake, not less than 500 cu.ft. of air per minute, per person employed in the mine, and so distributed that there will be sufficient volume in circulation in and around the working places, to give not less than 300 cu.ft. of air per minute, per person employed in each split.

No mine shall have at the intake less than 300 cu.ft. of air per minute, per person employed, and sufficient volume shall be supplied in and around working places to give, at least 150 cu.ft. per minute, per person employed in that split. This rule provides increased air at working faces and at the intake, above that required by the state mining law.

These measurements of air supplied are carefully made and reported to the general office once each week. Local officials, at mines which generate gas, are required to keep air up to the working places, and to such other places where explosive gas might be encountered.

On all ventilating fans can be found the Bristol recording and "U" gages, and these are kept in good and operating condition. At a number of the larger and more recent plants, the ventilating fan is operated by two engines, one on each side of the same and each of them is powerful enough to operate the fan in case of failure of one or the other.

Here is installed a system of piping, with valves, by means of which either engine, or both, can, in case of accident be stopped immediately by the attendant should he be in either engine house. All ventilating systems in the mines are ascensional.

Clowes' Hydrogen Lamp

We do not rely on the ordinary safety lamp for the detection of gas. The Clowes' hydrogen-test lamp is used in all mines generating methane. This will detect a very much smaller percentage of gas than can be discovered when watching the indications of an ordinary safety lamp. Samples of air are taken in gaseous mines and sent in copper cans to the company's laboratory where they are analyzed. A detailed report is filled out by the party obtaining the sample, who is usually a mine foreman, his assistant or a fireboss.

The results of the analyses are reported to the general office and to the mine, and if there should be a percentage of explosive gas which might have been de-

*Assistant chief engineer, H. C. Frick Coke Company, Scottdale, Penn.

Note—Abstract from paper entitled "Welfare, H. C. Frick Coke Company," read before the winter meeting of the Coal Mining Institute of America. Continued from our issue of Feb. 8, 1913, page 230.

tected by the Clowes' lamp, the party making the test and reporting no gas is required to explain, and perhaps to hand in his resignation. In this way, all the underground officials are trained to make careful investigations.

Boreholes are frequently drilled from the surface to release any dangerous accumulations of explosive gas in the gob where these cannot be removed by the mine ventilation. Shotfirers have been employed to do all blasting and they are required to inspect all places where shots have been fired to see that there is no fire or other danger thereafter. Only the safest permissible explosives are used, and all tamping is done with clay.

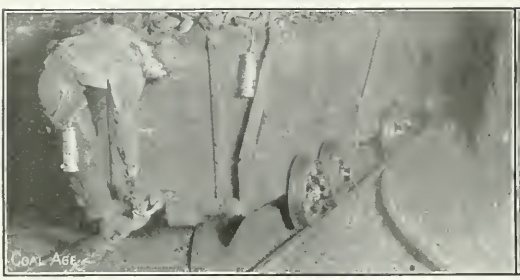
All safety-lamp mines must be examined on Sundays, holidays and lay-off days, and all mines which have been idle for more than two consecutive days are examined before operations are renewed.

In the larger mines, wherever safety lamps are used, any other workman can at once note the clearance side of the heading when passing a moving trip.

All underground trips controlled by motors, steam engines or other mechanical means must carry front and rear lights. Underground signal systems on all haulages are standardized. All apparatus in connection with these signals is kept in good working order. On electric haulage you will see the block system, similar to that used in the operation of street cars in our towns and cities.

Timbering Provisions

Systematic timbering systems are devised and strictly followed. Printed regulations cover the system of timbering in rooms, headings and rib and pillar drawing, and are worked out to suit conditions at the various mines. Timber is not set without caps or crossbars as safety depends so much on their use and only when it is so set will it bear its full share of the load which it



Ordinary Method of Releasing Chain of a Haulage Rope by Use of Foot

Frick Method of Detaching Haulage Rope without Risk to Trip Runner

auxiliary escapeways are provided. In some instances these are stair shafts from the surface to the mine, located in the active working sections. These shafts are also arranged so that they will aid ventilation. In other instances, means of escape are provided by having connections between mines which are closed by double iron doors. Frequent examinations are made to make sure that these doors are always in condition for use in case of necessity.

Where coal dust is a menace to safety, a system of pipes and a supply of water under sufficient head and all necessary appliances are provided to dampen thoroughly the floor, sides and roof of all parts of dry mines.

Means of Avoiding Accidents from Cars

When a trip of loaded wagons has been hauled to the shaft bottom, the rope rider, at most mines, releases the rope or chain by using his foot to remove the slack so that the pin attaching the chain may be extracted. This dangerous practice has been eliminated by a simple device which disengages the chain as soon as it is given slack.

At the bottom of steep headings safety switches are provided, so that in case of a runaway, the trip is derailed before it can reach the main headings, the landing or possibly the shaft bottom, with a consequent accident and even loss of life.

Brakes are provided for mine cars, eliminating the use of sprags where braking is necessary. The wide or clearance side of all headings in the mine is indicated by a wide whitewashed strip so that the driver, brakeman or is intended to support. A post extractor is furnished so that timber can be withdrawn in safety and a long hook is provided for the recovery of timber when making a "fall."

Boreholes for Pipes

Another point of technical interest is that high-pressure air lines for underground haulage are placed in boreholes from the surface to the mine, thus eliminating accidents from the bursting of these high-pressure pipes. Also, in a number of cases steam lines are placed in special boreholes drilled for the purpose, and water discharged from main pumping stations to the surface by way of boreholes.

On compressed-air haulages, at the charging stations, there is protection provided to the engineman, so that he cannot be injured while attaching or detaching the supply pipe of the locomotive.

All the mines of the H. C. Frick Coke Co. have complete mine telephone systems. Phones are located at the various landings, shaft bottom, mine foreman's office, connecting with the superintendent's office on the outside, where a connection can also be made with the general office at Scottdale. Thus in case of accident, immediate attention or assistance can be obtained.

(To be continued in an early issue)

In gaseous mines the coal seams should be worked out systematically and completely in order to bring about a uniform subsidence of the strata, thus preventing the accumulation of gas in reservoirs.

DISCUSSION BY READERS

Reducing Ventilation When Firing

Letter No. 12—After reading Mr. McAllister's letters, in recent numbers of COAL AGE, I was inclined to think that he was not serious, or, at least, that he had greatly exaggerated his statements or is himself mistaken as to the facts observed. Not one man in a thousand has had the opportunity of making tests such as as he has described; or would have the nerve to experiment with his employer's property in such a reckless manner.

During the 30 years I have worked in the mines I have had ample opportunities of studying the different conditions that exist. I worked as shotfirer in a very gaseous mine, in the north of England, where my instructions were that not a shot was to be fired if the lamps showed the faintest trace of gas at the working face. This often occurred, and the only remedy was to increase the circulation so that the air would dilute and sweep away the gas. Since it is well known that marsh gas (CH_4) will only explode when mixed with a certain amount of air, someone might say: "Stop the fan and let the place fill with gas, and then fire the shots." It is safe to say that such argument would not appeal to many practical mining men.

Mr. Waterman (Letter No. 6) states that the advocates of reducing the ventilation at firing time "have been, for the most part, content with recounting their personal experiences." I would like to ask, what better proof can be found than that of "personal experience." This discussion arose from the personal experience of Mr. McAllister; and if any good is to be derived from the discussion, it will be through the personal experiences of others, either confirming or disproving the theory he advances. Many practical men, myself included, have a high regard for theory where it can be applied to everyday practice.

Referring again to Mr. McAllister's experience, I call to mind an explosion that occurred in our mine, caused by a single shot; and there was not a trace of gas in the mine. The explosion killed 20 men and destroyed all the overcasts and many stoppings, besides doing other damage. Although we did not stop the fan when firing, after that occurrence; but adopted the use of permissible explosives and fired as before with the full current of air in circulation, there were no more explosions in the four years following. But, suppose, instead, we had adopted the practice of slowing down the fan and had put doors on the upcast shaft, no more explosions occurring, we would have concluded that such practice was correct and that it prevented other explosions.

The practice of slowing down the fan, or stopping it altogether when firing, may possibly work in some mines, but it can never become a general thing.

This is a subject that should receive the close attention of all our expert mining men, who should strive to prove or disprove the correctness of the theory. But until shown to be wrong, the old practice of running the fan at the normal velocity when firing, should be continued. If Mr. McAllister, however, has not converted a single man to his belief, he has still the satisfaction of knowing that he has called attention to a subject that is worthy of discussion.

THOMAS HOGARTH.

Heilwood, Penn.

Letter No. 13—We are operating a pick mine and, at times, have some very heavy shooting. It is our custom to run the fan at a speed of from 35 to 40 r.p.m., during working hours. The other evening, my duties required me to go into the mine, at shooting time. Having been much interested in this discussion, it occurred to me to speed up the fan to 50 r.p.m. before going down, which I did.

Upon going below, I met one of the shotfirers, and asked him the question: Considering your own safety and the safety of the property, do you prefer to slow down the fan, or to increase its speed when firing? Not knowing that I had speeded the fan before coming down, he replied: "When I am shooting I want the fan to run about the same as it is running now. This is a good air." I might add the speeding of the fan, in that case, gave no trouble.

I believe it is important, however, to regulate the air according to certain conditions, as they exist in the mine. For example, a new mine that is just being opened has a comparatively small air space; and the number of shots fired is correspondingly small. The volume of the workings and the number of shots fired increase with the development of the mine. At the present time, in our mine, we are firing from 250 to 300 shots, in about 95 minutes. Many mines fire a larger number of shots in less time. It seems to me that it is of the utmost importance to give more time for firing, so that the air current will be able to handle the large volume of smoke and gases produced by the firing of the shots. I believe mine accidents will be reduced by this method more than by reducing the ventilation.

AN INDIANA FIREBOSS.

Linton, Ind.

Letter No. 14—As bearing on the question of reducing the ventilation when firing in a mine, my attention has been drawn to a statement of Mr. Verner, COAL AGE, Jan. 11, p. 75. In speaking of electrical firing, in mines Mr. Verner refers to the concentration of a strong dust-laden current returning toward the face, where a single shot has been fired. He adds, that this concentration of dust-laden air, which he styles "draft concentration," is minimized or fully eliminated when a large number of shots is fired at one time.

Mr. Verner concludes his obscure reasoning with the statement that, assuming each of the 100 shots fired simultaneously produces an equal effect, the "draft concentration" affecting each shot would be less than, say 10 per cent. of the effect produced by the firing of a single shot. No attempt is made, however, to explain the reason for this "dangerous draft."

Except in steeply-pitching seams and under extreme conditions of temperature, a velocity due to an air column, in an entry, could not exceed, say 800 ft. per min., as a simple calculation would show. But, even assuming a draft of high velocity returning toward the face, following the blast, it is hard to see how the firing of a large number of shots at one time will reduce this draft, so that the heat and flame produced will be less liable to ignite a dust cloud than when a single shot is fired.

Stopping or reducing the ventilation in a mine, at the time of firing, may or may not reduce the chances of a dust explosion in a large mine generating little or no gas. However, this is not proven by the bare unsupported statement of a theory. When a man starts to propound a theory for the guidance of practical mining men, he should make clear the facts on which his theory is based, so that others than he can judge whether or not his conclusions are correct.

LEONARD L. QUISENBERRY.

Johns, Ala.

Letter No. 15—The discussion on reducing ventilation when firing has been of great interest to me and I consider it of much importance in practical mining.

I fail to see any reasonable ground for reducing the air current to a low ebb when firing shots in mines. I consider it of far more importance to adopt measures that will prevent the ignition of gas and dust, than to consider how the violence of an explosion once started, may be diminished.

Mr. McAllister certainly had a remarkable experience and is to be congratulated that he is still among the living. In my estimation, a man would be taking desperate chances to place 25 lb. of blasting powder in a pile and cover it up with fine coal dust and ignite that pile together with 27 shots, at the same time; and withal remain in the mine to await the explosion. Not only would I never attempt such an experiment, but I certainly would not remain in the mine in a safety hole, as no hole inside the mine could be considered safe under those conditions. The result, in this case, has proved the truth of the old saying: "It is always the unexpected that happens." Certainly an explosion might have been expected under the conditions Mr. McAllister has described.

Willian Scaife has estimated that a pound of powder has a potential energy of 500 ft.-tons, and that this energy expended on the air, in a 10x10-ft. airway, would produce a velocity of 346 miles an hour. This estimate, if true, easily explains how tipples have been weakened, fan houses destroyed and loaded cars of over two tons weight hurled through the air like feathers in a breeze. In my opinion a mine is never safe unless it is thoroughly ventilated by an adequate supply of pure air to dilute and render harmless the obnoxious gases generated.

In the Crows Nest Pass mines of British Columbia, at Fernie, Morrissey and Michel, should the ventilation be reduced to a low ebb, the gases generated would fill the entry a long distance back from the face, in a few minutes, and make it impossible for a shotlighter to approach the working face to fire a shot, even with a safety lamp. Again, the seams here often pitch 40 and 60 deg. and generate explosive gas to such an extent that the head of the pitch where the shot is to be fired would become dangerously charged with firedamp, immediately upon the current being reduced.

The object of reducing the current is apparently to obtain a low oxygen content in the mine air. It would seem to me, however, that the atmosphere of the mine would supply enough oxygen, for a long time after the air has ceased to flow, to defeat this plan or render it effective for the purpose in view. This would be especially true in a large mine generating little or no gas. In the samples of mine air, given as explosive by G. A. Burrell, COAL AGE, Jan. 18, p. 106, one of the samples contained only 17.49 per cent. of oxygen, which, I believe, is lower than what could be, or is commonly realized at the working face.

In closing, I wish to refer to the excellent article of R. T. Rhys, COAL AGE, May 11, 1912, p. 1004, in which he classifies all the principal explosions that occurred in Iowa, from the year 1892 to date; comparing those that occurred under reduced ventilation when the fan was slowed down, with those that occurred under the normal ventilation of the mine. From the records of these explosions, I am sure that the claim that reducing ventilation at firing time reduces the force of the explosion is not supported, but the records are decidedly against such a theory. I shall watch with interest the further discussion of this subject, which must prove of much value in mining.

J. W. POWELL, Mine Manager,
Columbia Coal & Coke Co.

Coalmont, B. C., Canada.

Seven Shifts a Week

Personally I cannot agree with the Colorado Engineer, COAL AGE, Jan. 18, p. 88, who considers seven shifts a week a "fallacy." I have had some experience as mine superintendent, mine manager, etc.; and I want to say that the man who expects to be successful, working a limited number of shifts or hours for the present-day corporations, will certainly be disappointed.

There was a time, before the large companies came into existence, that six shifts a week were sufficient; but, today, with our large plants and valuable machinery to be carefully gone over, repaired and inspected, it is necessary for the superintendent, master mechanic and mine manager, to be on the job almost day and night; and often he must live, eat and sleep with the job. When that is necessary, the job will be better off and so will the man who contentedly adapts himself to the conditions and stays with the work.

I have been on the job, at times, forty-eight and sixty hours, without seeing home or bed; and when the job was done and my tonnage thereby increased by little improvements made, here and there, which would not have been made had I been at home or enjoying a season of recreation, I always feel amply repaid for the extra hours of toil.

My opinion is that living with the job will never hurt anybody as long as they are ambitious and determined to make good. Seven or even ten shifts a week cannot hurt such men. But the man who limits his time, watches the clock, and neglects business for ease and pleasure, will soon be reduced from a monthly wage to day's pay; and placed in the class in which he rightly belongs.

MINE FOREMAN.

Collinsville, Ill.

INQUIRIES OF GENERAL INTEREST

Weir Measurements

I have built a weir 6 ft. 6 in. long, in a stream in which there is a considerable velocity of approach and in which it is impossible to secure a forebay of any size.

I would like to ask: (a) What means do you recommend for obtaining the velocity of approach? (b) What formula do you prefer for the calculation of the quantity of water passing through the weir?

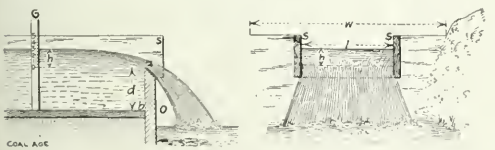
I have read the height of the water on the weir at two points, one 3 ft. and the other 8 ft. upstream. Could the difference of the readings at these two points be used to calculate the velocity of approach according to the formula $v = \sqrt{2gh}$?

W. B. T.

Canmore, Alberta, Canada.

The formula suggested by our correspondent could not be used for calculating the velocity of approach. The formula $v = \sqrt{2gh}$ gives the velocity due to any height h when a body falls from rest, or when the initial velocity is zero. But, even assuming that $h = h_1 - h_2$, which is probably the meaning of our correspondent, the formula would give only the increase in velocity between the two points at which the measurements were taken. It would not give the velocity of approach. What is required is the *average* velocity of approach, which cannot be calculated by the above formula, even if the actual head were known.

There are two or three essential points that must be observed in order to obtain accurate weir measurements.



Longitudinal Cross-section and Front View of Weir, Showing Important Dimensions

First, it is desirable to reduce, as far as possible, the velocity of approach. In order to do this, the area of cross-section of the flow of water through the weir represented by $h \times l$ (see accompanying figure) should be small with respect to the total area of cross-section of the stream, represented by $w\ (h + d)$. To obtain good results, the depth d of the bottom of the weir below the crest a, over which the water flows, should not be less than twice the head h; and the length of the weir l, say not greater than one-third of the width of the stream w. With these limiting dimensions, the area of the cross-section of the weir will not exceed one-ninth of the cross-section of the stream; and, as a result, the velocity of approach will not exceed one-ninth of the velocity through the weir.

It is important, also, that the back of the weir, ab, shall be vertical. The cross-section of the weir must, of course, be regular throughout; the sides, also, of the weir $s\ s$ must be vertical and extended a short distance beyond the crest over which the water flows. The purpose of extending the sides is to prevent the rapid expansion of the stream of water, until it has passed beyond the point where such expansion would influence the velocity of the flow over the crest. It is always important that the weir should be so arranged that there will be no vacuum formed in the space o in front of the weir and under the waterfall. If this space is closed, the falling water has a tendency to reduce the pressure at o which would increase the flow of water over the weir; and this increased flow would not be accounted for in the formula.

There are different methods of measuring the height h, which is assumed as approximately the velocity head of the water flowing over the crest a. A simple method is to erect a vertical gage G, in the weir, say from 6 to 8 ft. upstream from the crest a, making the zero of the gage correspond exactly with the elevation of the crest a. The reading of the gage at the surface of the water will then be the required height h, which must be measured in feet. The gage must be thin and arranged so as to prevent the formation of ripples at the surface of the water; it must present no appreciable obstruction to the flow of water through the weir.

Except in a still-water basin, the water reaches the point where its height h is measured, with a certain velocity called the "velocity of approach." It is ordinarily impracticable to measure the head to which this velocity is due, or the head to perfectly still water upstream. Moreover, as stated previously, the velocity of approach is the actual average velocity of the stream, allowing for friction and other obstructions. Experiments have shown that when the velocity of approach does not exceed 1 ft. per sec., the discharge calculated for the height h will show an error not exceeding 2 per cent. of the actual discharge.

Ignoring the velocity of approach, or taking the measured height h as the head creating the velocity of the water flowing over the weir, the flow of water may be calculated very approximately by the formula

$$q = 3.1 l h \sqrt{h}$$

When it is necessary, in any given case, to consider the velocity of approach, divide the quantity of water, as calculated by this formula, by the area of cross-section of the weir, which is l times h; or this velocity may be calculated independently by the formula

$$v = 3\sqrt{h}$$

derived from the preceding formula.

The head due to this velocity of approach, or the additional head, is then calculated thus,

$$h_1 = \frac{v^2}{2g} = \frac{(3\sqrt{h})^2}{2 \times 32.16} = 0.14\,h$$

This head h_1, due to the velocity of approach, must be added to the measured head h to obtain the total head

creating the flow of water over the crest. Calling this total head H, we have

$$H = h + h_1 = h + 0.14\,h = 1.14\,h$$

The quantity of water passing over the weir is then found by substituting this total calculated head for the measured head h in the previous formula; thus,

$$Q = 3.1\,l\,H\sqrt{H} = 3.65\,l\,h\sqrt{h}$$

This last formula is practically correct for finding the approximate flow of water over a weir constructed according to the diagram shown in the accompanying figure, when the measured height of the surface of the water in the weir, above the crest, is h, in feet, and the length of the weir is l, in feet, assuming that the weir complies with the other conditions mentioned. The quantity of water thus found is given in cubic feet per second.

Does Carbon Monoxide Support Combustion?

In reading up on the subject of carbon monoxide, I find a conflict of opinion regarding this gas. Some books state that carbon monoxide supports combustion, while others state that it does not. Will you kindly state somewhat fully the opinion you hold in regard to this question?

M. D. Cooper.

Ellsworth, Penn.

The following quotation from "Mine Gases and Explosions," p. 62, will make our answer clearer:

> In a broad sense, combustion is any chemical reaction accompanied with the evolution of heat and often with the production of light or flame or both. Combustion always involves at least two substances, one of which is the combustible and the other the supporter of combustion, the latter being generally a gas.

Carbon monoxide is a product of the incomplete combustion of carbon in oxygen. Since the combustion of the carbon is incomplete, in this case, it is possible to carry it farther, in an atmosphere that will supply the needed oxygen; and, as a result, carbon dioxide will be produced. It is clear that the carbon monoxide is, here, the combustible, because it is susceptible of further oxidation. It is not, in this case, the supporter of combustion.

The only reason we can suggest for the statement being made that carbon monoxide is a supporter of combustion, is that the idea probably has grown out of the fact that lamps continue to burn in an atmosphere of this gas. The gas is not an extinctive gas, as is carbon dioxide, because the presence of this gas in air does not depress or extinguish the flame; but the combustion of the gas itself in contact with the flame increases the heat of the latter, causing it to burn brighter and with greater intensity. A lamp will not burn in an atmosphere of pure carbon monoxide, since there is then no available oxygen to carry on the combustion.

From this reasoning, it is clear that carbon monoxide cannot, in any sense, be considered a supporter of combustion, except a reaction takes place in which the carbon monoxide gives up its oxygen to another substance, in which case, it could be said to support the combustion of that substance. In all other cases in which this gas is concerned and combustion ensues, the gas is the combustible and not the supporter of combustion.

Relative Size of Intake and Return Airways

I would like to ask: Which should have the largest sectional area, the main-intake or the main-return airway of a mine, and why? The textbooks all say the return airway should have the greater sectional area, owing to the expansion of the air and gases in the mine.

In my opinion, the relative size of the intake and return airways should be determined by considering which of these airways is the haulage road. I believe it is of greater importance that the haulage road should be the larger of the two. There is scarcely an hour of the day when the haulway is not more or less blocked by trips of loaded cars, which greatly obstruct the flow of air along the road.

Besides, when the haulage road is used as a traveling-way, extra width should be provided, so that men or animals can safely pass the loaded cars. For this reason, it seems to me, that considering both the ventilation of the mine and the safety of the men, the haulage road should always be the larger of these two airways.

J. Bennett.

Lock No. 3, Penn.

The question presented by our correspondent is one that is frequently asked in mining examinations, and the answer generally given is: The return airway is the larger of the two, for the reason first stated. There is no doubt, however, but that there is much truth in the remarks offered by our correspondent in reference to the need of a large haulage road.

This is a case, as frequently happens, where the answers given to examination questions are too theoretical and ignore the practical requirements in the mine. We might add, however, that while it is well to refer to the necessity of a large sectional area for haulage purposes, it is also important and absolutely necessary that the sectional area of the return airways shall be amply sufficient to allow the increased volume of the return air and gases to travel out of the mine at a moderate velocity. This is very essential, particularly in a gaseous mine. We are glad attention has been drawn to this point, as the answers to all examination questions should cover both theory and practice.

Height of Flame Cap and Percentage of Gas

The following formulas are given, Coal Age, Vol. 1, p. 1020, for calculating the percentage of gas from the height of flame cap:

Unbonneted Davy, $Percentage = \sqrt[3]{36\,h}$

Bonneted Davy, $Percentage = \sqrt[3]{70\,h}$

Please give a formula for calculating the height of a flame cap when using a Wolf lamp.

Fireboss.

Bruceton, Penn.

There is no formula for calculating the percentages of gas from the height of the flame cap, in the use of the Wolf lamp. The volatile nature of the oil burned in the Wolf lamp makes the height of the flame cap vary according to the length of time the lamp has been exposed to the gas.

EXAMINATION QUESTIONS

Air and Mine Gases

(Answered by Request and Suggested)

Ques.—Find the weight of 1 cu.ft. of dry air, at a temperature of 70 deg. F. when the barometer is 29.5 inches.

Ans.—The weight of 1 cu.ft. of dry air is calculated thus:

$$w = \frac{1.3273 \times 29.5}{460 + 70} = 0.0738 \text{ lb.}$$

Ques.—Find the weight of 1 cu.ft. of air fully saturated at a temperature of 65 deg. F. and a barometric pressure of 29 in. The tension of the water vapor, at this temperature (65 deg. F.) is 0.6176 in. of mercury.

Ans.—The weight of 1 cu.ft. of saturated air at the given temperature and pressure is calculated thus:

$$w = \frac{1.3273\ (29.0 - 0.3765 \times 0.6176)}{460 + 65} = 0.0727 \text{ lb.}$$

Ques.—How many gallons of water are carried out of the mine per minute by an air current of 100,000 cu.ft. per min., assuming the temperature of the return air is 70 deg. F., at which temperature the tension of the water vapor is 0.36 lb. per square inch?

Ans.—The weight of water vapor in this return air is

$$w = \frac{0.6235 \times 0.36}{0.37\ (460 + 70)} \times 100{,}000 = 114.46 \text{ lb.}$$

Taking the weight of water as $8\frac{1}{3}$ lb. per gal., the number of gallons of water carried in the return current, in this case, is $114.46 \div 8\frac{1}{3} = 13.735$ gal. per min., or nearly half a barrel of water each minute.

Ques.—Find the weight of 1 cu.ft. of marsh gas, at a temperature of 60 deg. F. and a barometric pressure of 28.6 in.; taking the specific gravity of the gas as 0.559.

Ans.—The weight of 1 cu.ft. of gas is found by multiplying the weight of 1 cu.ft. of dry air, at the same temperature and pressure, by the specific gravity of the gas. It is calculated thus:

$$w = \frac{1.3273 \times 28.6}{460 + 60} \times 0.559 = 0.0408 \text{ lb.}$$

Ques.—Write the chemical equation expressing the complete combustion of marsh gas in oxygen, and state what volume of carbon dioxide is produced in the explosion of 100 cu.ft. of marsh gas.

Ans.—The chemical equation expressing the reaction is

$$CH_4 + 2\,O_2 = CO_2 + 2\,H_2O$$

The coefficient of each term, in this equation, represents the relative volume of the gas concerned in the combustion. Thus, one volume of marsh gas (CH_4) consumes two volumes of oxygen ($2\,O_2$) and produces one volume of carbon dioxide (CO_2) and two volumes of water vapor ($2\,H_2O$). Therefore, 100 cu.ft. of marsh gas will produce 100 cu.ft. of carbon dioxide and 200 cu.ft. of water vapor.

Ques.—How would you proceed to remove firedamp from a section of a mine after an explosion; what dangers would you expect, and how would you overcome them?

Ans.—Before attempting to remove any considerable accumulation of firedamp, the men on the return of the air must be notified and withdrawn from that section of the mine. Under certain conditions where roof falls are imminent, all of the men in that section of the mine should be promptly withdrawn. Guard all approaches to the district by stationing reliable men to prevent anyone from entering that portion of the mine. Select only experienced men, and provide each man with a good safety lamp that has been previously examined. Arrange to increase the circulation in the affected district, as the conditions may require. Approach the trouble from the intake side, and avoid as far as possible being trapped in the gas. Erect the necessary brattices so as to deflect the current of air upon the gas. Allow sufficient time for the air current to sweep away the gas, making occasional tests to ascertain the progress of the work.

The dangers are: The possible ignition of the gas by a defective lamp or otherwise. A possible fall of roof may drive the gas back upon the men, and envelop them in an explosive atmosphere. If poisonous gases are present the men may be overcome by the gas. To avoid these dangers the work must be conducted, as explained, from the intake side, with safety lamps, by experienced men; and ample time must be given for the removal of the gas. The best type of safety lamp must be used.

Ques.—While examining for gas near the roof, if the safety lamp is extinguished without giving any of the characteristic indications of firedamp; what inference would you draw and what would be an approximate composition of the gas?

Ans.—It is possible for the lamp to be extinguished by a body of pure marsh gas (CH_4) given off at the roof; but in that case, the lamp flame, if carefully observed, should give some indication of the gas before being extinguished. Again, it is possible for the lamp to be extinguished by blackdamp, issuing freely from the roof strata and coming probably from an overlying seam that has been previously worked out and abandoned.

It is very probable, however, that the gas in question is a mixture of carbon dioxide (CO_2) and marsh gas (CH_4). Under certain conditions where these gases mix in the strata without being diluted with air, there is produced a firedamp mixture lighter than air but containing sufficient carbon dioxide to make the mixture extinctive. This mixture of carbon dioxide and marsh gas has been termed "flashdamp," for the reason that when a lamp is first elevated into the gas the pure air contained in the combustion chamber of the lamp dilutes the gas, which gives a distinct cap to the flame. But this cap appears for a moment only and is gone, owing to the lamp filling with the undiluted gas, which dims and may extinguish the flame if the lamp is not promptly withdrawn. It is this brief appearance of the cap that has given the mixture the name "flashdamp." By the addition of air the mixture becomes highly explosive, as the proportion of carbon dioxide is insufficient to prevent explosion.

COAL AND COKE NEWS

Washington, D. C.

Orders issued by the Interstate Commerce Commission on Saturday, Feb. 8, have canceled the advanced coal rates which it had been intended by the Atchison, Topeka & Santa Fé R.R. to put into effect from Colorado coal-producing regions to points in Kansas, Oklahoma & Texas. Under the new orders, however, coal rates are allowed to be established from the Walsenburg fields at a figure 10c. higher than the rates from the Cañon City field to the same points in the three states named. This new adjustment will go into effect on Mar. 12.

The commission is following the general policy of keeping coal rates down so far as possible practically everywhere. While it probably has not been more extreme in this matter than it has in regard to other advances on commodities of miscellaneous character, it is a fact that the general policy planned by the commission contemplates the keeping down of rates on staple products which are presumed to have a direct relationship to the cost of living.

In the case of coal it has been strongly desired by the administration that so far as possible everything should be done to keep the product moving steadily to market. That there has been success in this regard is claimed by some to be shown in the fact that the coal-car shortage up to Feb. 1 is reported to the commission to have increased by 1211, notwithstanding that there was an idle-car surplus of 37,260 on the same date, which was an increase of very nearly 9000 cars, as compared with the middle of January.

An advance in coal rates, it is supposed by some members of the commission, would prevent coal from moving to market quite as actively as would otherwise be the case. It is probable that the question of the attitude of the new administration on the freight-rate question generally and particularly with regard to rates on coal and other staples will be one of the first business problems that has to be met after Mr. Wilson is inaugurated.

A New Record of Output

According to information received here by Government authorities, a new record has been set for anthracite shipments in the first month of the year. The shipments in January amounted to 6,336,419 tons, an increase of 572,723 tons over January, 1912. The former record, made in January, 1903, was 5,964,950 tons, or 371,469 tons less than were shipped last month.

The immediate effect of this is shown by an increase of nearly 35,000 tons in the amount of coal on hand at tidewater shipping ports in the last month. On Dec. 31, 1912, there were 340,637 tons on hand. On Jan. 31, 1913, this amount had increased to 375,566 tons.

The Threatened Strike

The threatening developments in the controversy between the railroads and the firemen are causing considerable anxiety in administrative circles because of their dangerous charter and particularly on account of the possibility of their intensifying the coal shortage should matters come to an actual breach.

The fact that Commissioner of Labor Neill, although reappointed by President Taft, has not been confirmed by the Senate is an additional aggravation. If arbitration should be attempted under the Erdman act, the only man available for the service in the Bureau of Labor would be the present chief clerk, G. W. Hanger, who is not considered sufficiently familiar with the task to handle it successfully.

The criticism to which the Erdman act is now being subjected in the present controversy has greatly weakened the demand that that act be so extended as to permit Federal arbitration in cases involving coal-mine controversies.

PENNSYLVANIA

Anthracite

Scranton—Although the colliery engineers employed by the D. L. & W. Coal Co., in the Scranton district, have joined the miners' union, after a one day's strike at eight collieries of the company, it is said that in many instances the engineers will not have to take the oath of allegiance which would call upon them to quit work in case of mine strikes. The engineers have long hesitated about joining the miners' union because of their eligibility under the company's pension rule, which would be canceled if they went on strike or left the employ of the company.

Archbald—Employees at the White Oak Colliery of the D. & H. Co., in Archbald, have gone on strike, alleging that the company is unfair in the distribution of cars, and that certain men are being discriminated against. It is claimed by the miners that contractors in headings and gangways are working six or more men, and that these contractors are being openly favored in the number of cars furnished them.

Ashland—Following a conference of officers of the union and officials of the Reading Coal & Iron Co., 75 miners on strike for over a week because of a checking out system recenly inaugurated, agreed to return to work at Bast Colliery. Instead of the check system obliging all men to report at the colliery office nightly, forcing many of them to walk a long distance out of their way, the company has agreed to place peg-boards at all openings to the mine.

Williamstown—The Williamstown colliery resumed work Jan. 30, after an idleness of one week. The one miner who refused to join the union has quit and the men have returned to work.

Shamokin—Enterprise colliery employees have resolved that they will not work with men who refuse to pay dues to the United Mine Workers' organization. It is feared that a strike may result.

Coal stripping operations are to be started soon at the Alaska Colliery of the Reading Coal & Iron Co., at Shamokin. Two 18-ton locomotives and a 70-ton steam shovel are on the ground ready to begin work.

Hazleton—The boys at the White Ash breaker of the Lehigh Coal & Navigation Co., at Hazleton, have been given a 15 per cent. increase, putting them on equal terms with the No. 6 breaker boys.

Nanticoke—In order to do away with any inconvenience and delay in sending its officers and engineers to the different collieries, the D. L. & W. Coal Co. has installed a new auto bus which will run between Nanticoke and Kingston.

Wilkes-Barre—In addition to the elaborate provisions for rescue and first-aid work now in force in the anthracite mines, the Lehigh Valley Coal Co. is preparing for service a mine-rescue car, which can be rushed at a moment's notice to any colliery in case of accident. This car consists of a remodeled passenger car equipped with oxygen breathing apparatus and every kind of first-aid equipment. It has six Draeger helmet outfits, with the necessary auxiliary equipment, pulmotors, stretchers, blankets, splints, bandages, etc. It will be used as a hospital and ambulance combined, and rushed on call to any colliery where an accident has occurred, by special train service, and manned by a crew of trained helmet men.

Pottsville—To stop annoyance resulting from the numerous petty strikes, the Reading Co. has adopted a new policy. Where such strikes are called the operations shall remain idle until the operators get ready to resume. This rule has gone into effect in several parts of the anthracite region.

Bituminous

Punxsutawney—The Lindsey Coal Mining Co. has bought 250 acres of coal land of the Berwind-White Co., near Punxsutawney, and will make a new opening at once on the Bellwood-Punxsutawney branch of the Pennsylvania R.R. It is expected that this opening will tap nearly 1000 acres and will lead to the mining of nearly a million tons of coal.

WEST VIRGINIA

Bluefield—Twenty-one miners of the Houston Coal & Coke Co. have been arrested by Mine Inspector Nicholson on the charge that they have been shooting off the solid. Twenty of the men were fined $10 each and one was fined $30. It is learned that if this practice is not stopped Mr. Nicholson intends to have the mine foremen prosecuted for allowing the men to make use of this dangerous method.

Charleston—Much interest has been attracted by the introduction of a bill in the House of Delegates, which will

ake the mine owners responsible for deeds of violence committed by guards employed by them.

Reports are current that the town of Acme has been shot o by the striking Eskdale miners. Some rumors say that 500 ots were fired. It is claimed that conditions on Cabin Creek re as bad as they ever were. The mine-guard system is inaming the miners to a pitch where a serious outbreak may ome at any time.

KENTUCKY

Basketts—The breaking of the hoisting cable in the mine f the Pittsburgh Coal Co., at Basketts, Ky., recently imrisoned the entire working force in the mine for four hours. he cage started to fall when the cable broke, but it was topped by the safety catches, and no one was injured. The ccident occurred at 2 o'clock in the afternoon, and it was before the cage was put in working condition.

Whitesburg—It is announced by the Consolidation Coal o. that coal shipments from its plant at McRoberts will soon e doubled, reaching something like sixty cars a day, most f which goes to Northwestern points. The company's mines Jenkins, in the same field, are also making large increases their capacity, and will cut a large figure in swelling the ompany's output.

OHIO

Columbus—The Colonial Coal & Supply Co. has asked the hio Public Utilities Commission to collect $15.70 from the ocking Valley and the Chicago and Erie Ry. companies. The oal company claims that there was a shortage in weight on car of coal shipped from Pomeroy to a customer in Lima. he railroad companies are charged with being negligent in he transportation of the coal resulting in the loss.

A hearing was held recently before the Ohio senate committe on mining, on the anti-screen bill pending in the Ohio gislature. Operators who spoke were C. L. Cassingham, resident of the Coshon Coal Co., of Cleveland; E. M. Poston, the New York Coal Co., Columbus; Edward Johnson, presint of the Lorain, Coal & Dock Co., Columbus. All of the perators were opposed to the bill as unjust in every respect. number of representatives from the miners' union appeared favor of the bill.

INDIANA

Indianapolis—The supreme court of Indianapolis has reersed the decision of the appellate court and the Greene ounty circuit court and holds that coal in the ground and ld is taxable although it is not connected with an open al mine This decision was handed down in the case of the reene County officials against the Lattas Creek Coal Co.

The court thinks that after a farmer has sold the coal nder his property he should no longer be compelled to pay xes on it. These taxes should be paid by the persons who ought and own it.

Fort Branch—Two shotfirers were recently killed in an plosion in the mine of the Fort Branch Coal Mining Co., by "windy shot" caused from the clay placed around the harge not being packed tightly enough. Horace Dewees and illiam Bush were the names of the men, who went into the ine after the other men had left, in order to shoot down al for the next day's work. The first shot caused their ath. The mine-rescue car from Evansville, Ind., was sent r, but no great damage was done to the mine, and the bodies ere removed by volunteers from among the miners employed the company.

ILLINOIS

Lincoln—A pocket of gas was set off, Feb. 1, by the lamp an electrician in the Latham coal mine. Two miners were lled and thirty were imprisoned. Three hundred were in e mine.

MISSOURI

Rolla—The State Bureau of Geology and Mines has just sued a report showing that the annual coal production for e state of Missouri reaches 4,000,000 tons. The productive ams vary from 18 in. to 5 ft. in thickness.

NORTH DAKOTA

Grand Forks—Thousands of tons of coal are being conmed in North Dakota by fires which are burning in undeloped mines. It is expected that action will be taken by e state legislature to halt this destruction of the nation's sources.

FOREIGN NEWS

Nagasaki, Japan—One hundred and fifty coal miners were tombed, Feb. 6, by an explosion in a colliery near Fukooka. tle hope is entertained for their rescue.

PERSONALS

General Superintendent Thomas R. Evans, of the Parrish Coal Co., has tendered his resignation.

D. A. Thomas, who has been visiting various coal properties in this country, and whose home address is Cambrian Building, Cardiff, Wales, sailed for home Feb. 11.

Chas. Dorrance, hitherto fuel engiiner of the Lehigh Coal & Navigation Co., has been made chief mining engineer for the same company, having superintendence of the mining and mechanical departments.

Judge George Gray has appointed Charles P. Neill, United States Commissioner of Labor, as referee in three cases which the Board of Conciliation was unable to settle.

Clinton Neyhart, weighmaster at No. 3 D. & H. Colliery, has been appointed outside foreman at the Boston Colliery of the same company, to succeed William Steevers, who was transferred to No. 2 Colliery.

It has been announced that T. K. Jenkins, formerly purchasing agent of the Durham Coal & Iron Co., at Chattanooga, Tenn., has been appointed chief clerk to the assistant to the president of the Davis Coal & Coke Co.

Robert W. Johnson, for 10 years sales manager of the Ottumwa Box Car Loader Co., has accepted the general managership of the United States Coal Co., at Kemmerer, Wyo. This company has a plant with a daily output of 2500 tons.

E. T. James, superintendent of shops of the Lehigh Coal & Navigation Co., has resigned to become an assistant of Charles A. Straw, his former chief. His place is to be filled by Joseph Williams, hitherto general foreman of shops. Albert Leonarz is made assistant master mechanic in charge of the electrical department.

At the annual meeting of the stockholders of the Red Ash Coal Co., Woodward Leavenworth, John N. Conyngham, William H. Conyngham, G. Frederick Parrish and Edgar R. Reets were elected directors. The officers elected are: Woodward Leavenworth, president; G. Frederick Parrish, vice-president and treasurer; Walter Roberts, secretary.

OBITUARY

John Fritz, mechanical and mining engineer, born in Londonderry Township, Chester County, Penn., Aug. 21, 1822, died at his home in Bethlehem, Penn., Feb. 13, 1913.

His early boyhood was spent upon his father's farm, where he received what education the local school afforded. At the age of 16, Mr. Fritz became an apprentice in a machine shop; later on entering the employ of the Moore & Hoover Iron Works. It was here that he perceived the immense possibilities in the iron industry.

From the Moore & Hoover Iron Works he went with the Morristown Iron Works and later the Cambria Iron Works, at Johnstwn, Penn. While here he revolutionized the iron-rail industry, securing a better product with four-fold greater capacity of the mill, thus enabling American manufacturers to compete with those of foreign countries.

About this time he perfected blast-furnace practice. In July, 1860, he began service with the Bethlehem Iron Co. as general superintendent and chief engineer. While here he greatly assisted in perfecting the bessemer process of steel manufacture, and also in remodeling and improving the Siemen-Martin openhearth process.

Turning his attention to the production of steel plates and structural shapes, he designed mills and rolls superior to any then on the market. When the problem of making armor plate arose, he originated the solid steel plate, the superiority of which still remains unquestioned.

He took a great interest in Lehigh University and recently presented that institution with a laboratory.

The engineering profession has lost one of its great members—one who was associated with all of the principal engineering societies both in this country and abroad, which vied with each other in doing him honor. Engineers and scientific men throughout the entire world will mourn the loss of "Uncle" John Fritz, as he was familiarly called, whose name will be forever associated with the growth and development of the American steel industry.

BOOK REVIEW

BOOK OF STANDARDS. National Tube Co., Pittsburgh, Penn. 559 pp.; 4x6½ in.; leather bound, about ⅝ in. thick. Price, $2.

This is strictly a handbook devoted to pipe and allied products. Much valuable information bearing on subjects which may appear to be but remotely connected with the main theme of the work are concisely treated. Among these might be mentioned the Pitot tube, the Venturi meter, the mechanical properties of solid and tubular beams, boiler incrustation and corrosion, the properties of saturated steam, etc., etc.

Not the least valuable part of the contents is a glossary of terms used in the pipe and fitting trade. To the man unfamiliar with these and particularly to the technical student or recent graduate, this glossary alone is worth the price of the volume.

The compilers of this work express themselves as being of the opinion that it contains a greater amount of information in regard to tubular products than any other similar work of this character. We think that we can honestly concur with them in this belief.

ANNUAL REPORT, DEPARTMENT OF PUBLIC WORKS OF THE PROVINCE OF ALBERTA. 1911. 242 pp., 6½x10. Paper.

This pamphlet, as its title suggests, contains more than mining reports. It covers bridges, ferries, roads, architecture, building, steam boilers and telephones. The mining section is spread over 95 pages. It states that whereas in 1910 there was one life lost for 49,783 tons of coal mined; in 1911, 242,080 tons were extracted for each fatality.

It seems to be easier in Alberta to secure conviction of violators of the mining code than in the United States. Seven persons were fined an aggregate of $110, and paid costs amounting to $31.25. One case was dismissed. Two managers, three firebosses and two miners were convicted. All prosecutions were instituted by the mining department.

The Bellevue explosion is detailed at some length in this report. The inspector states that telephones are being installed in nearly all the mines in accordance with the suggestion of the coroner's jury, impaneled after that disaster. An arrangement is being made to ventilate the completed sections of the Bellevue mines by frequent openings to the surface, and instructions have been given the West Canadian Collieries Co., Ltd., that no further pillars may be drawn until a sufficient number of crop holes have been made where these pillars are to be extracted.

The examination questions for mine managers, "pit" bosses and firebosses are given in full, as are also the wages for all employees. Outside workers labor 10 to 12 hours, and those underground for 8 hours only.

CONSTRUCTION NEWS

Fall River, Mass.—The Fall River Gas Works Co. is making plans for a $500,000 coal gas works at Birch and Bay Sts.

Earlington, Ky.—The St. Bernard Mining Co. has installed at its coke ovens a 20-in. rubber belt conveyor for carrying coal to the washer.

Rankin, Ill.—The new $12,000 coal dock of the L. E. & W. has been completed. It is built entirely of steel and is run by a 12-hp. gasoline engine.

Centralia, Ill.—Chicago capitalists have secured a large acreage of coal land in the Zeigler district and will put up a modern colliery during the summer.

Albion, Mich.—Albion's coal mine will soon be in operation, provided high water does not interfere with the work. The shaft has been sunk 66 ft. and is now within 6 ft. of the coal.

Honesdale, Penn.—The D. & H. Co. are soon to build a washery between Honesdale and Waymart for the purpose of cleaning up the coal and culm dumps along the line of the old gravity road.

Holt, Ala.—The Central Iron Co. has broken ground for 20 more ovens, thereby increasing its byproduct plant capacity 50 per cent. The company recently completed a blast furnace at a cost of $325,000.

Schafer, N. D.—Beds of lignite will form the foundation for the new line of the Great Northern Ry. through this section. In some places the track will be built on a continuous seam of lignite. Most of this fuel which has been blasted out will be wasted.

Monongahela, Penn.—A corps of engineers under the direction of George B. Eaton is making surveys of the Charleroi coal properties sold recently to the Carnegie Coal Co. As soon as the surveys have been completed work of improvement will begin.

Uniontown, Penn.—Engineers for the W. A. Stone Coal & Coke Co. have been making surveys on the company's property near Maidsville Landing, on the west side of the river. It is stated that the surveys are preliminary to the opening of mines. The company owns 350 acres at that point.

Whitesburg, Ky.—It is announced that an eastern syndicate has bought the Sam J. Wright and John Osborne tracts of coal and mineral land, consisting of about 1200 acres. Early development is planned. A 4-mile branch railroad from the main line of the Lexington & Eastern will be constructed at once.

Battle Creek, Mich.—The big 10,000-ton coal pocket at the Commonwealth Power Co.'s plant has been completed. The coal stored in this pocket will be kept under water in order to avoid fire and explosion hazards. The sidetrack, which is being constructed to the plant by the Michigan Central, has not yet been completed.

Altoona, Penn.—Actual work has been started to transform the old Wopsy road into the Altoona-Northern line. The new road will extend from Altoona to Patton, a distance of 20 miles. The line will be designed for both steam and electric power and will carry passengers by day and coal by night. At Patton connections will be made with the Northern Cambria Ry. The company is capitalized at $750,000.

Mobile, Ala.—Information has been received that the first barge of the New Orleans & Mobile Transportation Co. will be launched about Mar. 15. The announcement is received with great satisfaction by those who are interested in the Warrior coal fields. Boats of the company will make points between Mobile and New Orleans wherever tonnage is offered in sufficient quantity to warrant. The company was organized for the purpose of developing the Warrior coal field.

NEW INCORPORATIONS

Toronto, Can.—The North Alberta Coal Co.; capital stock, $2,000,000.

Louisville, Ky.—The Purity Coal Co.; capital stock, $8000. Incorporators: A. H. Gardener, R. H. Tydings and J. T. Gardener.

Little Rock, Ark.—The Arkansas Anthracite Coal Co.; capital stock, $100,000. Incorporators: W. H. Barrett, T. M. Barrett and W. H. Barrett, Jr.

Greensburg, Penn.—The Greensburg Coal & Coke Co.; capital stock, $200,000. Incorporators: Alexander Coulter, H. W. Coulter, W. A. Coulter and Margaret Coulter.

Danville, Ill.—The Two Rivers Coal Co.; capital stock, $100,000; general coal and lumber business. Incorporators: R. H. Sherwood, W. C. Hartshorn and J. W. Hegler.

Chattanooga, Tenn.—The Paint Rock Consolidated Coal Co.; capital stock, $50,000. Incorporators: J. R. Barnes, H. B. Bonney, W. B. Garvin, J. E. Patton and G. M. Price.

Mann, W. Va.—The Kistler-Schuler Coal Co.; capital stock, $50,000; to develop coal properties. Incorporators: J. F Kistler, Grace Kistler, E. J. Schuler, J. F. Schuler and S. A. Schuler.

Cambridge, Ohio—The Economic Coal Co.; capital stock, $10,000; to mine and deal in coal. Incorporators: C. B. McCoy, J. L. Secrest, J. A. Thrasher, Homer Whitten and F. W. Tobin.

Charleston, W. Va.—The California & West Virginia Lumber & Mining Co.; capital stock, $3,000,000; to produce lumber mine and market coal, iron and other minerals and ores, together with oil.

New York, N. Y.—Plans have been completed for the consolidation of the Burns Brothers and the Curtis-Blaisdell Co. The new firm will be known as the Burns Brothers and will be capitalized at $2,000,000.

Fairmont, W. Va.—The Ross Coal Co. capital stock, $75,000; to carry on a coal mining and real estate business. Incorporators: C. E. Hutchinson, C. H. Jenkins, E. C. Curry, R. A. Johnson, and H. M. Pierpont.

Charleston, W. Va.—The Argyle Coal Co.; capital stock, $50,000; to do a general coal and mining business and deal in

real estate. Incorporators: W. H. Thurmond, T. H. Hooper, E. J. Payne, G. M. Jones, and A. W. McDonald.

Ashland, Ky.—The Elk Horn Fuel Co.; capital stock, $150,000; to do a general mining business and acquire real estate and mineral lands. Incorporators: R. D. Davis, Jr., J. S Hager, K. M. Fitzgerald, Thomas Boggess, Jr., and W. P. Wheeler.

Canal Fulton, Ohio—The Fulton Pit Car Co., of Canal Fulton, Ohio, has been incorporated with a capital stock of $100,000 to manufacture mine cars and deal in iron and steel products. The incorporators are E. J. Nichler, E. E. Shilling, C. A. Vanderhoof, A. H. McCadden and George Fellmeth.

INDUSTRIAL NEWS

Elys, Ky.—The Camp Coal Co. has increased its output to 200 tons per day. H. N. Camp is general manager.

Pueblo, Colo.—The Royal George coal mine is now working on a larger scale than ever and is employing several hundred people.

Clinton, Ind.—Now that the waters of the Wabash are receding it is the hope of the management of the Lyford mines that work can soon be resumed.

Waynesburg, Penn.—Dr. J. C. McClenathan has purchased the West Aberdeen Coal Co.'s property and is now repairing mines with a view to putting them in operation.

Connellsville, Penn.—The Mahoning plant of the Cambria Steel Co. has been sold to J. M. Gray and K. K. Kramer, of Connellsville. The 82 ovens will be fired within two weeks.

Pekin, Ill.—Coal has been found on the farm owned by George W. Cunningham, 4 miles north of here. The quantity of the find is not known, but men are at work to determine it.

Providence, R. I.—At the annual meeting of the Portsmouth Coal Co., which was formerly the Rhode Island Coal Co., the stockholders voted to continue the development of the property.

Pittsburgh, Kan.—The Missouri, Kansas & Texas R.R. Co. has just completed taking options on coal leases on 20,000 acres of land in Grant Township, on the west border of Crawford County.

Jasper, Ala.—The gas development in Walker County is assuming greater proportions. The Pennsylvania Gas & Oil Co. has enlarged its working capacity and is beginning to bore for gas and oil in additional fields.

Kansas City, Mo.—The possibilities of large coal deposits as yet untouched in the Ozark regions will be investigated by a party of Eastern capitalists. Recent small finds have been made in the country near Gretna, Branson and Hollister.

Saline, Ia.—Drilling operations have been resumed after a suspension of about 8 months. In case anything valuable is found a company will furnish funds for further testing. In case a general field is indicated by the test drilling a shaft will be sunk.

Bartlesville, Okla.—A coal company, recently formed in Wann by B. W. Mizer and D. W. Bunnell, has leased a tract of land 2 miles south of town and has begun operating their mine. The seam crops out at a creek, is of good quality and is 15 in. thick.

Connellsville, Penn.—J. E. Barnes, of Pittsburgh, has secured options on 2500 acres of coal land in Whitely Township at $400 an acre. It has been reported that he secured the options for the Pittsburgh Coke & Coal Co. The options extend for 90 days.

Chicago, Ill.—The strength of the Colorado Fuel & Iron preferred stock, which has advanced to 155, is taken in some quarters to foreshadow a substantial payment on accumulated back dividends. This year's earnings are at about the same rate as last year's.

Moline, Ill.—The old Sackville coal mine which was abandoned some years ago is to be reopened. There is plenty of coal, left in the field and good management is all that is needed to make it a paying project. It has been secured by Sievers & Sommerson.

Petersburg, Ind.—The miners at the Hammond coal mine have found a vein of lead or bismuth embedded in the center of a 6-ft. seam of coal. The vein is about 3 in thick, but no estimate can be made as to how far it runs. Samples have been sent to the assay office.

Cañon City, Colo.—The coal mines of Fremont County are in a prosperous condition and are working better than they have for months. One mine official states that there are sufficient orders now booked by the Victor American Fuel Co. to the mines and putting them in operation.

Lewis, W. Va.—Owing to the abandonment of the Lynch mine the Consolidation Coal Co. has removed its store to the Two Lick mine. The Lynch mine was opened in 1878. It was first made a modern mine by the Hutchinson Coal Co. and was then sold to the Consolidation company.

McRoberts, Ky.—The Consolidation Coal Co. announces that this plant will double its capacity. They expect to ship from 20 to 25 cars a day. The plant at Jenkins is also expected to make an increase. Thousands of men are now employed at the mines at McRoberts and Jenkins.

Tuscaloosa, Ala.—Certain Florida men have purchased 320 acres of coal land at Shira's Station. This land contains two fine seams of coal which is considered to be the best in the country. The purchasers expect to ship much of the coal which they mine. The property is situated near the Warrior River.

Steamboat Springs, Colo.—Graders on the Moffat Road extension have struck sufficient coal to last the road for years, 12 miles below here. The seam is 4 ft. in thickness and the coal is being thrown over the dump by the graders. M. A. Wogan, the Denver contractor, has charge of the construction work.

Cheyenne, Wyo.—John Skinner and son have been working all winter opening a seam of coal which they discovered on Badwater. They expect to get into the best coal within a few days and are contemplating putting it on the market as soon as they have the mine sufficiently developed to warrant hauling the coal to town.

Waynesboro, Penn.—Dr. J. C. McClenathan has purchased from W. F. Patterson 1500 acres of coal land located in Monroe County, Ohio. The amount involved in the transaction was $100,000. The new owner has not given out any plans he may have in regard to the property but it is understood that he bought it as a speculation.

Howe, Okla.—It is stated on good authority that the Southwestern Tennessee Iron & Coal Co. has purchased all the mines of the Rock Island R.R. from Hartford to McAlester. This means the opening of new mines and the working of the old ones, together with a demand for men. The properties or leases are valued at $3,000,000.

Connellsville, Penn.—A company of eastern capitalists who own about 7000 acres of mineral land in the vicinity of Kingwood have been drilling test holes on their property. Results show that the land is underlaid with a seam of excellent steaming coal varying in thickness from 54 to 62 inches. Analysis shows this coal to be of superior quality to that of the Humbert field.

Cincinnati, Ohio—Arrangements are being completed for the issuance of $10,000,000 convertible 6 per cent. notes by the Consolidation Coal Co. This new financing has become necessary owing to the great growth of the company. Of this issue $6,000,000 is to be sold at once and the proceeds used to continue the development of the company's coal lands in Kentucky, and otherwise enlarging facilities.

Racine, Wis.—The Racine Gas & Electric Co. of Racine, Wisconsin, have placed an order with the Roberts and Schaefer Co. for a large coal-dock bridge for the storing of coal at Racine and the handling of same mechanically. Contract price approximately $75,000

This company has also secured a contract this week from the Alpine Coal Co., Ottumwa, Iowa, for a complete coal mining plant at the point

Colorado Springs, Colo.—Alex Patterson has opened up what is said to be the finest bed of lignite ever discovered in this state. This strike confirms the belief of the experts that the land immediately north of here is underlaid by coal deposits.

Patterson has opened up a seam 11 ft. thick, which apparently extends over several hundred acres, at a depth of 371 ft. The value of the find is estimated at $1,000,000.

Columbus, Ohio—The Kilbourne & Jacobs Mfg. Co., of Columbus, Ohio, in the annual report recently issued shows a fine year in every respect. The company is preparing to put on the market a new kind of mine car which is intended for slope mining. At the annual meeting James Kilbourne was elected president, Felix A Jacobs, first vice-president, James R. Kilbourne, 2d vice-president and general manager, F W Hubbar, secretary Frank C Eaton, treasurer and Joseph B. Potter auditor Lincoln Kilbourne was elected assistant general manager

COAL TRADE REVIEWS

GENERAL REVIEW

The continual rather cold or stormy weather over the last two weeks has had a mildly stimulating affect on the demand for hard coal. This has not materially aided the situation, however, as this demand has been concentrated entirely on one or two sizes already in short supply; these are pea and stove, the only two grades for which there is any sustained demand, and the former is the only one which now brings a ready premium. Substantial concessions on the regular circular are easily obtainable, and the individuals are creating a market by their usual methods of price cutting. All sales departments are actively seeking orders. The current month will no doubt see the smallest production in the anthracite field since May of last year, at which time the suspension in mining was brought to a close.

Contracting is the only feature of interest in bituminous circles at the present time. It is rumored that a considerable volume of the Eastern contracts are being closed at a small advance over last year's figures, and with the usual protection being guaranteed against a declining market. This applies more particularly to the Coastwise situation, few all-rail contracts having been placed so far, most operators apparently waiting action by the larger producers. In spite of the abrupt change in weather conditions, there is little demand except on contract. The movement is rather light, and prices low, with buyers showing no interest whatever in the market; there are, however, fair tonnages moving on contract.

The market in the Pittsburg district is now feeling the effect of the long period of mild weather, which greatly increased the production at the mines, and at the same time curtailed consumption; there is little active negotiating on season contracts, buyers evidently doubtful if the new prices will be maintained. At Buffalo the abrupt drop in temperature occurred at the crucial stage, and turned what might otherwise have been a disastrous slump into a fairly active market.

The change in weather conditions also brought an immediate increase in the orders for domestic coal in Ohio. This, together with the heavy steam consumption, has materially stimulated the market, although not sufficient to affect prices. The indications are for a thoroughly good business the balance of the season, and the operators are optimistic. The feature of the Southern market is a rumor to the effect that there will be a general advance on the Cahaba domestic grades, to take effect March 1. There is a tendency in this district to shade prices on the steam sizes in order to secure good business, but otherwise quotations will remain unchanged.

Colder weather has caused an increased consumption, and a rather unsettled feeling in the Middlewestern trade; however, the heavy overproduction is still tending to keep prices down. In the Northwest cold weather has made a decided change for the better, although the domestic grades continue weak. The dealer's stocks are still quite heavy, and some cancelations of orders are coming in, while others are being held up.

BOSTON, MASS.

A week of continuous cold has served to steady the market, but neither bituminous nor anthracite can be said to be at all active. Sales are few and prices are no higher than a week ago; it is simply that the downward tendency has been checked for the time being. There is ample coal at the Hampton Roads piers and what transportation reports is loaded promptly; a liberal share is going off-shore.

Contract business has already been closed in considerable volume, but only by two or three of the Southern shippers. The prices are understood to be slightly in advance of the figures for 1912 but as usual protection is guaranteed against a declining market. It is the usual straining to get business covered. Meanwhile, spot coal, Pocahontas and New River, is being sold down to $2.70 f.o.b. and even less.

All-rail there is nothing new. Buyers generally have lost interest in the current market, if indeed there can be said to be any, and prices are on last summer's level. There are the usual signs of campaigning for contracts but little is heard of actual sales being made. Most of the operators are marking time to see what position is to be taken by the larger producing companies. Cars are in much better supply and the movement is so good that cancelations, rather than orders, are the rule just now.

Individual hard-coal operators had a taste of lucrative business for a few months but now they are offering coal broadcast at prices well under the company circular. Not much of it is likely to reach New England, however, for the rates on company transportation are likely to exclude outside shipments at market freights. On Long Island Sound the margin between the company rate of 40@45c. and the market rate of 45@50c. is so small that some individual coal is still being received, but mostly on old purchases. All-rail anthracite is almost certain to be stirred up more or less by offerings of independent coal right through the season. The sales departments of all the companies are actively out for orders now and February is sure to be the lightest month for tonnage since May. Egg is still the long size, and stove and pea are again coming into supply so that free shipments of those sizes are beginning to be made.

Current wholesale quotations are about as follows:

Clearfields, f.o.b. mine	$1 20@$1.35
Clearfields, f.o.b. Philadelphia	2 45@ 2 60
Clearfields, f.o.b. New York	2 75@ 2 90
Cambrias, Somersets, f.o.b. mines	1 30@ 1 45
Cambrias, Somersets, f.o.b. Philadelphia	2 55@ 2 70
Cambrias, Somersets, f.o.b. New York	2 85@ 3 00
Pocahontas, New River, f.o.b. Hampton Roads	2 70 and less
Pocahontas, New River, on cars Providence	3 85@ 4 00
Pocahontas, New River, on cars Boston	3 90@ 4 10

NEW YORK

Bituminous—In spite of a week of severe winter weather the soft-coal market has fallen off still further. Prices on all grades have receded sharply, the off qualities suffering particularly. Conditions now, however, are only about what was ultimately to have been expected in view of the abnormally open winter up to the first of the current month. As a result of this, production in the mining regions was greatly facilitated, while on the other hand consumption was correspondingly curtailed. Consumers have naturally accumulated substantial surpluses, and in the face of these conditions a reversal of form was inevitable. The abrupt change in weather conditions had a steadying influence on the trade, and while essentially weak it cannot by any means be considered down to a low level.

There is little or no activity in contracting for the new year. Because of the unsettled conditions in the spot market, consumers are holding off in the hope that the present slump will see prices forced to a low level; such a condition would, of course, have a detrimental effect on contract figures. Prices on both the hard and soft coal have suffered a more or less general reduction on all grades, and the market is now quotable on the following basis:

	Anthracite		Bituminous
	Circular	Individual	
Broken*	$4.50	5.00	West Virginia, steam $2.65@2.75
Egg	5.25	4.75	Fair grades, Penna	2.75@2.85
Chestnut†	5.25	5.25	Good grade, Penna	2.90@3.00
Pea*	3.50	3.75	Best miller, Penna	3.05@3.15
Buckwheat**	2.75	3.70	Georges Creek	3.25@3.30
Buckwheat†	2.45	2.55	
Rice**	2.25	2.25	
Rice†	1.95	1.80	
Barley†	1.75	1.10	

* Scranton and Lehigh. ** Scranton. † Lehigh and Schuylkill.

Anthracite—The advent of more seasonable weather conditions failed to have any very stimulating affects on the hard-coal market. All sizes are in free supply and can be obtained in any required tonnages promptly. Egg is quite long, and concessions under the circular are being freely offered; nut is in fairly good demand, while stove and pea are the two short grades in the market, the latter being the only one to command a ready premium. Buckwheat is plentiful, while the same applies to barley, but there is a fairly persistent demand for rice.

There is but little doubt that substantial surpluses have been accumulated, and many dealers will not require any additional shipments until after the summer reduction in the circular goes into effect Apr. 1. The week of cold weather the first of the month helped the speculative coal to a cer-

tain extent, but it was not of sufficient duration to do more than check the slump, temporarily. Operators agree that nothing less than two or three weeks of continuous severe weather will save the situation for them.

PHILADELPHIA, PENN.

There has been a continuous run of cold weather for the last week or ten days, but while it has stimulated trade to a certain extent, the demand has been concentrated on sizes which were already short. The demand for egg coal seems to have fallen off altogether, and some dealers report that chestnut is rapidly going the way of egg. Stove and pea coal seem to be the only sizes for which there is any sustained demand, and for these the dealers are having to depend on current receipts. From now on until the spring or opening prices are announced, there is hardly likely to be any great movement of the egg and chestnut sizes, and it is understood that some of the large companies are putting some of the former size into stock.

The individuals are creating a market by their usual methods—quoting prices which dealers cannot very well overlook. This has been continuing for several weeks now, and it is only by working the lever of stove and pea that the large companies are able to work off any of the egg size at all. Of course, the production of the stove and pea sizes is limited, and with the demand as it is, there is some little premium pea coming to the market that is disposed of without trouble, but stove is at circular, and likely to remain there. The steam market is not particularly good, although it is understood that there is a fairly good movement of buckwheat. This grade is gradually falling into the domestic class, large quantities being used for both ranges and furnaces in the smaller residences.

The bituminous market is anything but favorable at the present time. Prices as well as the demand are off, although the figures secured now compare more than favorably with those being received late in the fall of 1912, but the operators do not seem at all pleased with the situation. Complaints are general that this branch of the trade has been infected with the apathetic condition of the anthracite trade, and a cure for one will bring the other back to normal.

PITTSBURGH, PENN.

Bituminous—The market has continued rather dull, and is feeling the effects of the open weather so long prevalent, encouraging production and curtailing consumption below expectations. The prompt market is dull, except that there is slightly improved demand from retail dealers. While there are inquiries against contracts to begin Apr. 1, there is little active negotiating, and buyers are evidently in doubt whether the advanced prices for the season will be maintained. The prompt market in the past few weeks has been on the contract basis, except for slack, which commanded premiums, although for prompt shipment it has now dropped to the contract level. We continue to quote: Slack, 90c.; nut and slack, $1.05; nut, $1.25; mine-run, $1.30; ¾-in., $1.40; 1¼-in., $1.55, per ton at mine, Pittsburgh district.

Connellsville Coke—The prompt coke market continues to slump, and contract coke, while not definitely quotable in the absence of sales or active negotiations, may be considered as having declined equally. In the past few days standard grades of furnace coke for prompt shipment have sold at $2.50, and it is doubtful if above that figure has been obtained within a week, while it is possible the price has been shaded. The total turnover has been very light. This makes a total decline in prompt furnace coke of fully $1.50, all occurring in less than 30 days. Contract coke, while not closely quotable, can hardly be considered as above prompt, which would make a decline in contract of $1, since $3.50 was the minimum quotation on first-half, and was actually obtained in two or three instances. We quote: Prompt furnace, $2.50; contract furnace (nominal), $2.50; prompt foundry $3; contract foundry, $3@3.25, per ton at ovens. The slump in prices has now reached such proportions that curtailment in production will undoubtedly occur. This will be particularly with respect to off grades, which found a market during the scarcity, but can hardly be sold now at any figure.

BALTIMORE, MD.

In spite of a decided change in weather conditions during the week, there was but little demand for fuel, except on contracts. Prices were weak, steam coal being quoted around $1@1.10, while run-of-mine sold at 90c., with but few consumers interested. The movement from the mines to tidewater was light due to a lack of cars. A number of additional contracts were renewed during the week, at an advance from 8 to 10 per cent. in the price as compared with last year.

B. Nicoll & Co., selling agents for the Pittsburgh Terminal R.R. & C. Co., recently forwarded their first shipment of Pittsburgh gas coal to Spain. Early in the week, 6700 tons were loaded on the "Volnay," destined for Valencia, Spain, and about 6000 tons will be shipped this month. The coal is from the new mines opened by the Pittsburgh Terminal R.R. & C. Co., located on the West Side Belt R.R., in the Pittsburgh district.

BUFFALO, N. Y.

The sudden cold turn on the opening of February saved the local bituminous market from a bad slump. Prices had become weak and there was report, as usual at such times, of considerable coal offering at sacrifice prices, but the temperature dropped 40 deg. at the crucial point and the market began to right itself. The railroads, which had been delivering coal at a rapid rate also fell down at this time, which further strengthened the market. In a short time coal began to pile up at terminal points, especially if destined for Canada; embargoes were issued against several trunk roads and the Grand Trunk embargoed itself by refusing coal. The last active Lake Erie ferry began to freeze up with 600 cars of coal waiting for it, and Canadian coal consumers became anxious, especially after it began to snow.

It would be hard for bituminous prices to go down after such conditions had set in and it is quite possible that the market may stiffen up soon. This uncertain condition of the market creates some uneasiness as to the prices likely to be obtained for spring contracts; predictions differ 15c. to 20c., and it is quite possible that as much variation as that may be the case. It is known that contracts already let have varied more as a rule than usual. Pittsburgh lump is quotable at $2.75, three-quarter at $2.65, mine-run at $2.50 and slack at $2.40, with best Connellsville foundry coke down to $5.50. There is no change in cannel or the smithing coals, as they are not commonly affected by the fluctuations of ordinary bituminous.

The demand for anthracite has been easy of late, on account of the mild weather and the return of snow has not firmed it up much. Retailers say that a great part of the supply bought early is still unused and there is now talk of a short winter, even though February is severe, so that buying is not likely to be heavy, unless the cold weather runs quite late, as it did last year.

COLUMBUS, OHIO

Lower temperatures which prevailed during the past week were almost immediately reflected upon the coal trade in Ohio by a large run of orders for domestic grades. This, coupled with the larger steam tonnage required, stiffened the market perceptibly, but not sufficiently to advance the price list. Coal men are content that prices did not go lower and believe that there are indications of a better trade from this time on.

Dealers who had rather large stocks during the winter months and were unable to dispose of them are now placing orders with the operators and jobbers and are asking for immediate delivery. Factories are also taking more fuel and the large apartment houses and office buildings are buying better. Operators believe that prices will remain at the present level until late in the summer as it is too late for rush of orders to have any great effect upon quotations.

Operations in the various mining districts of the state have been more active during the week. The Hocking Valley probably received the greatest benefit although an increase is reported from eastern Ohio and the Pomeroy Bend. The indications are very bright for an active lake season during the present year and the larger shippers are making preparations accordingly.

Operators are preparing for a good Lake trade, despite the soft winter weather which has prevailed so far in the Northwest. The supply on the docks is not large, and as a result shipments via the Lakes will probably be heavy. Arrangements are already being made for chartering vessels, and it looks like there will be a scarcity of bottoms.

Quotations in the Ohio fields are as follows:

	Hocking	Pittsburgh	Pomeroy	Kanawah
Domestic lump	$1 50	....	$1.65	$1 50
3-inch	1.30	$1.20	1.35	1.30
Nut	1.45	....	1.35	....
Mine-run	1.20	1.05	1.20	1.15
Nut, pea and slack	1.10	..	1.10	1.05
Coarse slack	1.00	0.95	1.00	0.90

CLEVELAND, OHIO

The sudden change to winter weather put new life in the coal trade here, and prices on slack advanced 5 to 10c. a ton. The final arrival of real winter caused a feeling of comfort to shippers, and they look for a strong market during the balance of February. While reports indicate that all

manufacturing plants are operating full capacity, line trade and the spot demand have slightly diminished and shipments are largely made on contract business.

The transportation of coal has been remarkably good since the first of the year and consumers report deliveries arriving with a good degree of promptness.

Coal men are in the market for all available vessel-tonnage for the coming season of navigation on the Great Lakes; 1,000,000 tons is already under contract for delivery to principal Lake Michigan Ports at 35c. per ton, which is an advance of 5c. over last season's rate. Contracts are made subject to price adjustment, but with the demand for ore and grain tonnage, vesselmen believe that 35c. will be the established price this year. Vessel men are satisfied with the 30c. rate to Lake Superior and have placed approximately 5,000,000 tons under contract for shipment to the head of the Lakes.

Quotations per short ton f.o.b. mines are as follows:

District.	Freight rate	¾-in.lump	Mine-run	Slack
Youghiogheny	$1.00	$1 40	$1 30	$1.00
Pittsburgh No. 8	0.90	1 20	1 10	1.05
Goshen No. 6	0.70	1 35	1 25	1.15
Coshocton	0.70	1 75	1.50	1.15

BIRMINGHAM, ALA.

The most interesting feature of the current week is the rumor that several of the mines producing Cahaba domestic coal will increase their prices beginning with the month of March. Some of the leading companies are now quoting $2.50 f.o.b. mines, for March and April shipment as against $2.25 for the same months in 1912. This is an increase of 25c. per ton and if adhered to during the remainder of the year, it will place the maximum price for the winter months at $3.25.

Some winter has appeared, but it has not stimulated the market except in retail trade. A slight weakness is apparent in the steam market, there being a tendency to shade prices in order to hook desirable business. The coke market is unchanged.

LOUISVILLE, KY.

There is ample production of coal at the mines, plenty of cars available, and there are no impediments to traffic, but the temperature is such that the average citizen does not find it necessary to heat his residence and the wheels of industry are threatened with paralysis by reason of a lack of demand.

As a consequence of this condition, summer prices are prevailing, insofar as any quotations at all are to be had. However, many operators have practically withdrawn from the market, believing it to be useless to attempt to sell coal by cutting the prices, especially in view of the possibility of more severe weather later on. Some Indiana coal is coming into this market for steam consumption, because of the vastly reduced output of these grades in all sections of Kentucky.

The Monongahela River Consolidated Coal & Coke Co. reports that business has been fairly active on domestic grades, although this demand is merely the accumulation of an abnormally light run of orders during the high-water period. This company has recently put into effect a price of 8½c. a bushel on Pittsburgh, a substantial reduction from the price of 10c., which has prevailed through the winter.

DETROIT, MICH.

Bituminous—The unexpected cold weather has made a decided change in the local coal situation. Domestic trade still seems to be the weakest factor. Retailers' stocks are heavy and they are not inclined to place new orders while those for delivery the early part of January are being canceled or held up. However there does not seem to be the amount of domestic on track that there was a week ago which has a tendency to strengthen the market. The demand from many factories is holding up well and railroads are also taking large tonnage.

Prices for mine-run and slack are probably the strongest points in the market. Most of the West Virginia districts report less than 50 per cent. of normal capacity while in strictly domestic fields the production was even lower.

The prevailing market prices for today are as follows:

	W.Va. Splint	Gas	Hocking	Cambridge	Ohio No. 8	Pocahontas	Jackson Hill
Domestic lump	$1.65		$1.80			$2 00	$2.25
Egg	1.65		1 80			2.00	2.25
Nut	1 35		1.50			...	...
¾ lump	1 10	$1 15	1 15	$1 15	$1.15	...	...
Mine-run	1 00	1 00	1.00	1 05	1.05	1 35	
Slack	Open	Open	1 05	1.05	1.05	Open	

Anthracite—The demand for hard coal has been unusually heavy. The cold weather has drained the supplies of all the large wholesalers, so that the consumers are again demanding great quantities. The premium is now about 25c. above circular, but should these conditions continue for some time dealers will be paying more than a dollar above circular again.

MINNEAPOLIS—ST. PAUL

A careful estimate of stocks of anthracite at the head of the lakes up to and including Dec. 13, after the last boat was in, shows the following figures: Egg, 88,000 tons; stove 67,500 tons; nut 85,000 tons; pea 8000 tons. The stove and nut is practically all gone and the pea is reduced to about 400 tons. About 50,000 tons of egg are on the docks and some companies are thinking of getting a stone crusher and reducing the egg to smaller sizes as this grade can only be used in furnaces. Some Twin-City shippers are receiving some nut and stove direct from the mines all-rail, but it comes slow owing to shortage of cars in the east.

Arrangements for making Minneapolis the head of navigation on the Mississippi River are working into a reality. With the completion of river improvements and the establishment of adequate steamboat facilities, followed by the operation of a line of freight-carrying barges, there will be a reduction in cost of transportation of fully one-third. It now costs $2 to bring hard coal from the mines to Eastern loading ports. There it is loaded and carried to the head of the Lakes for 35c., and the railroads charge a $1.25 rate to the twin cities. With steamboats coming here, the coal could be loaded on boats at Pittsburgh and brought here via the Ohio and Mississippi River route for $2, if the charge for conveying the coal from the mines to Pittsburgh by rail does not exceed 50c. per ton. A company incorporated in South Dakota has been formed by Minneapolis capitalists under the name of the Star & Crescent Navigation Co.; it is capitalized for $2,500,000.

ST. LOUIS, MO.

With some slightly colder weather, causing an increase in the consumption of coal, the market still remains in an unsettled state. Under ordinary conditions, the local trade should be in fine shape, but the overproduction in the Illinois field keeps the price below cost. The only sizes that are standing up are the small steam grades. The ice in the river has put the ferries out of commission and everything is moving via the bridges; traffic is consequently much congested. Standard mine-run has sold as low as 80c. and lump 87½c., while Carterville lump and egg have sold at $1.10, with nut at $1.

The prevailing prices, however, are:

	Carterville and Franklin Co.	Trenton and Big Muddy	Mt. Olive	Standard
2-in. lump				$0 95
3-in. lump			$1.25	
6-in. lump	$1 25		1.40	1 15
Lump and egg	$1.45 @ 1 60	$2 00		
No. 1 nut	1 25			
Screenings	0 90			0.60
Mine-run	1 20			0.85
No. 1 washed nut	1.50			
No. 2 washed nut	1.40			
No. 3 washed nut	1.35			
No. 4 washed nut	1.35			
No. 5 washed nut	1.00			

OGDEN, UTAH

Shipments continued good from both the Wyoming and Utah mines during January, except for the shortage of equipment on the Rio Grande railroad which to date has not been entirely relieved. This condition has continued for practically two months and has greatly diminished the shipments from the Utah mines. Idaho, Washington and Oregon are short on Utah coals and the operators anticipate good business during February and March on account of this shortage.

The Nebraska and Kansas market has not recovered from the extensive shipment in the later part of December and January and at present consignments into this territory are at a minimum. The railroad could not be persuaded to remove the east routing placed on the cars until the mines had accumulated a great number of loaded cars drawing demurrage at Rock Springs. Then, after the Eastern market had been flooded, they removed the embargo and allowed the cars to be billed west. However, the damage was done and there is nothing for the mines to do but wait until this over supply has been partially consumed.

There has been an over-production of slack and some of the larger operators have reduced the price to several large consumers which if continued will place the slack market in bad shape. Both Utah and Wyoming prices continue as follows: Lump, $2.75; nut, $2.25; mine-run, $1.85. Wyoming slack brings $1, with Utah 25c. higher.

The box-car situation on the Union Pacific Railroad has been somewhat relieved, and a good portion of the equip-

ient sent to the mines for loading is closed. The mines in 'tah are still bothered with a car shortage, although the ituation is slightly relieved, and no doubt in a short time here will be sufficient equipment available. The officials of he Denver & Rio Grande Railroad have succeeded in overoming the congestion along the line, and coal is now movng in reasonable time.

SPOKANE, WASH.

Fear of a coal famine in Spokane and the Inland Empire as been alarming the citizens here for the past two weeks, n account of the conditions of the railroads in the mounains, but the local coal dealers state that although they have een running close for the past month, conditions are now nproved to such an extent that there is no further cause or alarm. There is no advance in the price of coal, quotaions continuing as follows:

	Crows Nest	Wyoming Northern	Wyoming Southern	Utah	Montana	Roslyn
ump	....	$6 45	$7 20	$7 20	....	....
ump and egg	....	....	....	....	$6.35	....
rnace	$6.00	....	....	....	....	....
gg	....	5 95	6.85	6.85	....	....
ine-run	5.00	....	....	....	....	$5 00
ack	4 50	....	....	....	....	....
reened domestic	....	....	....	....	....	6.25

PRODUCTION AND TRANSPORTATION STATISTICS

SAN FRANCISCO, CALIF.

The total deliveries of coal by sea into this port for year 912 aggregated 374,556 tons, of which quantity 135,438 tons as the domestic product, consisting of 110,299 tons of Pocoontas for the U. S. Navy, and 25,139 of steam coal from the tate of Washington, for use on the Pacific Coast Co.'s steamrs. Imports from British Columbia were 149,830 tons, and rom Australia, 89,288 tons.

THE CAR SITUATION

American Ry. Association reports surpluses and shortages f coal equipment for two weeks ended Feb. 1 as follows:

	Surplus	Shortage	Surplus or Shortage
ew England Lines	49	233	184
Y., N. J.; Del.; Maryland; Eastern Penn.	1,676	1406	**270**
io; Indiana; Mich.; Western Pennsylvania	6,049	211	**5,838**
Va.; Virginia; N. & S. Carolina	1,103	2380	1,277
entucky; Tenn.; Miss.; Ala.; Georgia; Fla	686	143	**543**
wa, Illinois; Wis.; Minn.; N. & S. Dakota	2,535	266	**2,269**
ontana, Wyoming, Nebraska	135	35	**100**
ansas; Colo.; Missouri, Arkansas; Okla	1,566	0	**1,556**
xas; Louisiana; New Mexico	353	6	**347**
regon; Idaho; California; Arizona	2,745	40	**2,705**
nadian Lines	0	0	0
Totals	16,897	4720	**12,177**
me period 1912	14,042	5538	**8,504**

ANTHRACITE SHIPMENTS

Shipments of anthracite for January of the current year ere the highest on record for that month, and fourth highst of any month. The following is a comparative statement shipments for December and January of the last two years:

	December 1912	December 1911	January 1913	January 1912
ila. & Reading	1,223,880	1,238,727	1,257,132	1,186,534
high Valley	1,108,765	1,109,705	1,175,151	1,020,447
nt. R R N. J	760,479	820,963	813,367	760,035
el Lack & West.	850,977	827,248	922,099	791,698
el. & Hudson	598,969	592,922	653,177	567,279
nnsylvania	543,361	600,803	576,552	542,819
ie	667,532	722,093	717,235	682,845
nt. & Western	190,539	202,966	221,706	212,039
Total	5,944,502	6,115,427	6,336,419	5,763,696

CHESAPEAKE & OHIO RY.

The following is a comparative statement of the coal and oke traffic over the lines of the C. & O. Ry., for November, nd the five months ending Nov. 30, 1911-12, in short tons:

	November 1911	November 1912	Five Months 1911	Five Months 1912
stination				
Tidewater	284,872	252,447	1,603,154	1,466,758
East	260,002	211,684	869,191	963,386
West	825,597	731,129	4,798,527	4,222,603
Total	1,310,471	1,195,260	7,270,872	6,652,747
Coke	18,605	24,216	93,046	111,392
om Connections				
Bituminous	18,464	69,230	94,122	175,687
Anthracite	2,273	1,198	15,411	5,430

IMPORTS AND EXPORTS

The following is a comparative statement of imports and exports in the United States for the first 11 months of 1910-11-12, and for November of 1911-12, in long tons:

	11 Months 1910	11 Months 1911	11 Months 1912	November 1911	November 1912
Imports					
Anthracite	....	54	1,670	12	13
Bituminous	1,815,356	1,101,228	1,480,503	102,475	142,612
Coke	147,555	65,843	95,732	4,959	9,307
Exports					
Anthracite	2,754,214	3,312,755	3,404,958	296,628	372,267
Bituminous					
Canada	7,083,881	9,917,740	9,838,701	984,696	930,733
Panama	447,608	451,743	423,327	34,267	27,100
Mexico	627,230	449,671	263,407	31,192	12,350
Cuba	777,142	941,504	1,033,220	87,666	89,958
West Indies	414,676	511,608	602,406	64,251	38,458
Other countires	671,760	608,076	1,383,092	34,339	55,378
Total	10,022,297	12,880,342	13,549,753	1,236,411	1,053,977
Bunker coal	5,933,516	6,118,474	6,766,443	534,997	610,153

CONNELLSVILLE COKE

The "Courier" reports production and shipments in the Connellsville region for the week ended Feb. 8, as follows:

Production (tons)	Week	6 weeks	*Shipments (cars)*	Week	6 weeks
			Pittsburgh	4,344	21,666
Connellsville	225,207	1,228,882	W. of Pittsburgh	6,825	34,173
Lower Connellsv'le	182,162	924,462	E. of Region	871	4,484
Total	407,369	2,153,344	Total	12,040	60,323
Same period 1912	354,569	2,109,842	Same period 1912	10,590	62,133

FOREIGN MARKETS

GREAT BRITAIN

Jan. 31—The market is weak in places for spot loading, due to tonnage being delayed by stormy weather. For forward loading quotations are on a firm basis. Prices are approximately as follows:

Best Welsh steam	$4.56	Best Monmouthshires	$4 20
Best seconds	4 44	Seconds	4 08
Seconds	4.32	Best Cardiff smalls	3 60
Best dry coals	4 62	Seconds	3.36

The prices for Cardiff coals are f.o.b. Cardiff, Penarth or Barry, while those for Monmouthshire descriptions are f.o.b. Newport; both exclusive of wharfage, and for cash in 30 days —less 2½ %.

Spanish imports of coal for 11 months to Nov. 30, 1912 were 2,118,948 tons as compared with 1,834,315 tons for same period the year previous. Coke imports over same periods were 327,325 and 293,841 tons respectively. Practically all imports are from Great Britain.

COAL SECURITIES

The following table gives the range of various active coal securities and dividends paid during the week ending Feb. 8:

Stocks	Week's Range High	Week's Range Low	Week's Range Last	Year's Range High	Year's Range Low
American Coal Products	90	90	90	....	....
American Coal Products Pref	111	111	111	....	....
Colorado Fuel & Iron	41½	38	39½	41½	31
Consolidation Coal of Maryland	102½	102½	102½	102½	102½
Island Creek Coal Pref	86	85	85	....	....
Lehigh Valley Coal Sales	240	204	204	....	....
Pittsburgh Coal	23½	22¼	23½	24½	21½
Pittsburgh Coal Pref	92½	91	91½	95	87
Pond Creek	27	25½	25½	28½	24½
Reading	166½	164½	165½	168¾	160¾
Reading 1st Pref	91	90¾	90¾	91½	90
Reading 2nd Pref	91½	91½	91½	93	91
Virginia Iron, Coal & Coke	54	54	54	54	52

Bonds	Closing Bid	Closing Asked	Week's Range or Last Sale	Year's Range	
Colo. F. & I. gen. s.f g 5s	98½	100	99	99¾	98 99½
Colo. F. & I gen. 6s	107½	....	107½	June '12	....
Col. Ind. 1st & coll. 5s. gu	84½	Sale	84	85	83½ 85
Cons. Ind. Coal Mr. 1s 5s	....	....	85	June '11	....
Cons. Coal 1st and ref. 5s	....	94	93	Oct '12	....
Gr. Riv. Coal & C. 1st g 6s	95	....	102½	Apr '06	....
K. & H. C. & C. 1st s f g 5s	....	....	98	Jan. '13	98 98
Pocah. Con. Coll. 1st s f 5s	87½	Sale	87½	87½	87½ 87½
St. L. Rky. Mt & Pac. 1st 5s	77	77½	77½	Jan '13	77½ 80
Tenn. Coal gen. 5s	102	103	103	Jan. '13	102½ 103
Birm. Div. 1st consol. 6s	102½	....	103	Jan. '13	103 103
Tenn. Div. 1st g 6s	101½	103	101½	Dec. '12	....
Cah. C. M. Co. 1st g 6s	....	....	110	Jan '09	....
Utah Fuel 1st g 5s	....	....	....	....	....
Victor Fuel 1st s f 5s	79½	84	85½	Oct '12	....
Va. I Coal & Coke 1st g 5s	97½	98	97½	98	96½ 98

No Important Dividends were announced during the week.

FINANCIAL DEPARTMENT

Philadelphia & Reading Coal & Iron Co.

BALANCE SHEET TO JUNE 30

Assets—	1912	1911	1910
Coal lands	$49,397,660	$49,913,026	$50,385,196
Timber lands	841,691	841,691	841,568
New York and Eastern depots	839,540	839,540	790,097
Western yards and depots	1,736,979	1,651,644	1,351,571
Mines' and other houses	553,138	553,138	553,138]
Pottsville shops, real estate, etc.	391,463	391,463	376,169
Storage yards and washeries	851,892	851,892	851,892
Other real estate	388,425	388,425	386,339
Improvements and equip. at collieries	12,959,224	12,959,224	12,959,224
Stocks and bonds of, and loans to, cos. contr'd	9,863,915	9,863,915	9,563,915
Cash on hand	2,692,618	456,949	678,200
Coal accounts	3,221,693	3,480,268	3,109,475
Rent accounts	24,164	29,647	35,228
Companies and individuals	796,146	854,524	734,917
Coal on hand	776,701	3,333,268	3,817,482
Supplies and materials on hand	1,236,240	1,517,489	1,406,986
Depletion of coal lands fund			300,004
Stocks, bonds and mortgages, owned, etc.	76,034	73,151	72,905
Total assets	86,647,523	87,999,254	88,214,307
Liabilities—			
Capital stock	8,000,000	8,000,000	8,000,000
Bonds	1,110,000	1,140,000	1,170,000
Reading Company	73,466,530	74,423,817	75,395,787
Pay-rolls and vouchers	1,033,421	1,147,656	980,244
Phila & Reading Ry. current account	647,870	1,274,437	564,933
Interest, taxes and miscellaneous	930,008	725,225	711,908
Profit and loss	1,459,694	1,288,119	1,391,435
Total liabilities	86,647,523	87,999,254	88,214,307

INCOME ACCOUNT

Earnings—	1911—12	1910—11	1909—10	1908—09
Anthracite coal	$34,021,026	$32,695,271	$31,619,652	$33,411,277
Bituminous coal	1,186,203	1,152,915	1,080,489	909,809
Coal rents and miscell.	526,424	541,944	517,794	471,606
Earnings	35,733,653	34,390,130	33,217,936	34,792,694
Expenses—				
Fixed charges and taxes	85,455	86,598	88,818*	106,876
Mining coal and repairs	18,382,202	18,194,578	17,616,030	18,091,769
Coal purchased (anth.)	1,618,059	1,906,678	1,826,169	2,111,246
Coal purchased (bitum.)	1,100,315	1,070,566	1,040,909	838,169
Royalty leased collieries	458,523	510,687	563,224	594,182
Transportation of coal by rail	6,704,904	7,114,995	7,250,288	7,909,920
Transportation of coal by water	995,791	1,140,540	1,042,277	1,170,408
Handling coal at depots, taxes on coal lands, imports., coal sold from stock and miscellaneous	4,513,002	2,895,524	*1,455,880	*1,330,175
Colliery improvements	839,742	1,139,041	1,216,015	1,172,205
Depletion coal land fund			445,868	465,768
Int. on Reading Co. loan	864,084	375,573	743,958	935,003
Int. on Trem. C. Co. bonds matured, amount adv.		58,667		
Total expenses	35,562,077	34,493,447	33,289,437	34,725,720
Balance, sur. or deficit	sur. 171,576	def. 103,317	def. 71,501	sur. 66,974

* In 1909—10 this item amounted to $1,878,628, less $422,748 coal added to stock—$1,455,880; in 1908-09, $1,809,042, less $478,867 coal added to stock —$1,330,175.

Nova Scotia Steel & Coal Co.

The following is an abstract from the general manager's report for the fiscal year ended Dec. 31, 1911:

The company controls for periods of from 2 to 10 years, 8 large steamers, totalling about 42,000 tons dead weight, chartered sometime ago. Several additional steamers will be required to move the ore and coal tonnage of 1912. Two steamers of about 13,000 tons deadweight capacity each were put in the service in May last. These boats are under contract for 10 years, the hire paid being based on a certain percentage of the cost of the vessels. One of these boats landed 37,560 tons of ore in Philadelphia during August; The total tonnage carried by the fleet was in the vicinity of 1,000,000 tons, of which more than one-half was iron ore.

Iron-ore mining at Wabana passed through a period of transition, due to the substitution of submarine for surface mining; the quantity mined, however, was nearly 25,000 tons more than during 1910, but owing to the severe weather during December, and other causes, the actual shipments were less than would have been the case under normal conditions. It is expected that 1912 will show a substantial increase in shipments.

The main haulage slope at Wabana was driven 1835 ft., while levels east and west of the main slopes have been driven 2335 ft., opening up a considerable amount of productive territory. In all, more than 5000 ft. of slopes, crosscuts, rises and levels have been driven in the submarine ore territory during the year. No serious difficulties were encountered, and exploration and development work done has further increased the quantity of proven ore in this property.

OUTPUT OF CALENDAR YEARS (IN TONS)

	Coal	Wab. Ore	Coke	Pig Iron	Steel In.	Steel Billets	Bars, etc
1911	780,468	521,011	97,580	84,497	83,718	78,004	(?)
1910	847,176	532,058	90,360	65,484	73,019	59,244	50,915
1909	809,341	460,387	87,816	58,676	64,240	52,931	45,090

RESULTS FOR CALENDAR YEARS

	1911	1910	1909	1908
Profits for the year	$1,019,392	$1,140,504	$799,978	$586,767
Government bounties *a*			107,971	147,935
Total profits	$1,019,392	$1,140,504	$907,949	$734,702
Balance brought forward	500,603	336,807	1,219,221	1,202,604
Deduct 20% stock div., declared Dec. 1909			1,000,000	
Total available	$1,519,995	$1,477,311	$1,127,170	$1,937,306
Deduct—				
Interest on bonds, etc.	$291,169	$248,000	$247,837	$263,650
Accrued int. on bonds				18,000
Int. on debenture stock	60,000	60,000	30,000	
Depreciation and renewals	96,124	79,371	77,669	76,746
Div. on pref. stock (8%)	82,400	82,400	82,400	82,400
Div. on common stock(6%)	360,000	(4½) 270,000	(1) 60,000	(1½) 74,814
Disc., etc., on bonds issued		218,103	*b* 184,453	
Improvements and betterments	73,881		52,174	86,808
Sinking fund and miscel.	47,876	18,834	55,830	115,667
Total	$1,011,450	$976,708	$790,363	$718,085
Surplus carried forward	$508,545	$500,603	$336,807	$1,219,221

a Under the Act of April 27, 1907, the Government bounties expire in 1910.
b Commissions and premiums on converting bond issues written off.

BALANCE SHEET DECEMBER 31.

Assets—	1911	1910	1909
Property and mines	$14,489,286	$13,490,554	$12,582,191
Inventories	1,338,128	1,245,682	1,134,259
Ledger accounts and bills receivable	390,543	606,857	662,280
Cash	397,289	498,788	207,029
Total	$16,815,247	$15,841,881	$14,585,759
Liabilities—			
Preferred stock	$1,030,000	$1,030,000	$1,030,000
Common stock	6,000,000	6,000,000	6,000,000
Bonds	4,933,900	4,960,000	3,500,000
Sinking fund	26,101		607,459
Debenture stock	1,000,000	1,000,000	1,000,000
General reserve	750,000	750,000	750,000
Bills payable	775,000		
Pay-rolls and accounts not due	440,691	304,597	193,551
Coupons (January)	123,347	124,000	87,500
Coupons not presented	1,540	843	
Debenture stock interest Jan. 1	30,000	30,000	30,000
Dividend on preferred Jan. 15	20,600	20,600	20,600
Dividend on common Jan. 15	90,000	75,000	60,000
Reserve for depreciation, etc.	1,023,332	994,624	924,562
Insurance funds	62,191	51,614	45,280
Profit and loss	508,545	500,603	336,807
Total	$16,815,247	$15,841,881	$14,585,759

Maryland-Georges Creek Coal Co.—This company was incorporated in Maryland in September, 1912, and has a paid-up capital of $1,500,000. It has recently floated a large bond issue which is secured by 2470 acres owned in fee, 661 acres of coal without surface and 41 acres of surface, a total of 3172 acres located in the Maryland-Georges Creek coal basin, nine miles from Cumberland, Md. The mortgage also covers mining plant, miners' houses, etc., charged on the books at $120,000 along with $80,000 for other equipment. The sinking fund is 10c. per ton of mine-run coal and 5c. a ton on all clay mined with a minimum for 1913 of $10,000; 1914, of $15,000; 1915, of $20,000; 1916, $25,000; 1917 to 1931, $33,000 per year, and 1932, $35,000 to retire bonds at not to exceed $105 and interest.

COAL AGE

Vol. 3 NEW YORK, FEBRUARY 22, 1913 No. 8

It might as well be understood that the "good old days" are gone for good. The "good old days" of careless haste, enormous profit, sinful waste, are dead and done and have been cast out on the culm heap of the past.

New times are here, new days, new ways, and "forward" we must turn our gaze—set forth upon a modern track and never think of turning back. If there are bills which must be paid for blunders that our fathers made, we might as well make up our minds to pay them. We need our skill and common sense, our tact and our experience, and now's the time for coal men to display them.

The labor problem is ours to face at almost every time and place, and ancient force and brutal power are *not* the methods of the hour. We cannot trample underfoot with ruthless strength and iron boot the mighty hosts of labor. The man who mines the good black coal is *not* a blind and brainless mole, but human, with a *mind* and *soul*—a brother and a neighbor.

Yes, we must deal with discontent because of ways our fathers went, because they somehow wouldn't see the lesson of humanity. It's not by guns and high stockade that wage agreements can be made; it's not by guards and strong redoubt that peace and calm are brought about. But we must keep our passions cool and give the gentle golden rule some practical expression, and meet the men who toil and sweat for all the tonnage that we get, with just and fair concession.

The "good old days," thank God! are done, a better time has just begun, a time for which we've striven; a time to heal each wound and sore; a time to love our brother more, forgive—and be forgiven. We have our problems grim and great, our legacy of wrong and hate, but we shall reach a nobler state, with less of toil and sorrow. The bitter past is dead and gone, and progress still goes marching on to greet that bright and rosy dawn—The Dawn of a Tomorrow!

Berton Braley

Post Timbering at the Working Face

By J. T. Beard

In considering methods of reducing mine accidents there is no subject of greater importance than that of timbering the working face. More than one-half of the fatal accidents in mines are due to falls of roof and coal, as the direct result of either a lack of proper timber or faulty methods or systems of timbering. Mine officials throughout the country have expressed their willingness and desire to coöperate with mine inspectors and mine legislators, in an effort to secure greater uniformity of remedial action in respect to determining and adopting the most efficient methods and systems of mining.

An Outline of The Next Question for General Discussion

Aside from the knowledge and skill required in the placing of mine posts in a working place, it is the miner's own neglect that, in the large majority of cases, is responsible for his injury. There is an old saying: "Time and tide wait for no man"; and none the less true is it that *a falling roof never waits for a miner to load out his coal before setting a post or two, needed to make his place safe.*

Few miners—a small percentage only—learn the lessons their procrastination should teach them; and a still smaller number can ever be expected to profit by the misfortunes of their fellows. This habitual disregard of safety is, therefore, an element of human nature that must be recognized as ever present, and one that it will be needless to dwell upon at any considerable length, in the present discussion. Instead of wasting time and valuable space in a fruitless attempt to enlarge upon the well known failings of men, let us have the practical suggestions of practical men, setting forth ways and means of improving conditions as they now exist at the face, and advocating the adoption of systems that shall tend to eliminate the human factor, which is so largely responsible for the daily recurrence of fatal mine accidents.

There are many intelligent miners today who have but an imperfect knowledge of the simple rudiments and principles of post timbering. They make no study of the nature of the roof under which they work, or its mode of action. They regard faults and dislocations in the strata, only in the sense that these cut out the coal and make the work of mining more laborious, not to say necessarily more dangerous. Many miners set a post in a mine, as they would shore up a building that was liable to fall. It does not once occur to them that this same mine post, aside from the slight support it affords to the roof slate, acts or should act as a silent but faithful monitor of impending danger, to a careful and observant miner.

What is the real province of a mine post; where, when and how should the post be set; what advantages are to be gained by systematic timbering; do you advocate systematic timbering under all conditions in mines; what arguments can be urged for and against systematic timbering; should a miner be compelled to timber his own place and be held responsible for the proper performance of this work, or should special timbermen be employed for the purpose; should the bark of mine timber be removed before it is sent into the mine; when should mine timber be cut and how should it be stored; what methods, if any, should be employed for its preservation? These are some of the practical questions that can be discussed with profit, with a view to increased safety and economy in the operation of mines.

On the other hand, there are many theoretical questions of equal importance, such as the relative diameter and length of mine posts, to secure the greatest efficiency in service; the calculation of the load a mine post can properly be expected to support; the crushing strength of mine timber; the effect of seasoning, and other like questions. Owing to the growing scarcity of timber in mining regions, the use of steel timber in mines, and its preservation from the corroding action of mine water, are questions of growing importance.

It is the plan of Coal Age to confine each of these discussions to one month, except it should be found advisable to extend this time, in any case, owing to the interest manifested and the importance of the matter discussed. It is, therefore, important that all who are seeking to improve methods and systems in mining coal should take part in the discussion as early in the month as possible.

A Modern Mine Ventilating Plant

By U. U. Carr*

SYNOPSIS—This plant was built with the ideas of efficiency and economy predominating in the design. The rope transmission between motors and fan is a departure from ordinary practice and one which possesses many advantages over the customary and time-honored belt drive. The arrangement of sheaves and clutches to obtain operation from either motor independent of the other is also particularly worthy of notice.

The pre-eminent ideas governing the design of the ventilating equipment of the Monongahela River Consolidated Coal & Coke Co.'s Crescent Mine, located near California, Washington County, Penn., were to provide against interruption of service, and to secure a permanent, fire-proof construction that would endure throughout the life of the mine, combined with the highest possible efficiency of the fan.

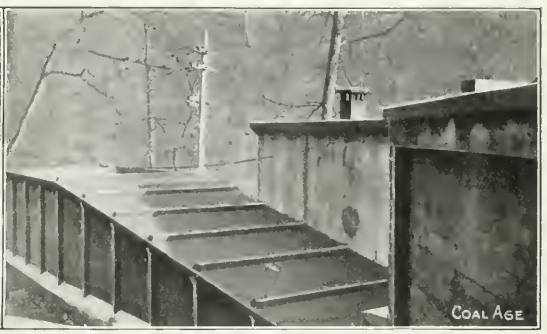
The desirability of continuous operation is easily appreciated and, in emphasis of the importance of permanent construction, it may be said that with an output of 6000 tons daily the estimated life of this mine is 35 years.

Cost of power is apparently often disregarded or passed over with the thought that the generation of a few extra horsepower will show no appreciable increase in the expense of operation, but the fact remains that every horsepower generated, represents an expenditure of money.

In the case of this installation, each per cent. increase in efficiency means a saving of approximately four horsepower, or say $100 annually; an amount justifying a considerable outlay, tending to increase the efficiency.

For the fulfillment of the above conditions, several innovations were employed. Chief among these may be mentioned the duplication of the driving machinery, self-closing steel explosion doors, reinforced-concrete construction, extra large airways and an evase chimney of unusual strength.

General View of Fan House



Evase Chimney, Showing Pilasters

Position of Fan and House

The center line of the fan drift intersects the main airway at an angle, and the fan and motor house are removed from the direct force of any explosion occurring in the main airway. The explosion doors are located in the side of the fan drift, directly in line with the main air course.

These air ways are lined with concrete through the faulty strata overlying the coal near the outcrop. For this work, plank forms were used on the side walls, and Hy-Rib sheets bent to the proper radius were used as forms for the segmental arch roof. After the concrete arch was placed on these sheets, the under side was plastered; the Hy-Rib sheets forming the steel reinforcement for the arch.

The minimum thickness of concrete on the side walls was fixed at 6 in., and where the space to be filled was much greater than this, cyclopean masonry was employed. The haunches of the arches were cut into the rock, and the space above packed with broken stone in the usual manner.

The concrete airways and fan drifts are proportioned to carry the output of the fan with a maximum velocity of 1500 ft. per min., at which speed the frictional losses in them are negligible.

The fan drifts are constructed entirely of reinforced concrete and were poured in plank forms. The side walls are 6 in. thick, stiffened with pilasters and reinforced with vertical and horizontal sets of $\frac{3}{8}$-in. diameter bars, spaced 18 in. centers and wired together at each intersection.

A flat slab, 4 in. thick reinforced with $\frac{3}{8}$-in. diameter bars spaced 10-in. centers, forms the roof over the fan drifts. To reduce the span of the roof slab, reinforced-concrete beams were arranged crosswise and along the center line of the structure, so as to not interfere with the drainage of water from the roof.

These beams rest on the pilasters of the side walls and project upwards from the roof, leaving the interior free of obstructions. The roof slab was finished with a $\frac{1}{4}$-in. coat of cement plaster, waterproofed with Trus-Con waterproofing paste, afterwards heavily coated with asphalt paint.

Location and Construction of Explosion Doors

The explosion doors, located in the side of the fan drift facing the main airway, cover an opening equal to and coinciding with the projected area of this pas-

*410 Barclay Ave., Pittsburgh, Penn.

sage. While the impossibility of constructing a door that would withstand the force of a severe explosion without damage was well understood, the intention was to provide a device which, if not completely wrecked, would automatically close and thus restore the ventilation.

Manifestly the size of the opening (15 ft. by 17 ft. 10 in.) rendered the use of single or double doors impracticable on account of their inertness to the explosive force and their momentum when in motion.

In the design adopted, sixteen overlapping doors were used, each one capable of opening or closing independently of the others. These were made of $\frac{3}{16}$-in. steel plates, hung on 2¼-in. diameter axles by means of 2¼x⅞-in wrought-iron hinges, which extend the full

Explosion-door Frame and Pit Mouth during Erection

width of the plate. The doors are further stiffened by a 3x2x¼-in. angle, riveted along the lower edge and aranged to lap on the upper edge of the door below.

The frame supporting the door axles consists of five vertical 12-in. I-beams tied together by a 12-in. channel at the top and a plate and angle at the bottom. The door axles extend the full width of the opening and pass through holes drilled in the webs of the beams.

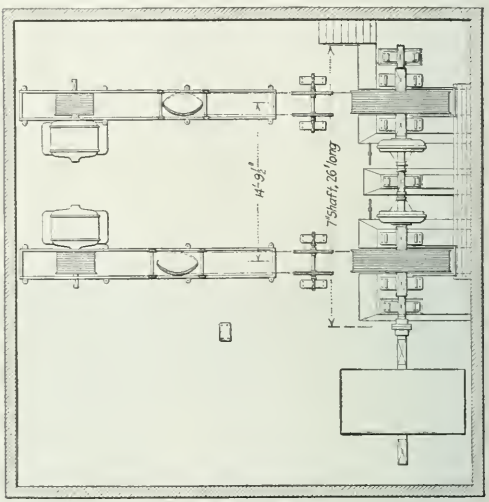
The concrete was built around this frame, and is so interlocked with it, that it can be displaced only by the destruction of the walls. The axis of the hinge, being located near the tops of the doors and two inches from the vertical plane, causes them to close against the I-beam frame, by gravity, where they are tightly held by atmospheric pressure.

In this connection it may be said that for this mine it was not considered necessary to have a reversible fan. It, therefore, was designed primarily for exhausting and no provisions were made for operating it as a blower.

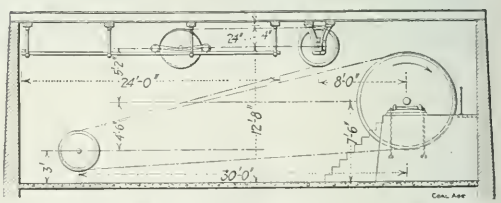
Type and Size of Fan

The fan is a double inlet "Sirocco" type, manufactured by the American Blower Co., and was designed to deliver 350,000 cu.ft. of air at 157 r.p.m. against a 5-in. water gage. The wheel is 13 ft. in diameter and 6 ft. 9 in. wide, driven by a central hub, mounted on a shaft 10 in. in diameter, which is reduced to 8 in. in diameter at the Journals.

The fan shaft extends into the motor house and is



Plan of Fan Drive



Side Elevation of Fan Drive, Showing Important Dimensions

carried in three adjustable bearings, one mounted on a concrete pedestal within the house itself, while the other two rest on bridges in the fan inlets. These bridges are of unique design, being constructed of ½-in. steel plate, so disposed as to offer a minimum resistance to the flow of air through the inlets.

Only the inlet cones and upper half of the fan casing are steel plate; the lower half and the evase chimney are of concrete construction.

Theoretically, the maximum water gage effect and efficiency of an exhaust fan would be realized were it possible to extend the chimney with an increasing area to that point, where the velocity of the air discharged would be zero. This, of course, is impossible and subject to practical limitations, but that chimneys of greater length than those usually employed, would result in increased efficiency, is not doubted.

The chimney in this case is about 40 ft. long from the point of cutoff to the end of the evase portion. For practical reasons it was placed in a horizontal position, representing the usual vertical arrangement of chimney and casing rotated through an angle of 90 deg. Beyond the evase portion, the bottom is inclined upward and the discharge opening made horizontal, so that the outflow of air is not appreciably affected by the direction of the wind.

That portion of the stack below the ground line is made of plain concrete, poured in plank forms. The remainder of the stack is constructed of Hy-Rib sheets supported on a steel frame and plastered with cement mortar.

The frame consists of 4-in. I-beam posts spaced about 6-ft. centers, tied together at the top and bottom with angles. The latter were used mainly to facilitate erection, rather than as a necessary member of the frame. The cover is carried on 6-in. I-beams which rest on the posts, and the Hy-Rib sheets are secured to the inner sides of the beams by steel clips made for that purpose.

To carry the plaster coat, strips of metal lath were stretched over the projecting beams and fastened on either side to the Hy-Rib sheets. This gives the appearance of small pilasters on the wall, and encloses the steel beams in concrete. On the sides of the chimney the finished concrete is 2 in. thick, while the roof slab is 2½ in. thick.

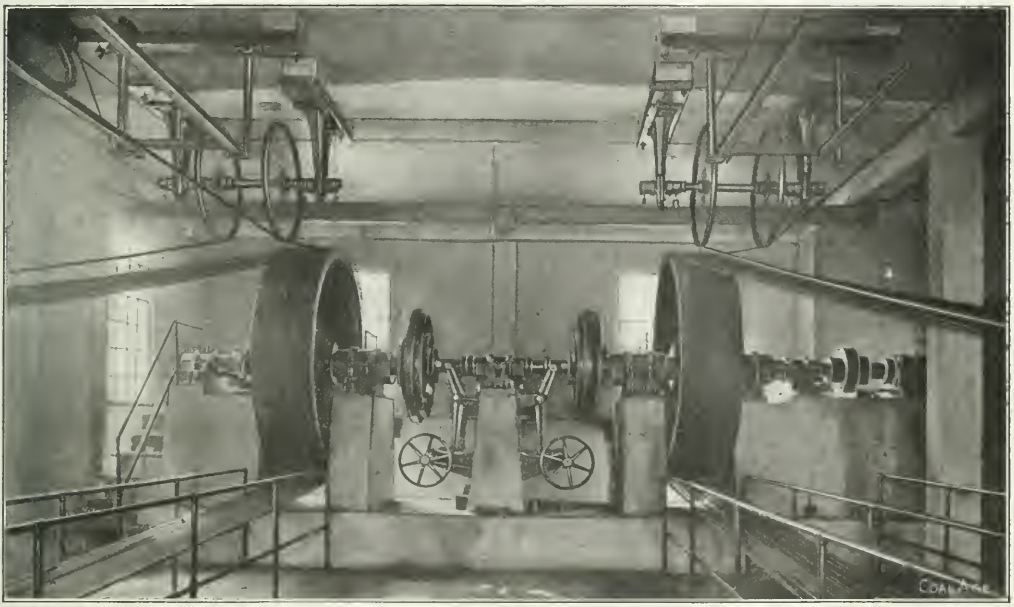
Power Transmission to the Fan

The fan is driven by manilla rope transmission from two Allis-Chalmers Co.'s 300-hp., 450-r.p.m., 2300-volt, 60-cycle, three-phase-wound rotor, variable-speed, induction motors. These are of the three-bearing type with extended sub-base; speed variation being accomplished by means of resistance in the secondary circuits.

The stacks of grid resistance for each motor are inclosed with expanded metal and provided with a face plate controller. The switch board equipment consists of two indicating wattmeters, one recording wattmeter, and two triple-pole automatic oil switches with low voltage release and inverse time limit overload relays.

With the exception of the incoming lines, which are carried in the ceiling, all wiring for the motors is placed in conduits under the floor. Current for lighting is furnished by a 110-volt transformer from the high-tension line, the wiring being run in small pipes.

To provide for increased ventilation in an emergency, the rope sheaves are proportioned to operate the fan at normal speed with a motor speed of 400 r.p.m., so that full motor speed would run the fan at 172 r.p.m., or ten per cent. above normal.



The Twin Rope Drives and Clutches

The rope transmissions are the Dodge Manufacturing Co.'s American or single rope system, each carrying sixteen wraps of 1-in. manila rope, and are duplicates in every particular.

The motor sheaves are 12 in., and the driven sheaves 107 in. in diameter. These latter are mounted on hollow or quill shafts through which a 7-in. jack shaft passes. The jack shaft is rigidly connected to the fan axle with a flanged coupling and is engaged by 18-in. Dodge patent split friction clutches bolted to flanges on the ends of the quill shafts and operated by handwheel and pinion.

The quill and jack shafts are supported independently in adjustable bearings, resting on concrete pedestals, which are joined by a continuous concrete footing to prevent uneven settling.

The motors are set 30 ft. centers from the jack shaft, which gives sufficient room to operate the tension carriages inside the building. The winding sheaves and tension carriage tracks are placed directly above the driving ropes, and are bolted to timbers which are in turn secured by anchor bolts to concrete leveling pads on the under side of the roof. With this arrangement, extreme accuracy in setting the anchor bolts is avoided and the alignment of sheaves and tracks greatly facilitated.

Pipe hand railings are provided around the sheaves and ropes while the clutches are protected by expanded metal guards.

Either drive can be thrown in or out without changing the speed of the fan, in fact the sheaves and clutches on the quill shafts being split, one drive could be dismantled without interfering with the operation of the other.

The ropes run exceedingly smoothly and are practically noiseless, and in addition when worn out their replacement is a matter of small expense.

Size and Construction of Motor House

The motor house proper is 30 ft. wide by 45 ft. long, with an irregular addition to its width where it joins the fan drift and chimney. It is also of concrete construction.

The roof slab is $5\frac{1}{2}$ in. thick, reinforced with $\frac{1}{2}$-in. and $\frac{5}{8}$-in. steel bars, and has a rise of 8 in. at the center. Reinforced concrete beams projecting above the roof and resting on columns carry this slab and leave the clear height under the roof unobstructed for the accomodation of the rope drives.

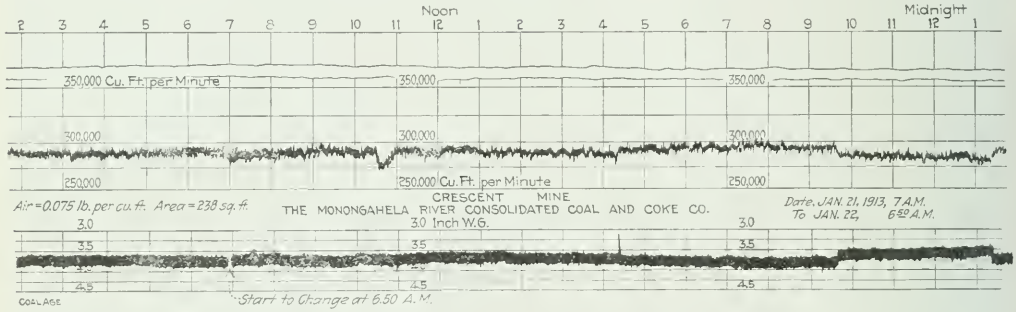
The concrete columns, ten in number, are 12x12 in., reinforced with four $\frac{5}{8}$-in bars. Plank forms were used for the columns, beams and roof slab but the motor house walls are constructed of Hy-Rib sheets, placed horizontally and plastered with cement mortar and are 2 in. thick.

The ends of the Hy-Rib sheets are secured in grooves in the columns, and are also attached to 3x3x$\frac{1}{4}$-in. angle posts, which are set in the concrete and support the door and window frames. A surface coat of cement plaster, waterproofed with Trus-Con waterproofing paste was applied to the sides and roof of the motor house. The latter was also heavily coated with asphalt paint.

The foundation walls under the motor house are of plain concrete as are those under the sides of the fan drift. Trussed Concrete Steel Co.'s standard reinforcing and waterproofing materials were used throughout the work.

In addition to the usual water manometer required by law, the fan is equipped with a Hydro Manufacturing Co.'s recording gage, which indicates both the pressure and the volume of the air delivered. The recording pens of this instrument are attached to floats resting on water and move up or down by the action of the air on Pitot tubes stationed in the main airway. This instrument is quite sensitive and faithfully records any variation in conditions.

The fan when running at 147.4 r.p.m. will deliver 322,470 cu.ft. of air at 4.97 in. water gage. Its mechanical efficiency is remarkably high, ranging between 79 and 83 per cent.



Hydro Chart. Record of Fan Performance for 24 Hours

Mining Steep Seams in South Wales

At the southern outcrop of the South Wales coal field, the seams are usually steep, having a dip of from 17 to 27 deg. Shafts are not common in this field; instead, advantage is taken of the outcropping and the seam is followed inward and downward with a pair of main slopes. This method permits quick travel, provides plenty of fuel available for power, and water gives less difficulty than if a vertical shaft crossed the measures. Large pillars are left along the main slopes for protection against caves, also as the mine deepens substantial pillars are left against the outcrop to prevent the percolation of surface water.

Where more than one seam is to be worked, connection is made by cross-measure headings driven horizontally and the coal taken out through the seam in which the slopes have been driven. Often an inferior seam unfit for working, is chosen for the main haulway, simply because it has a good roof.

The Park Slip modification of longwall mining is used. Level headings are driven every 100 or 110 yd. Ventilation is secured by driving a roadway, about 50 yd. distant from the slope, through the block of coal to the level above; an airway is then driven from this crosscut, parallel to the level heading which leaves a rib of coal 22 yd. wide between, which is cut through every 25 yd. for ventilation, thus forming pillars 25x22 yd. along the upper side of the level. These are allowed to stand until the level is worked out.

SNAP SHOTS IN COAL MINING

Mine of Victoria Coal Co., Madisonville, Ky. Shaft Is 220 ft. Deep. Tipple Loads 675 Tons per Day. Coal Is Undercut with Punchers

Surface Plant of Highland Mining Co., Providence, Ky. A 700-ton Mine, Ventilated by a 16-ft. Crawford and McCrimmon Fan

Northwestern Improvement Co.'s No. 3 Tipple, in the Roslyn, Wash., Field

Town of Ronald and No. 3 Tipple of Northwestern Improvement Co., Near Roslyn, Wash.

Tipple and Power House, Caledonia Mine, Dominion Coal Co., Glace Bay, N. S.

Showing Tipple and Loading Shed, No. 5 Mine of Northwestern Improvement Co., Roslyn, Wash.

Gas and Oil Wells in Coal Fields

By George S. Rice*

SYNOPSIS—Much pressure has been brought to bear on the Bureau of Mines to induce it to call a conference on the proper methods of drilling and casing gas and oil wells in coal fields and on the legislation needed for the regulation of the same. The author here suggests tentatively the discontinuance of the practice of leaving pillars around wells, and the protection of boreholes by other means. He questions whether a return of the measures to their original condition is not sufficient when wells are abandoned. His scheme for protecting wells through goaves is submitted to the consideration of the public.

The problems of gas or oil wells extending through or near coal mines, and through the future coal reserves, has gradually become more and more serious, not only on account of the danger to the miner, but also because there has been an increasing loss of coal in pillars left around the wells. There will be a further loss in the future unless means are found which, while giving safety to the miner, will enable the coal to be extracted.

Drilling Has Made Property of Doubtful Value

A prominent engineer told the writer recently that he had been obliged to report unfavorably to his client upon the purchase of a certain tract of coal land which he was examining, on account of the numerous oil and gas wells on the property, which would seriously interfere with mining operations.

Fortunately so far there has not been a large loss of life in mines through explosions or fires caused by leakages of gas from wells, but there are a number of cases on record in which lives have been lost, and the possibility of occurrence of disasters has been present in a number of instances.

One special case, which has been much referred to, is that of the Middleton and Enterprise mines, near Fairmont, W. Va., where natural gas under high pressure leaked from a well and entered the two adjoining mines, leading to local explosions in each mine, and to the death of three miners. Fortunately the entrance of gas into the mine occurred at night when but few men were in the workings; and fortunately also, the company which owned the mines had taken most excellent precautions to keep the coaldust wet, and the explosions were thus limited in extent.

This case is particularly interesting because the well was surrounded by a pillar 100 ft. wide, and there was also a coal barrier between the two mines 100 ft. thick. Therefore the gas entered the mines, not through the coal, but through the floor and along a line 2300 ft. in length, according to Mr. Tarleton, general superintendent of the company, who presented a paper on the subject, which appeared in the *Transactions* of the West Virginia Mining Institute for 1911.

Mine Fires from Gas Wells

Wells are constantly being drilled in the coal fields of this country, and are numerous in the coal basins of Pennsylvania, West Virginia, Ohio, Indiana, Illinois and Kansas. In Pennsylvania and West Virginia, mines not infrequently strike uncharted and abandoned wells.

In many cases these have been found filled with gas, and in some instances the gas has been lighted. Recently a serious fire was caused in a mine in the vicinity of Pittsburgh, by gas which ignited when an unknown well was struck in mining operations.

Fortunately this fire was not attended by an explosion, but it led to the mine being shut down for two weeks, and the bureau's engineers and rescue crew had to be called upon to investigate behind the fire stoppings. In a number of cases where wells have been encountered, explosions have been but narrowly escaped.

It would therefore appear that the industry hitherto has been more lucky than far-seeing, in not taking precautions to make secure and to record the location of abandoned holes, which, while not giving gas in commercial quantities, make sufficient to render them serious menaces to mining.

The Need for Satisfactory Legislation

The dangers which threaten have frequently been pointed out by I. C. White, of West Virginia, president of the Association of State Geologists. In a recent meeting of this association, a committee was appointed to confer with the director of the Bureau of Mines on this subject. Director Holmes also received requests from others to take up the question with a view to formulating suggestions which might lead to uniformity of oil- and gas-well legislation in the various states in which gas or oil is found in the coal fields.

Hitherto the legislation on gas and oil wells in all states except Ohio and Indiana, has dealt with the subject only from the standpoint of protecting the wells from one another. The Ohio laws, and to a lesser extent the Indiana laws, take some cognizance of the dangers to mining in the vicinity, but they are considered inadequate.

The Preliminary Conferences

As a preliminary to this general meeting, it was thought advisable to have conferences with those interested in the questions involved; consequently a meeting was held a few weeks ago with some of the coal operators who had had experience in dealing with gas and oil wells through mines. Then followed a conference with representatives of the gas-well interests; and more recently the problem was discussed with a number of state geologists, representing several of the leading coal-mining states in which gas and oil wells have become or are becoming an important factor.

Following these preliminary meetings, the members of the staff of the Bureau of Mines who had been charged by the director with this investigation prepared a tentative outline of rules and regulations which might serve as a basis for possible legislation on the subject of oil and gas wells, passing through coal measures.

These were formulated to harmonize as far as possible with the ideas presented in the several preliminary conferences with the different interests, taking into consideration that it would be wise to have such rules and regu-

*Mining engineer, Bureau of Mines.

Note—A paper delivered before the conference to suggest legislation covering the drilling of gas and oil wells in coal fields, Feb. 7, 1913.

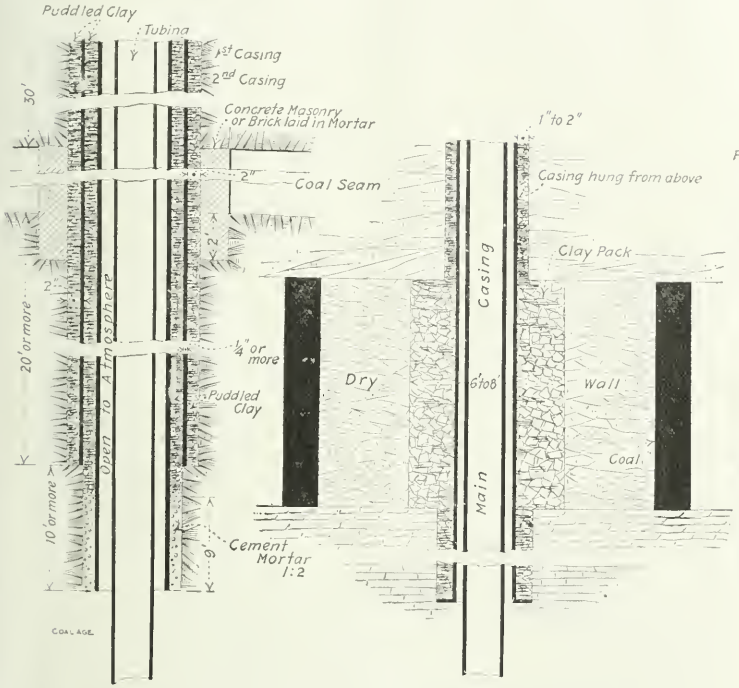
lations of a general character suitable for forming a basis for possible legislation in each of the states.

There are several features which have been discussed at considerable length in the preliminary conferences which have not been incorporated in the rules and regulations, as it was felt that it would not be wise to do so. The Bureau thought that certain questions should be left for gradual development, and in certain cases, should be left to private agreement between the parties at interest. These questions are as follows:

Pillar Is Not a Stopping But a Support

In the preliminary conferences it was unanimously conceded that pillars of coal of any reasonable size did not prevent leakage of gas into the mine when there were defects in the well casings, but that they served as supports to the overlying strata to prevent fracturing or breakage of the well casing anywhere from the coal seam upward to the surface.

Looking at it from this point of view, the question of



Suggested Method of Casing Well through Accessible Coal Seam, Hood and Haggem Plan

Suggested Method of Casing Well Where Pillar Is Withdrawn as Described on Pages 294 and 295

Suggested Plan of Casing Well through Inaccessible Coal Seam, Hood and Haggem Method

Size of Coal Pillars That Should Surround Gas and Oil Wells

It has been found from investigations and inquiry that the pillars which have been left around gas wells in Pennsylvania and West Virginia vary from 40 ft. diameter or 40 ft. square, to 200 ft. in diameter or 200 ft. square, the well being at the center of the circle or square. Inquiry has been made as to the underlying reasons by which the size of these pillars was determined, but it was found that the choice of size did not have a scientific basis. The various sizes of pillars merely represented the opinions of the parties concerned, or compromises made between interested parties. The courts in rendering decisions, would appear to have determined arbitrarily the size of pillars which must be left in certain cases. Presumably the size determined in each specific case represented the consensus of the testimony presented.

size of pillar surrounding the well is a problem similar to that which has arisen as to the proper size of pillar to be left surrounding a mine shaft. Investigation by the bureau has not disclosed any uniform system of determining the size of a shaft pillar, but there have been a number of empiric formulas used by mining engineers in the various mining countries. They are usually based on the distance of the coal bed from the surface.

The ratio in diameter of the pillar to depth from the surface in such formulas varied from ⅛ to 1 up to ½ to 1, that is, under the first ratio if the coal is 400 ft. below the surface, the pillar would be 100 ft.; in the latter ratio, the pillar diameter would be 200 feet.

Empiric Formulas for Barrier and Shaft Pillars

A formula used for barrier pillars in the anthracite district, by a number of prominent companies, and approved by one of the state mine inspectors, takes into ac-

count the thickness of the coal. The formula is as follows:

> The width of the barrier pillar is equal to the thickness of workings multiplied by 1 per cent. of the depth below natural drainage level, plus the thickness of the workings × 5.

If, for example, a seam was 9 ft. thick and 300 ft. below drainage level, the thickness of the barrier pillar would be $(9 \times 3) + (9 \times 5) = 72$ ft. The drainage level presumably is at or near the surface. While apparently this formula is chiefly for protection against inrushes of water, it is manifest that the effect of crushing is also involved, for if the pillar was crushed it would not furnish the necessary protection.

The Coal and Metal Miners' pocketbook offers this formula for shaft pillars deeper than 100 ft., namely, radius of shaft pillars equals $3 \times \sqrt{D \times t}$, where D equals depth of shaft and t equals thickness of seam. For example, in a shaft 900 ft. deep and the coal bed 8 ft. thick, the radius of pillar figures 255 ft., or diameter 510 feet.

The necessity for protecting a shaft is doubtless greater than for a gas or oil well. It is the means of egress, and it is not simply the protection of the shaft itself that must be considered, but also the support of the surrounding buildings, including the engine and boiler plant; hence there is greater need to have large pillars surrounding shafts than around wells.

The Fracture May Pass over the Pillar

It is manifest that the varying character of the strata in different districts affects the determination of the size of mine pillars to adopt for oil or gas wells—that is, assuming that it is necessary to prevent any movement of the measures surrounding the casing all the way to the surface. If the roof over the coal bed breaks easily, the fracture will probably extend upward in more or less vertical planes; on the other hand, where the roof is strong, sandstone or limestone, and the fall occurs on only one side of the well first, which is usually the case, there is a possibility that there may be a considerable pull toward that side which may carry the break diagonally upward, so that the plane of fracture may intersect the line of the well before it reaches the surface, in which case there might be danger of rupturing the casing, or at least swinging it out of line.

Inequality of Strength of Pillar

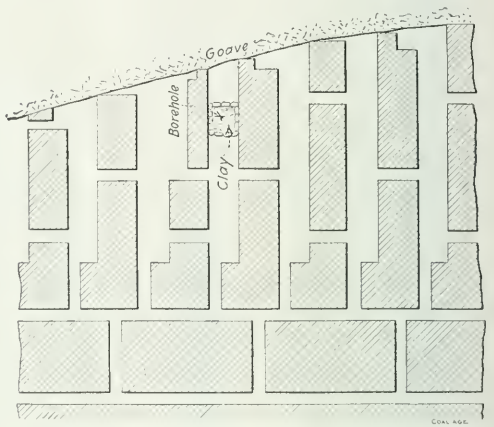
It was pointed out by S. A. Taylor in the first preliminary conferences, that where the cleavage of the coal was very marked, as in the Pittsburgh coal seam, a pillar should not be square but should be rectangular in order to get equal strength, that is, that the pillar should be longer across the faces, or parallel with the butts.

The Consolidation Coal Co., in the Fairmont district, is considering the necessity of leaving pillars 200 ft. square, surrounding the wells. It is easy, however, to realize how serious this requirement may be when the wells are close together, either from the standpoint of laying out the mine, or from the loss of coal in the pillars. This brings up the question whether or not it is necessary to retain the pillar permanently.

Extraction of Coal Surrounding a Well

I suggested in the preliminary conferences that it might be possible to dispense with a coal pillar around an oil or gas well provided an artificial pillar was substituted. This proposal is not quite so radical as it might seem at first. The coal surrounding shafts has been extracted without detriment in some of the longwall mines in Great Britain, and in one longwall mine in northern Illinois.

Where this plan has been employed, the section from which the coal has been excavated is carefully packed with broken rock and dirt, as is usually done in "longwall advancing," so that the movement downward is



Proposed Method of Protected Well Where Coal Is About To Be Entirely Withdrawn

very gradual and even, the strata all the way to the surface subsiding equally, and without damage to the surface buildings, provided the longwall face advances regularly. The final surface subsidence where the goave has been well filled with dry packing, is about 50 per cent. of the thickness of the excavation: that is, in a bed of coal 6 ft. thick the subsidence would be about 3 feet.

A Method Suggested Where No Pillars Are Left

To suit the room-and-pillar conditions, I suggest the following plan: That a room be laid out so that the drillhole will be approximately in the center of same: in drilling the well, the hole to be made 2 or 3 in. larger in diameter than the outer casing which is to be inserted, so that there is a space of from 1 to 2 in. surrounding that pipe.

Let us suppose this outer casing is to go 30 ft. below the coal bed, then the larger hole will be drilled an additional distance equal to the thickness of the seam, below where the shoe of the casing is to hang. The casing will then be lowered and hung from cross-beam supports at the surface, the ends of which are to be placed on piers so as to make these supports permanent.

These cross-beams should be steel channels or girders, 9 to 10 ft. or more in length, and of sufficient strength to hold the weight of the casing. Before lowering this pipe a gasket of rubber or canvas is to be fastened just above the shoe around the outside, so as to fit against the

rock or shale when the casing has been lowered to place and hung from the beam supports.

A grouting of clay will be run in between the casing and the sides of hole so as to completely fill the space from the gasket to the surface. This is to allow an opportunity for the casing to slide freely, either at the bottom or the top if the coal is excavated and the ground subsides.

After the casing has been put in and grouted with clay, the drilling and putting down of the inner casing will proceed in the usual manner. If subsidence of the ground occurs the arrangements spoken of will be equivalent to an expansion joint in a steam line. The inner casings and the gas tube being rigid and fixed below, when the subsidence takes place they will merely project that much further above the surface of the ground, and will not be affected by the subsidence.

It is, of course, assumed that a space will always be left open to the top between the outer casing and the next inner casing, so that if there are any gas leaks they will be enabled to pass unobstructed to the surface, in accordance with the plan employed in recent wells where by agreement with the coal companies various precautions have been taken.

Precautions When the Well Is Reached

When the room above mentioned has reached the well, the casing should be protected from contact with moving cars and from the violence of blasts by the use of the necessary post timber; and further, if the roof is very poor, a timber cog should be carefully built around the well and packed tightly with clay. When the rooms in the vicinity have reached their proper distance, before withdrawing the pillars, clay should be brought from the surface (any ordinary clay will do) placed around the well casing, and tightly packed so as to make a cylinder from 6 to 8 ft. in diameter. It will not be necessary to withdraw any of the timber to do this.

The space surrounding this clay cylinder back to the ribs should be filled with mine waste obtained from lifting the bottom, or from fallen roof rock. When the ribs have been drawn back to a point opposite the artificial pillars, a thin curtain wall can be retained on either rib, merely to hold the gob in place.

The purpose of the "gobbing" will be to allow the roof to be dropped evenly, as the packed clay around the hole will prevent undue pressure at any point, thus preventing distortion of the casing. Since above and below the coal bed the casing is surrounded with a layer of clay, it will either allow the roof to slip down without injury to the casing, or if the whole strata above goes down and grips the casing, the latter will slide further down into the hole, which has been previously drilled large enough to receive it.

With such a plan properly carried out, I can see no serious risk in not leaving a coal pillar, for even if a break of the outer casing occurred, which does not seem likely, at all times there is a vent to the surface between the inner and outer casing.

If abandoned wells are properly plugged from bottom to top, there would seem to be no need for other special precautions for deeper coal beds. It is manifest that in the great majority of cases these coal beds will not be worked for many years to come, perhaps 25 or 50, or as much as 100 years. It is also clear that no casing would resist corrosion for such extended periods, therefore it is believed that the project of restoring the strata to practically the same strength and impermeability as originally found will be the best method.

Abandoned Wells Should Be Plugged to the Surface

It was further agreed by the geologists that the simplest and safest way of handling abandoned wells through coal mines will be to plug them tightly all the way from the bottom to the surface. If holes are plugged so that there is no leakage of gas, there would seem to be no danger in laying out a mine, or in the working of same, without paying attention to an abandoned well, beyond approaching it carefully, and testing to see whether there is any sign of leakage of gas.

Drilling Gas Wells through Inaccessible Mine Workings

The question has arisen in several cases as to the protection from leakage of a gas well drilled through an inaccessible mine opening or excavation, as, for example, where pillars have been pulled. In the case of such leakage there would be danger of the goave filling with gas, which would escape into the active mine workings.

I will not attempt to discuss the relative merits of the two sides to the controversy, but as the courts have held that the parties possessing the gas ownership have the right to drill, it is necessary to consider how this can be done with a minimum amount of danger.

All have conceded the necessity of having at least one outer protective casing open at the top to the atmosphere, but in the event that acid mine water may corrode it, additional protection is necessary. One plan proposed by Mr. McCloy, of the Philadelphia Company, is to make the hole large enough to insert an outer pipe opposite the coal bed and fill between it and the casing with cement. This plan seems to be an excellent one.

The Protective Cone in Abandoned Workings

I offer an alternative scheme which might be used when the mine excavation is not too much filled with débris, and in some cases might be used to supplement the previously described method. The plan is: When the drill has entered the excavated space and drilled through any loose rock to the bottom, to fill the space with crushed rock or gravel, sand and cement, thoroughly mixed by a concrete mixer.

This is to be put in rapidly and will, if of proper consistency, form a conical heap with the apex at the top of the open space. A conical bit or tool fixed on the end of the string of tools will then be immediately lowered and used to spread out the top of the cone. More concrete must then be put in and again spread out by the conical tool.

The concrete should then be allowed to set, following which a hole will be drilled through it by the usual method. This hole may be a small one. Then liquid cement will be run in and forced under pressure to fill the interstices.

After this has set it is anticipated that there will be a strong concrete column through the mine excavation, which will be practically impervious to the mine water, and through which a hole of full size can be drilled as through a solid rock stratum, the casings being inserted in the usual manner.

The Gas and Oil Well Problem

By R. Dawson Hall

SYNOPSIS—Some reasons for urging the elastic casing as a necessity were presented at the recent conference on gas and oil wells passing through coal. A committee was formed to discuss the proposed legislation. It has been decided to proceed in a more leisurely and cautious manner in framing a code than was at first suggested.

In this article, I purpose to continue the remarks on the Pittsburgh fuel-well conference contained in the previous issue.

It was urged at the meeting that the recommendations of the Bureau did not furnish a sufficient guarantee of elasticity, though it must be granted that the provision for this quality has rarely if ever been even considered in previous discussions. It was pointed out that the space between casings was only two inches on either side, and even this was much reduced at couplings.

Some sketches here reproduced were presented to the meeting to aid in the presentation of this view of the subject. Fig. 1 shows a rock beam over an excavation. The roof in bending tends to break at *A*, *B* and *C*. *A* and

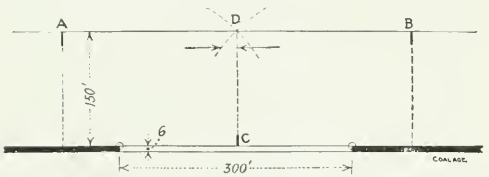


Fig. 1. Roof Which Has Failed by Bending Begins To Resist by Arching

B are points on the surface over the pillars, and *C* is the center point on the underside of the roof beam.

These breaks do not extend, at least at once, for the full depth or height of the rock mass, and it may be added that it is not asserted that the breaks over the pillars are vertical; there are some reasons for thinking they are not. For the present purpose, the matter is not material.

How Roof Will Warp

These breaks tend to divide the roof which we have in question into disturbed and unaffected areas. The latter shows in sectional elevation as a pair of rectangles. These rectangles tend to revolve on the edges of the coal pillars, which are here supposed to be completely resistant. This action produces a thrust between the rectangles at *D*, see Fig. 1. The bending is thus arrested until some part of the roof mass gives.

One action which may take place and the most probable of all, is a horizontal shear along one of the many weak measures, or less probably between two bodies of rock having a smooth bed between them. If the coal is 6 ft. thick and the opening is 300 ft., the final slope of the strata in case of complete subsidence and a complete break, will be 6 ft. in 150 ft. If the measures are 150 ft. thick, the aggregate of shear along the shearing planes must be 6 ft. in order that a body of rock which originally was rectangular may become a rhomboid.

It must be remembered, however, that if this slipping along bedding planes were uniform from coal to surface there would be little or no injury to a bore hole drilled through any part of the measures. The strain would arise wholly from actions prior to the shearing, which are in themselves severe enough. There is good reason to believe, however, that most of the readjustment takes place at favoring bedding planes, which are rendered free to slide past one another by reason of the new-found freedom caused by ruptures from tension.

How Shears Are Eased in Practice

O. P. Hood, the mechanical engineer of the Bureau, in reply, declared that there was rarely any such thing in actual practice as the shearing of pipe or iron by natural forces, that shearing could hardly be attained in a laboratory or a mill and that what actually took place was a reverse bending with curves of small radius.

This criticism is perfectly just and might be supple-

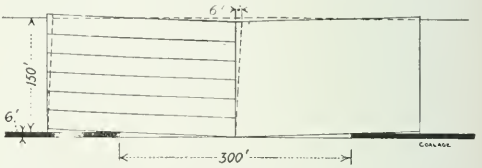


Fig. 2. Roof in Previous Figure Breaks Down Completely as the Measures Slide Past Each Other

mented by the statement that the principal shearing distortions would occur at beds of coal, clay and shale, and would be distributed over some distance. Still making all allowances, the fact that measures readjust their shape as much as 6 or more feet is extremely suggestive of deformations.

Of course, the angle of warp is further reduced when the floor rises, the coal crushes and gob is left in the mine. On the other hand there is an increase of movement when the coal is thicker and the roof beam of greater depth and is in proportion, other things being equal to these factors.

The Action of Unbroken Roof

It was pointed out also how extreme might be the motion of a borehole before breakage took place. If a lath is placed over two supports and the position marked by two tacks *A* and *B*, as in Fig. 3, on being loaded it is drawn down between the supports and the tacks moved to *A'* and *B'*. A similar action takes place in a modified degree with the mine roof and the new angle assumed by *A* and *B*, to wit, *A'* and *B'* shows the nature of the tilt which a vertical hole might receive.

At the same time a tack in mid span is lowered vertically and is still plumb, regardless of the amount of lowering. This is why a borehole in the location shown in Fig. 4 would be subject to minimum distortion.

It was suggested that the hole should be lined with a

Note—Continued from the issue of Feb. 15.

thin coating of cement of an internal diameter 8 in. larger than that of the casing. This cement could be kept in place by some extremely light pipe, possibly spiral riveted. The space between this pipe and the interior casing could be filled with clay.

The Difficulties in Abandonment

R. C. Johnson spoke on the possibilities of cement grouting under pressure for the filling of crevices in broken rock. The use of cement in this connection is described in Vol. 1, pp. 639 and 674, and the German system can be found in the *Engineering and Mining Journal*, Vol. 95, p. 363. There is little question but what such grouting would serve on abandonment of wells to stop natural crevices and those caused by the shooting of the hole, but it may be added that the pressures in a well 3000 ft. deep are even greater than Mr. Johnson has ever employed. The whole objection is to the cost of such work and that might not be prohibitive.

The difficulties involved in the abandoning of fuel wells caused some of the coal operators to favor the insertion of a 2-in. line extending 10 ft. above the surface and bent over with elbows. It is easy to see that the perpetual use of an unprotected vent pipe as part of an abandoned well is fraught with much danger and could only be

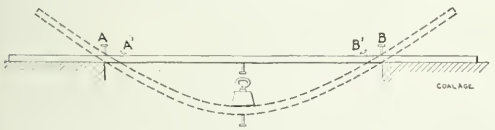


Fig. 3. Tacks Move between Supports and Tilt Out of Plumb When Lath Sags

justified where efficient plugging was impossible or where the measures above the fuel sands were so creviced as to make the escape of gas dangerous.

The Workable Seam

Mr. DeWolf frequently brought up the question as to what coal seams should be protected. He urged that drillers could not well form an estimate of the thickness of the coal beds through which they passed and would be less likely to find workable beds if the protection of such as they found would be likely to involve the expenditure of much money.

He thought the drillers should be compelled to protect, by double casings, all the productive coal measures whether coal was known to be contained in them or not. It was easy to see that the definition of "workable seams" had a larger meaning in Mr. DeWolf's vocabulary than in that of the Bureau. The engineers of that body declared a "workable seam" to be one likely to be exploited during the life of the well.

All other seams were to be protected by the precautions in abandonment. This seems a fair decision. Extremely remote protection afforded at great expense is not true conservation but waste. If beds are to be protected for long periods of time before mining has commenced concrete casing seems to be preferable wherever the oil can be prevented from attacking it.

Where the concrete is thick, it is probable that there is a limit to the corrosion, the face of the mass becoming glassy and impervious. But unless the quantity of material is large and dense, this action will not prevent corrosion. Moreover concrete is destroyed by oil and if any length of cement-protected casing is attacked by oil and salt water in turn, the casing will be inevitably destroyed.

The Difficulty in Placing the Clay

Opposed to these disadvantages, clay seems to be free from corrosion by salt water or oil. If deposited as a slime it would contain few air bubbles. Mr. Rice, however, doubted whether, if clay were comminuted so as to form a slime, it would settle at all in a coherent manner in a hole where the water is not filtered off.

Mr. Hood and Mr. Heggem urged that it would so settle if the water were made acid and instanced filling pipes with the loess of Louisiana, but while it is possible that the salt in the wells would be enough to cause the

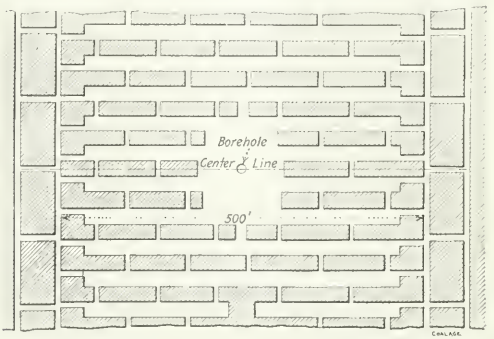


Fig. 4. The Only Location for a Fuel Well Where Coal Pillar May Be Withdrawn without Distortion

deposition of a cloud-like flocculence, the most acid of waters would be unlikely to produce the equivalent of a puddled clay. As Mr. Rice observed, it would coat the casings but not fill the spaces between them.

The keynote of the meeting was haste. It was represented that legislation should be secured before the legislatures ceased their sessions. It came as a surprise when H. M. Wilson, engineer in charge of the Bureau of Mines, stated that there was no hurry and that a committee meeting in March would meet the situation. It is too late to formulate or pass a well-considered measure. Possibly a bill regulating the surveying of wells could and should be immediately passed but the other matters have been so little discussed, and are understood in their entirety by so few that hurry is undesirable.

It might be added that on Thursday, Feb. 13, the committeemen named by the chair met and appointed a few of the final committee, the selection of the remainder being left for the individual committeemen, acting through and for organizations representing coal, oil and gas interests.

The coal committeeman was G. W. Schluerderberg; the representative of the bureau, G. S. Rice; Frank DeWolf is committeeman for the state geologists; J. B. Corrin and E. E. Crocker will represent the gas and oil interests, and David Young, the mine inspectors.

The next meeting was arranged for March, and is to be held in Pittsburgh. The presiding officer, W. E. Fohl and the secretary, O. P. Hood, are to be ex-officio members.

The Soft Coals of the Bering Field

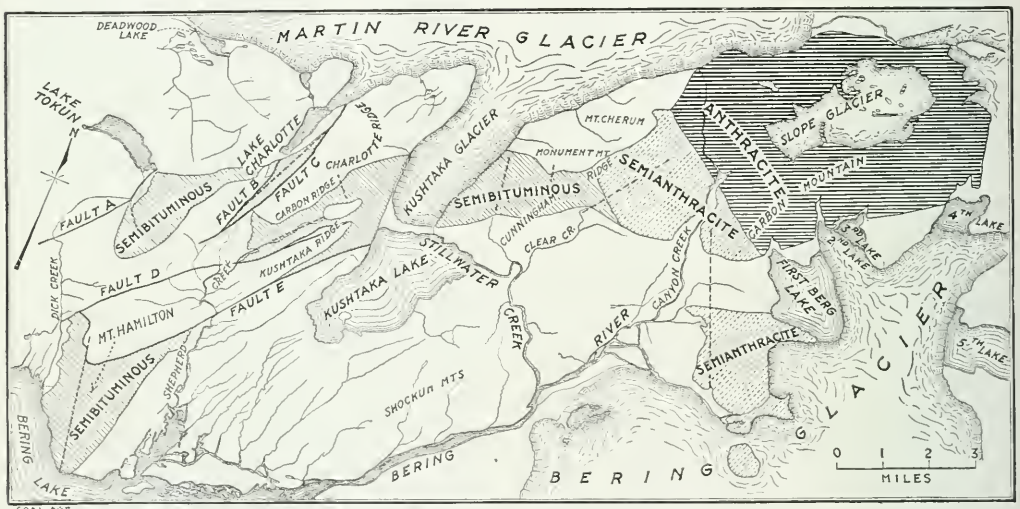
By W. R. Crane*

SYNOPSIS—The coals of the Kushtaka and Carbon ridges are thicker in aggregate than the anthracite coals to the east and may reach in all 188 ft., four beds ranging from 25 to 32 ft. Proceeding further to the east, a reduction in aggregate thickness is discovered, the Bering Lake district having 76 ft. and the Lake Tokun body only 30 ft. In some cases the coal is so fragmentary as to appear briquetted in the bed, and this condition extends into the body of the hill. But little of all the Bering River field will find its way into market in its natural condition. Coking or briquetting will be necessary before it is sold. The second of a series of articles by W. R. Crane.

The district named after the Kushtaka and Carbon ridges lies wholly within the semibituminous coal area. these beds is such as to place them parallel with those on the eastern slope of the ridge. The thickness of these beds is as follows: 17 ft., 13 ft. 6 in., 8 ft., 20 ft., and 19 ft. 6 in., making an aggregate of over 70 ft., which if added to the total thickness of beds on the eastern slope of the ridges make a total thickness of over 150 ft. of workable coal.

Western Half Has 188 ft. of Semibituminous Coal

There are abundant outcrops of excellent coal on the western slope of Kushtaka ridge and the southern extension of Carbon ridge, but owing to the distance between them and the extreme folding and faulting that they have undergone, it is hazardous to attempt to correlate with any degree of accuracy and equally difficult to estimate the number and thickness of the separate beds. A state-



The Bering River Coal Field in Alaska, Showing the Change in the Nature of the Coal Beds from Northeast to Southwest

The outcrops of the coal beds occur along the streams separating the two ridges, on the slopes of the latter, and to a limited extent on the tops of the ridges themselves.

Eastern Half Has 150 ft. of Semibituminous Coal

A large number of coal beds of moderate size have been located on the eastern slopes of the Kushtaka and Carbon ridges, but owing to the dense thickets of salmon brush, willows and alders, as well as a thick covering of moss, many of the outcrops are concealed. However, over 80 ft. of coal has been measured on the lake side or the eastern slopes of these ridges, and it is not improbable that many other workable beds still remain to be uncovered.

Five coal beds outcrop on the top of the extremely narrow prong of Carbon Ridge. The dip and strike of ment as to the number and thickness of the various beds will, however, serve to give an idea of the size of the coal beds that have been located.

Beginning with the extreme southern extension of this district on Carbon Creek and proceeding northward, the following thickness of coal beds was noted: 18 in., 10 ft., 9 ft. 4 in., 30 ft., 32 ft., 24 ft., 30 ft., 12 ft. 6 in., 25 ft., 14 ft., and many others impossible to measure with any degree of accuracy owing to excessive folding. The aggregate thickness of the beds measured is 188 ft.

Two Localities So Crumpled that Strip-pit Mining Will Be Required

There are two localities in this district, namely, west of the narrow ridge extending southeastward from Carbon ridge and west of the northernmost extension of Kushtaka ridge, where folding and faulting have caused such extreme changes in the coal beds as to render them

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totally unfit for working except by open cut, but fortunately such areas are very limited in extent.

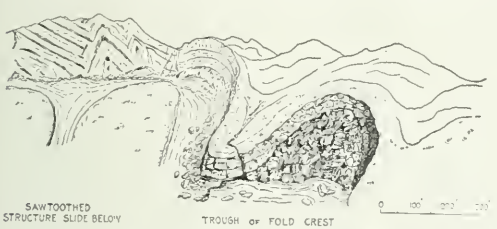
The coal beds at these points have been forced back upon themselves by the close folding of the inclosing rocks until in many cases the rock strata have been crowded out and the coal massed together in huge pockets. Erosion has removed the overlying rocks and exposed large bodies of badly crushed coal. See the illustration below.

Another more or less isolated coal-bearing area, which may be considered as belonging to this district, lies on the western slope of Carbon ridge and also on the like slope of Charlotte ridge. This area lies between two extensive fault planes forming a long narrow strip of land practically separated from the adjoining districts except for narrow extensions of the Kushtaka and Carbon ridges touching it on the east and a similar extension of the Tokun district connecting with it on the west.

No attempt has been made to correlate the coal beds lying within this area, but the following outcrops have been located: 20 ft. 6 in. of coal at the extreme southern extension of the area and 16 ft. at a point about halfway up Lake Charlotte.

Bering Lake District

The Bering Lake district comprises an isolated area lying directly to the east of Bering Lake and including



Section on West Wall of Canon, Canyon Creek, Showing Folded Strata

most of the highland between the lake and Shepard Creek. To the northward the district splits into two prongs, one extending toward Lake Tokun on the north, the other toward the Kushtaka and Carbon ridges district to the northeastward.

The coals of this district are wholly semibituminous and where not too badly broken are of fairly good grade. As the strike of the majority of the coal beds is east and west, a north and south line would serve very well along which to estimate their number and thickness. Beginning at Poul's Point and proceeding northward the following thickness of coal beds was noted: 9 ft., 7 ft. 6 in., 2 ft. 4 in., 6 ft. 10 in., 1 ft., 9 ft., 17 ft., 10 ft. 6 in., 7 ft., 3 ft. 6 in., etc., giving an aggregate thickness of over 76 feet.

Powers and Falls Creeks Are Not Only Contorted, but Have Many Shale Partings

The coal beds on Falls Creek, in the northern extension of this district, have been badly folded and faulted, so much so that it is extremely difficult to secure reliable information regarding their thickness and extent. Further, the coals of both Powers and Falls Creeks tend to be dirty, containing numerous shale partings.

The coal beds on a narrow ridge, the southern extension of Mount Hamilton, stand at high inclinations; one in particular, the 17-ft. bed mentioned above and occurring at a considerable elevation, stands practically on end. This bed measures 17 ft. at the summit of the ridge, but pinches out in depth, as shown by the outcrops on the side of the mountain, until it narrows to 6 ft. some 300 ft. below.

The coal bed at the McDonald mine is somewhat irregular and is claimed to be a detached mass of the original bed. If this is the case the line of displacement should readily be seen, but I am not aware of its existence.

Lake Tokun District

This area of semibituminous coal lies to the southeast of Lake Tokun, and on Tokun Creek. The locations of the outcrops of coal beds have been made principally along the gorge of the creek. The precipitous walls of the cañon of Tokun Creek afford an excellent opportunity to locate outcrops and while a number of fair-sized outcrops have been found, many others are so badly disturbed and broken by rock movements as to be practically worthless.

The following measurements were taken along the course of the creek, beginning with the uppermost and proceeding downward toward Lake Tokun: 8 ft. 10 in., 9 ft. 5 ft., 6 ft. 6 in., etc., making total thickness of approximately 30 feet.

Powdered Coal Sometimes Briquetted in the Bed by Pressure

The physical condition of the coals of the Bering River field is such as to render mining both difficult and wasteful. From one end of the field to the other extreme rock movements have broken the coal badly while in certain localities the coal has been crushed almost to powder, although it stands fairly well in the face at the outcrops owing to the high pressure to which it has been subjected.

There is little likelihood, as is often expressed, that the badly crushed condition of the coal is of a superficial nature only, and will disappear beyond the weathered zone. Sufficient work has been done in the nature of drifts and tunnels driven into the coal beds for distances up to 700 ft., to demonstrate that while the coal is not as soft as at the outcrops yet the fractured condition exists and practically the same degree of breakage is ex-

TABLE GIVING THE CONSTITUTENTS AND HEATING EFFECT OF BERING RIVER COALS

District	Average of Analysis			Total Moisture			Volatile and Combustible Matter			Fixed Carbon			Ash			Sulphur			Calorific Value B t u	
	A	S-A	S-B	A	S-A	S-B	A	S-A	S-B	A	S-A	S-B	A	S-A	S-B	A	S-A	S-B	S-A	S-B
Carbon Mountain	7	8		7 88	5 34		6 15	8 29		78 23	75 48		7 74	18 37		1 30	0 86		(2) 12,576	
Cunningham Ridge		1	1		5 59	3 62		7 13	15 51	...	78 85	74 80 (1)		6 16	6 53		1 43	1 30	13,667	13,952
Kushtaka and Carbon Ridges			15			3 64		...	14 10	...		75 42			6 16	.	...	1 37		(3) 13,580
Bering Lake			7			6 01			13 01			63 77			17 30			2 94		11,153
Lake Tokun			1			1 35			11 97			73 34			10 34			1 13		...

(1) Average of 6 tests. (2) Average of 4 tests. (3) Average of 4 tests
A = anthracite. S-A = semi-anthracite. S-B = semi-bituminous

perienced in mining and handling as at a distance of only a few feet from the exposures on the surface.

THE CRUSHING OF THE COAL HAS LESSENED ITS VALUE

Obviously the anthracite coals will be affected to a much greater extent by breakage and disintegration than the bituminous coals, and their commercial value will be reduced in proportion to the sizes that can be delivered to the consumer. A certain reduction in size is advantageous but beyond that the result is an economic loss.

Sizes including pea coal and below are often of necessity, placed on the market in competition with bituminous coals for steaming purposes and at a cost below that of production.

With the bituminous and to a less extent with the semi-anthracite coals the reduction in size is of less importance although it is a serious matter even with these coals, particularly from the standpoint of waste in mining and handling. With coking coals, aside from waste and the cost of cleaning, if necessary, there is little disadvantage in a certain amount of breakage, as reduction must ultimately be resorted to.

Much work has been done by the United States Geological Survey in determining the constituents and heat value of the coals of the Bering River field. At the foot of the foregoing page, the analyses of coals taken from the various districts are listed in the order followed in this description.

The ash content of these coals is very high so that extra care will be required in mining and there may be much expense incurred in preparation. It is not improbable but that in certain localities it may be found necessary to leave several inches of coal on the bottom to prevent too extensive mixing of the coal with waste.

As a whole, the bituminous coals of the Bering River field cannot be used without being first converted into coke. Likewise the anthracite and semianthracite must, for the most part, be rendered acceptable to the market by briquetting.

A Test of Carborite Bits

The old adage concerning the "the test of the pudding," is as applicable to coal mining as to anything else. Many devices are constantly being placed before the country which appear to possess good qualities. None of these, however, secure general adoption, unless they "make good" under actual conditions of service.

The Carborite Steel Bit Co., of St. Louis, Mo., has placed upon the market a new bit for use in chain coal-cutting machines, a test of which was recently made by R. Xceson, mine manager, O'Gara Coal Co. mine No. 4, at Harrisburg, Ill. The results obtained are here given:

Two machines were selected in as nearly the same physical condition as possible. One of these was supplied with ordinary bits, while in the other Carborite cutters were placed. These machines were then operated for 13 days in adjacent territory, so as to subject them to cutting conditions as nearly identical as possible, the bits in both machines being sharpened only when necessary. Records were kept of the voltage and amperage of the current and of the tonnage produced by each machine.

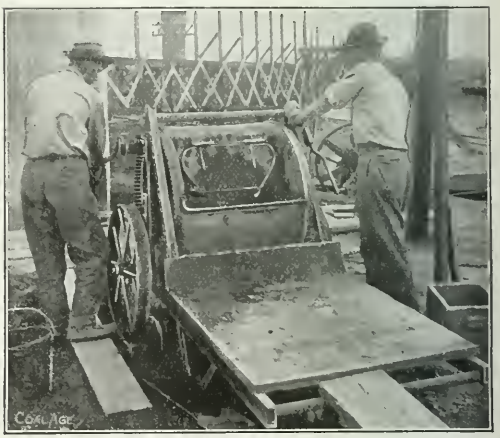
The Carborite bits operated 13 days with 12 sharpenings, producing 3546 tons of coal, or slightly less than 273 tons per sharpening. The average voltage was 250, while the amperage ran from 35 to 45. The machine worked free at all times and without any breakdowns.

The ordinary or standard bits tested against these, operated the 13 days with 36 sharpenings, producing 3120 tons of coal, or approximately 84½ tons per sharpening. The voltage recorded was 250, the same as before, but the amperage ran from 65 to 75. During the time of testing, this machine also suffered four breakdowns—three chain failures and one burn-out.

It is to be regretted that the test was not carried a step further, and the two types of bits exchanged between the two machines and the work continued for another equal period of time. Had the records then been as much in favor of the new bit as before, it would have removed all suspicion that the results might, in part at least, have been due to the condition of the machine rather than the excellence of the cutters.

A Hand Mixer for Concreting

Supplementing the series of articles now appearing in COAL AGE on colliery concreting, we show in the accompanying illustration an ingenious hand mixer. This machine is comparatively inexpensive and of such size that it could be readily mounted on mine-car trucks and run through any part of the mine.



VIEW OF SMALL CONCRETE HAND MIXER

It is a well known fact that ordinary hand mixing is not only exorbitant in cost but also uncertain in results. For the small jobs that are almost incessantly developing around the surface plant or in the mine itself, few companies feel justified in going to the expense of a complicated power-driven mixing machine, and such would also be cumbersome to handle under certain conditions.

The machine shown herewith turns slowly and easily, weighs only 1000 lb., and, as before mentioned, is self-contained so that it could be readily taken down the slope or shaft without dismounting. The manufacturers, T. L. Smith & Co., Milwaukee, Wis., claim that only three turns are required for a perfect mixture, the capacity of each batch is 2½ cu.ft., and the daily capacity of the machine, 25 to 30 cubic yards.

Central Washer of the Ala. F. & I. Co.—II

By Edw. H. Coxe*

SYNOPSIS—The second and concluding installment on this subject, in which a description of the mines and methods of working are given. Considerable water is encountered and a comparatively large drainage equipment is in use.

The main washer building, in the early stages of construction, is shown in Fig. 1, and the washed-coal bins in Fig. 3.

The separation in washing is made on a 1.37 specific gravity. The average analysis of the Margaret raw coal as brought to the washer shows 25 per cent. ash, which is reduced by washing to 7 per cent., as compared with 18 and 10½ per cent. for the Acmar coal. The washed coal contains 3 per cent. of sink heavier than 1.37 sp.gr., the balance of the ash being in chemical combination with the coal.

There is, in connection with the washer, a small machine shop, equipped with a lathe having a 24-in. swing, a sharpener, drill press and forge. In this shop all the light repair work for all the mines, as well as the washer, is done, that can be handled. The total number of men employed at this washer, including superintendent, electrician, engineer, etc., is thirty. These are housed in thirteen 4-room and one 6-room house, weather boarded and ceiled, with 16-ft. square rooms. The houses are fenced and each one has ample ground surrounding it for a good garden.

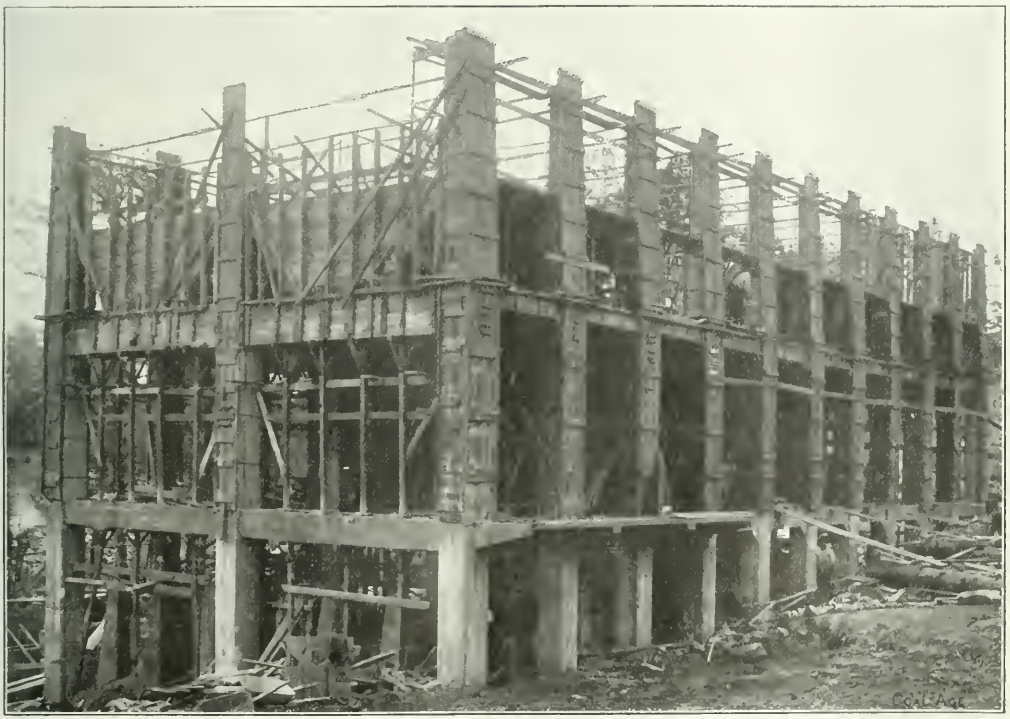


Fig. 1. The Main Washer Building of the Alabama Fuel & Iron Co., in Process of Construction

The Acmar Mine

As stated before, this mine is on the Mammoth seam and it has an average daily output of 1800 tons. The slate roof is about 30 ft. thick and is one of the best mine roofs I have ever seen.

The upper bench, which separates readily from both the rash parting and the roof, is shot out on the solid by shearing ahead of the cutting shots, advancing about 12 ft.; then the parting, which is soft, is shoveled off into the gob, and the bottom bench of coal is shot up. Monobel, manufactured by the du Pont Co., is used exclusively for blasting. The mine was opened on the outcrop, the slope following the seam at right angles to the strike; the pitch at the outcrop is about 29 per cent., which decreases gradually, till near the face it is only a trifle over 1 per cent.

Near the face of the slope is a fault. This is not a regular displacement, but is in the nature of a wave or wrinkle, the coal rising abruptly about 6 ft., without de-

*1026 Glen Iris Ave., Birmingham, Ala.

creasing in thickness; then rising gradually for about 80 ft., and at the present face indications are that it will again assume the slight normal dip. The headings are driven on a slight up-grade to be self-draining. On the right of the slope the pitch steepens, causing the headings to come closer together, and on the left the reverse obtains. Every eighth room an 80-ft. solid block of coal is left in.

Mine Is Ventilated by a Sirocco Fan

The mine is ventilated by a 6x3-ft. single-inlet, steel-incased, Sirocco exhaust fan, running 218 r.p.m., belt-connected to a General Electric 50-hp. induction motor, running 895 r.p.m. The main slope is the main intake and the manway the return. Each heading is furnished with a separate split of air, the return from the right side being overcasted over the slope, and the manway being undercasted across the left-hand headings.

The main pump station in the mine is between the third and fourth right headings and all the water made above this point is drained directly to this sump. The pump here is an electric-driven Alberger, two-stage centrifugal, working against a head of 270 ft., and having a capacity of 500 gal. per min. Below this and pumping to it, is another Alberger electric driven, single-stage, 500 gal. per min. capacity pump, rated for 125-ft. head. The sinking pump is an electric-driven Aldrich, triplex, portable, 120 gal. per min. capacity pump, rated for a 270-ft. head.

Considerable firedamp is given off, but it is carried out and rendered harmless by ample ventilation. This is naturally a damp mine, water dripping over the coal everywhere, so that there is absolutely no dry dust and humidifying is entirely unnecessary, even in winter. The slope is single track and laid with 60-lb. rails. In the rooms are laid 16-lb. steel rails on one side and 3x4-in. wood rails on the other, the latter being used to help hold the loaded cars coming out of the rooms.

Fig. 3. View Showing the Washed-coal Bins

Iron-frame, wood mine cars of 4800 lb. capacity, having side bumpers and swinging end gates, are used, the couplings consisting of a link and two clevises. Eight cars to the trip are hauled out of the slope by a Hardie-

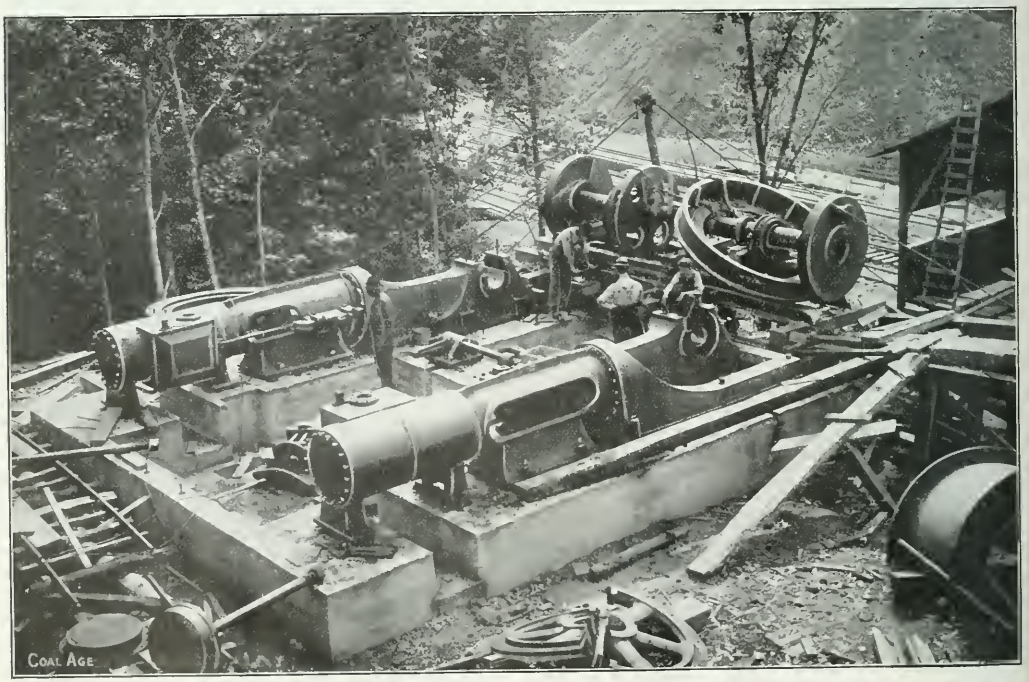


Fig. 2. The 28x48-in. First-motion Hardie-Tynes Hoist Being Erected

Tynes duplex, 28x48-in., first motion hoisting engine, having a single 8-ft. drum; steam for this is furnished by two 200-hp. Walton, Chattanooga, Tenn., boilers, having one stack 60 in. in diameter 120 ft. high. Fig. 2 is a photograph of the hoisting engines being erected, the end of the tipple showing on the right. In this picture will be seen a large pile of coal stored across the tracks, which was obtained while driving the slope before the railroad was built. There is an electric-driven auxiliary hoist, consisting of a 75-hp. General Electric induction motor, geared to a 4-ft. drum, for driving the slope and turning new headings in the mine.

Screening the Coal

The tipple is on a direct line with the slope track, and when a trip is landed, the cars are handled by gravity over a Phillips crossover dump, then over a switchback to the empty track, where they are attached to the rope and dropped down the slope. Fig. 4 is a photograph of the tipple and yard under construction, the former being of frame. The screens were built by the Montgomery

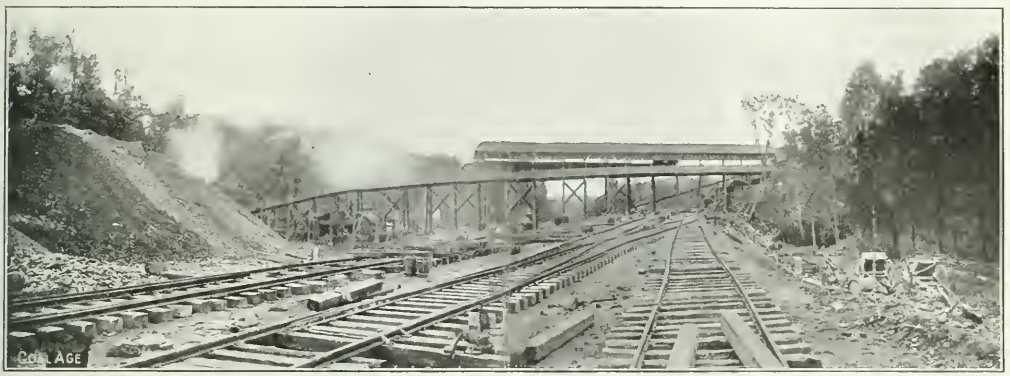


Fig. 4. General View of Yard Tracks and Tipple during Construction

Washer Co., of Birmingham, and consist of two parts, working in opposite directions, to equalize vibration. The upper section has 6x16 ft. of screening surface, with 4-in. perforations, and the lower one is the same size with 2-in. perforations. The lump coal from the upper screen passes over a 36x16-ft. traveling picking belt, where it is hand picked before dropping into the railroad car for shipment. The other two sizes over and through the 2-in. perforations are loaded separately and shipped to the washer. All the machinery at this plant is electrically operated, except the main hoist, by power from the washer generating plant.

William J. Hand is superintendent of this mine, and W. J. Lovejoy, mine foreman; 150 miners and 50 day hands are employed. All the employees are housed in company houses, 150 in number, mostly 4-room, and of the same construction and dimensions as those at the washer, except a few larger ones for the mine and office officials. There is also a commodious company commissary, operated for the convenience of the employees, where they can buy all the necessities as cheap or cheaper than can be done elsewhere. The inside of this building measures 100x40 ft., in addition to which is an ice house and well equipped meat market.

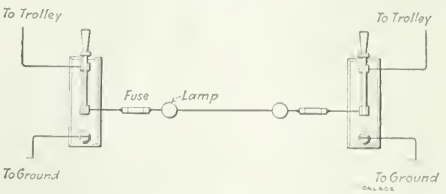
Signal Lights for Single Track

By C. J. Fuetter*

A number of mines are using electric haulage motors which, for some reasons, must pass over the same track for a certain distance. In such mines it is almost necessary to provide some arrangement so that only one motor at a time will have the right-of-way on this portion of track. Some mines have telephone systems, but these are not effective for the purpose.

The safest and most economical arrangement is to have an electric-lamp signal as shown in the accompanying figure. This consists of two lights of the proper voltage, connected in series, two single-pole double-throw switches, two fuses and enough of No. 14 B. & S. rubber-covered copper wire to be strung the full length of that particular place in the track. Suppose both switches to be in the upward position, giving a live wire but no return, and consequently no light. Then, the motorman to arrive at the signal light first, will throw the switch downward and light up the system, giving him the right-of-way. When he reaches the other end, he throws the switch downward, darkening the lights, showing that the section is clear.

The next motorman will repeat the same operation to get his right-of-way, with this difference, that instead of throwing the switches downward, he will throw them upward. Under no conditions must a motorman change the switches in any way when the lights are bright, as somebody else has right-of-way. Should the signal get out of order, no light can be obtained. In that case no motorman should enter the single track before signal is again in working condition.



Wiring Diagram for Block Signal

*Harding P. O., W. Va.

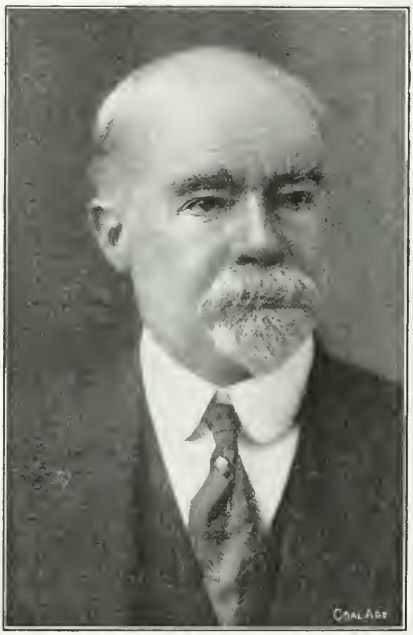
WHO'S WHO—IN COAL MINING

The legislature of Pennsylvania, which is credited with doing nothing without a political motive and whose politics is said to be swayed continually by the lure of the dollar, has managed to keep its mining and geological departments, among some others, remarkably free from graft. Geology is a study which attracts men who are not of a domineering or acquisitive nature, and to whom politics for its own sake or for hope of reward is utterly repellant. The ability of the geologist is rarely developed by men whose minds are diverted by their personal interests.

J. P. Leslie, for many years state geologist of Pennsylvania, chose men who were enthusiasts like himself. As one recalls the names of the men who were young enough to have a career after their service closed, one cannot recall a single instance of a man who failed to make good in his after life, and to justify the confidence Leslie placed in him.

They have all become elder brethren in the mining industry, doing far more than their share to stir its inner life and mold its later progress. It has been said that every Pennsylvanian is a geologist. The general interest in the strata of the hills and valleys of that state has been continually fostered by the able monographs of the second geological survey.

Among the *protégés* of J. P. Leslie, should we not rather say his stalwart supporters, was William Griffith, the eldest child of Andrew J. and Jemima (Sax) Griffith. He was educated in the public and private schools of West Pittston, Penn., and at Lehigh University. He taught school for one term in New Albany, Bradford County, Penn., and on holidays and Saturdays he surveyed near-by farms.



WILLIAM GRIFFITH

In 1878 he went West and secured a position as transitman and assistant engineer for the Union Pacific Railroad Co., for which he surveyed and supervised the construction of railroads in Nebraska, Idaho, Montana, Utah and Colorado. He returned East at the Christmas season of 1880, and became division engineer for the Lehigh Valley R.R., residing at Bethlehem, Penn. Two years later he became an assistant geologist on the Geological Survey of Pennsylvania, being located successively at Pottsville, Hazleton and Bernice, and mapping the Schuylkill, Lehigh and Bernice coal measures.

From 1884 to 1886, inclusive, he was engaged in private engineering practice at Pittston, Penn. During 1887 and 1888, as assistant state geologist, he had in charge the completion of the geological survey of the Wyoming & Lackawanna coal fields.

After this work was finished, he opened an office in Scranton as consulting mining engineer and geologist. Since that time he has prepared numerous economic geological reports, many of which have appeared in print and had extensive circulation in Canada, England and Holland, and some have been translated into German and French for circulation in Europe.

Among the most notable articles from his pen was an extended monograph entitled "Anthracite Coal with Estimates of Reserved Supply." This appeared in the "Bond Record" of New York and attracted widespread attention in business and financial circles. In 1892, Governor Pattison appointed him a member of a commission to inquire into the possibilities of utilizing the waste in mining anthracite.

In 1895, he purchased a tract of anthracite at Wyoming, Penn., organizing and becoming president of the Wyoming Coal and Land Co., which operated a colliery for a number of years until it was sold to the Lehigh Valley Coal Co.

In 1897 and 1898, he investigated and rendered a report on the anthracite deposits of northern Peru, both on the Pacific slope and on the head waters of the Amazon River. From 1906 to 1908 he examined and reported on the coal resources of the Matanuska valley in Alaska, being the first to recognize the high-grade character and coking qualities of the Matanuska coal. In fact, he manufactured on the ground the first coke ever made in Alaska. At one time or another he has visited all parts of the United States and Canada, including the more distant parts of the latter dominion, Vancouver and Queen Charlotte Islands.

In 1908 he was appointed by the Court of Northumberland County, Penn., a member of a commission to fix the taxable value of all the coal lands in that county. In 1910, with Eli T. Conner, he was appointed by the advisory committee to the city of Scranton to investigate the risks to which the city was exposed by the extensive mining work being prosecuted beneath it, and the report made was published by the Bureau of Mines.

EDITORIALS

Use of Explosives in Mines

It is entirely proper that explosives used in mining coal should be subjected to rigid tests. The only wonder is that the movement in this direction in the United States was so long delayed. The safety of our underground workers and the preservation of our mining property make it incumbent that the inquiry be extended indefinitely.

The advent of a flameless explosive would be welcomed by the whole industry; however, this is asking a great deal of the manufacturers of permitted powders. It is quite generally realized that even the best of our permitted explosives fall short in this respect under the crucial test of actual use. There is no doubt but that the present products have been improved until they more nearly approach the ideal than was ever the case when we used any and all powders with indifference as to their safety qualities.

The experience of Great Britain in the matter of testing explosives for use in underground work is of interest to the industry in this country. During recent years the British have formulated one Coal Mines Order after another, until legislation on this subject in that country is quite complete.

A survey of the most recent British acts shows among other things the following requirements: The storage of explosives underground is prohibited, and the workman must bring his remaining stock out at the end of his shift, or deliver it personally to the workman succeeding him in his room or entry. The mine owner must provide facilities on the surface for storing the powder. For use below, the explosives must be in cartridges in a secure case or canister, in which it must be kept until required for charging shot holes. If the explosive contains nitroglycerin, proper warming pans have to be provided.

Detonators are under the control of the mine manager, or some specially appointed person. When issued to shotlighters, the latter must keep the detonators in a locked case separate from any other explosive until about to be used.

Concerning the charging and firing of shots, the British rules are somewhat exacting. A shotlighter must see that all persons in the vicinity take proper shelter before firing, and the hole may be fired only by means of an efficient magneto, electrical apparatus or a fuse complying with stated conditions. In case a shot misses fire, careful search for the detonators and charge must be made; if they are not found, the coal must be loaded under the supervision of the person firing the shot, or one of the mine officials. After being loaded, this coal is sent to the surface in specially marked cars.

Only permitted explosives may be used in seams in which gas has been found within the previous three months, "in such quantity as to be indicative of danger." In mines not naturally wet throughout, the use of permitted explosives is required in "any road or any dry and dusty part of the workings, or any shaft or drift communicating therewith which is in process of being sunk, deepened or enlarged."

The wages of the appointed shotlighter must not depend on the amount of coal to be gotten, and no person shall be qualified for appointment as a shotfirer, unless he has obtained the requisite certificates as to his ability to make accurate tests for inflammable gas, and as to his eyesight. Before firing, the shotlighter must examine the place where the shot is to be fired and all contiguous places within a radius of 20 yd. for the presence of inflammable gas; and, also, he must examine the floor, roof and sides within a 5-yd. radius, for coal dust, and render all dust harmless that may be within such area.

It might be well for coal operators in this country to follow the example set by European nations in this matter of providing stringent regulations concerning the use of explosives in coal mines. A few states have taken steps in this direction, but the movement should be more general and the laws more uniform in character.

Reducing Ventilation When Firing

With this issue closes a discussion that has been at once interesting and profitable, in breaking down or at least *forcing a passage* through one of the high walls of prejudice surrounding the practice of coal mining.

Although the discussion has in no wise proved the truth of the claim that "greater safety is assured by reducing ventilation when firing," it has clearly pointed the way to a new field of investigation that promises developments that may lead ultimately to a practical solution of the mine-explosion problem, which thus far has successfully baffled both science and practice in their efforts to discover its hidden secrets.

Mining practice has dealt with the problem of the prevention of explosions of gas and dust in mines, by diluting the explosive atmosphere with air—the very element on which the explosion depends—much as a child's appetite for sweets is broken by an overdose of the same.

Recently, suggestions of a variety of different methods of treatment are being offered. Many of these, as wet zones, stone-dust zones, the Taffanel barrier, etc., have been tried with varying results. And now comes the latest suggestion—the depletion of the oxygen content of the air, by diluting the mine atmosphere with extinctive gases.

The Harger suggestion of doing this "by introducing the waste gases of the furnaces, into the intake air current" has not been taken seriously by practical men, because of the known poisonous character of these gases; and even could this element of danger be eliminated, there would still remain the difficulty of rightly gaging the percentage of gas necessary to prevent ignition and which would not be inimical to life. The margin is a narrow one.

The question of reducing the circulation of air in the mine when firing, by closing the discharge opening at the

mouth of the upcast shaft, has appealed to many practical men as a good suggestion, applicable to all but gaseous mines; where according to general opinion, such a proposition could not be considered, owing to the rapid accumulation of dangerous quantities of firedamp.

It has been rightly urged by a number of our correspondents that this question should receive the earnest attention of the federal Bureau of Mines, and that a series of suitable experiments should be undertaken to ascertain what, if any, advantage may be gained by this practice, and to what conditions it is applicable. We heartily commend this suggestion and hope that the Bureau of Mines will be able, soon, to throw some light upon this subject about which there is so much speculation.

Importance of Rail Bonds

The unfortunate property of electricity of taking the line of least resistance has been the cause of many urban troubles. Electrolysis and the deterioration of concrete are prominent among these. However, until the recent experiences at the mines of the St. Bernard Mining Co., in Kentucky, detailed by C. J. Norwood, the state geologist and chief inspector of mines of that state, the danger of stray electrical fields at collieries was not made clear.

Efficient bonds and adequate returns may, from now onward, assume an entirely new aspect. They may be regarded not merely as good investments; but as essentials, the use of which is to be enforced by laws and regulations.

If a permissible explosive had not been used at the mine in question, the men who were present at the premature explosions recorded would have been killed and their deaths would have been wrongly charged to their carelessness. Fortunately, the flame of the explosive was so short that the men could state what occurred.

In all three cases, the copper needle was in the hole when the cartridge exploded. In two cases, the powder had been in the hole for some time and had not been ignited. The presence of the copper needle seemed necessary to conduct the electricity. This raises the question whether in mines where extensive electrification has taken place, it is well to use metal and especially copper needles without some kind of protecting insulation.

W. C. Waddell, an electrical engineer, ascertained that a fair average of the current required to fire the permissible powder under investigation would be 25 volts and 0.30 ampère and to fire black powder 0.35 ampère. As Professor Dates obtained voltages of 25 volts between an air pipe and the lower dirt band and several of 12 volts between that parting and the mine floor, it is easy to see how an explosion could arise, especially if the needle tended to convey the current between two pyritiferous masses in one dirt band or from one dirt band to another. It was shown by H. B. Dates' experiments that the dirt and sulphur bands carried nearly twice as high a voltage as the cleaner coal of the seam.

Conclusions must be drawn with due conservatism, but it may be necessary in some instances not only to provide good bonds but a shorter return to the surface than is afforded by the mine tracks. As the resistance of mineral bodies, likely to be encountered, is apparently not known, it is impossible to form an estimate of their relative conductivity compared with iron. Moreover, much work remains to be done to ascertain the ampèrage by which powders may be exploded.

Too High an Efficiency

In our Feb. 1 number, we printed an editorial calling attention to the remarkable performances accredited to some mine fans, no approach to which has ever been attained in any careful or scientific laboratory test. In this issue we print an article describing a recent fan installation. This states that the efficiency ranges between 79 and 83 per cent.

We cannot but believe that the men making the test from which these efficiencies have been derived were deceived in securing their own data and that the real performance of the fan was considerably below the figures named.

In making the above statement, we do not wish to be misunderstood as casting any reflection whatever upon the veracity or accuracy of the observers; neither are we inclined to question the reliability of the Hydro-gage used, as the basic principle of this instrument is the Pitot tube, the accuracy of which has been firmly established.

If one will observe the flow of water in any stream, he will notice that the swiftest part of the current may or may not be in the center, but the movement close to the edge is quite different from both maximum and average velocity. Furthermore, that the only sure method of determining the average rate of flow, with any current meter, is by making a complete traverse of the entire cross-sectional area of the stream.

Coming back to the efficiency of the fan in question, we are much disposed to doubt that the velocity of the air at the point or points of measurement represented a correct average of the rate of flow across the entire heading or airway. And, if this did not represent the true average, the capacity or performance of the fan as reckoned from it would necessarily be erroneous.

Simultaneous Shot Firing

As to the advisability of firing shots simultaneously, in a coal mine, experienced mining men in the United States are divided in their opinions. The question was disposed of with considerable finality in Great Britain by the most recent Explosives Order. The British rule bearing on this problem provides that "Except in driving a stone drift, or in sinking pits, two or more shots shall not be fired in the same place simultaneously." In stone drifts the number of shots that may be fired at one time shall not exceed three, unless fired electrically in series.

In the United States, a number of mining companies have adopted the simultaneous-shotfiring plan, exploding all shots by electricity from the surface, after every man has been withdrawn from the workings. The officials at the mines where this plan is followed vouch for the success of the scheme, claiming that falls of roof are not increased thereby.

It may be suggested as a safeguard in firing simultaneously by electricity that the current should be thrown in, once only. When the switch is thrown a second time there is likelihood of a blownout shot occurring when the mine atmosphere has just been filled with gas and dust. A Western mine was severely damaged some years ago when this latter plan was followed.

SOCIOLOGICAL DEPARTMENT

A Winter First Aid Meet

By J. G. Smyth*

An interesting series of meetings was held under the auspices of the Miners' Y. M. C. A., of Jenkins, Ky., during the week beginning Jan. 20, 1913.

P. C. Dix, state secretary of Louisville, Ky., was present, and the Industrial Department of the International Committee of the Y. M. C. A. was represented by Peter Roberts, who is author of a system of teaching English to foreigners, which enables them to discuss mining subjects after a few lessons, and of books on the immigration problem, especially in relation to mining.

Gathering at First-aid Meeting Held in the Miners' Y. M. C. A., Jenkins, Ky., Jan. 21

D. J. Price, J. Henson and J. R. Fleming, of car No. 7, which has been located at Jenkins for three weeks, also gave their assistance. During their stay, they have instructed six distinct classes, of nine men each, in the use of the helmets and pulmotor in mine-rescue work. They have also given about 60 men a course of first-aid training.

Almost a Week of Safety Planning

Although a preliminary lecture, illustrated with moving pictures, was given at the Burdine Y. M. C. A. on Monday, Jan. 20, by J. R. Fleming, the meetings really opened with a dinner and conference at the home of W. N. Ewald, secretary of the Jenkins Y. M. C. A.

The first session of the institute was held on Wednesday, Jan. 22, with State Secretary P. C. Dix as presiding officer. Mr. Dix introduced as the first speaker D. J. Price, who gave a history of the mine-safety work of the U. S. Bureau of Mines.

J. R. Fleming then described the large first-aid meeting held in Pittsburgh in 1910, illustrating his remarks with moving pictures.

The Assimilation of the Foreigner

The concluding speaker of the evening was Dr. Peter Roberts, who, in a forceful address, proved to his listeners the economic value of the foreigners who are daily arriving at our shores, and the place they have and will have in developing the natural resources of our land. He clearly brought out the fact that immigrants do not reach their maximum efficiency until thoroughly assimilated into our civilization, or until they have become naturalized citizens of our country.

On Thursday night, J. R. Fleming gave an interesting and instructive lecture on mine safety, which was illustrated by stereoptican slides and motion pictures, taken by the U. S. Bureau of Mines.

Doctor Roberts addressed this meeting, dwelling principally on the part the Y. M. C. A. is taking in educational work among working men, and made a plea for the attendance of the men in and about Jenkins at the educational classes to be conducted by the Y. M. C. A. at that town.

The week culminated in a first-aid contest, the teams competing being taken from the various mines in and about Jenkins, and including two teams from the engineering department.

*Manager, Consolidation Coal Co., Kentucky Division, Jenkins, Ky.

Six men from each of the seven mines constituted the teams, the personnel of which was as follows:

Mine 201
Tom Thomas (Captain)
John C. Yates
M. D. Ramsey
L. D. Mann
Lester Schrum

Mine 202
Charles Smith (Captain)
M. F. Eskew
Fred Hemphill
Harry Smith
W. A. Perry

Mine 203
R. P. Jenkins (Captain)
M. C. Penix
S. S. Wright
R. S. Gunther
Tom Patton

Mine 204
L. Tomlinson (Captain)
Joe Rickett
P. B. Dent
Tom Cummings
C. Bowling

Mine 205
George Christopher (Captain)
J. B. Williams
Melbourne Boggs
R. W. Smith
James Sisk
David Campbell

Mine 206
John Huston (Captain)
Ed. Garret
Jim Short
J. A. Roberts
Steve Jones

Mine 207
J. H. Johnson (Captain)
J. S. Creech
George Rodick
R. F. DeBusk
Paris Smith
W. H. Smith

Engineering Dept., lower division
L. L. Holmes (Captain)
W. H. Robinson
J. C. Metger
Lawrence Malone
A. B. Walter
W. L. McLane

Engineering Dept., upper division
C. G. Evans (Captain)
Paris Fitzpatrick
A. J. Baldwin
Frank Fisher
C. W. Rhodes
J. C. Fi-man

The list of 15 problems had been furnished the men, the first of the week for practice, and from these 15, the following four problems were selected, which were only given to captains of the various teams at the time that the problem was to be demonstrated.

No. 1 Burns on the face, neck, ears, breast, arms and hands. Burned completely from waist up
No. 2 Bad cut on top of head on right side, severe bleeding, broken left collar bone, right leg broken below knee with bone stuck out on right side.
No. 3 One-man event. Man overcome by gas, found with broken right arm below elbow. Perform one-man shoulder lift and carry to place of safety.
No. 4 Man found lying on back over electric wire, unconscious with bad burn on back. Artificial respiration.

Three impartial judges were chosen. About 800 people were present, the number being limited by the accommodations. Special trains were run from the different mines to Jenkins to accommodate the people interested in their particular teams. The first prize was won by the lower division of the Engineering Department, second prize by team of mine 204, and third prize by team of mine 205. J. B. Williams, of mine 205, won the one-man event.

On Friday afternoon, for the benefit of the teachers in the Jenkins schools and for those who will instruct the class in English, which is to be conducted under the auspices of the Y. M. C. A., Doctor Roberts gave a demonstration of his method of teaching English to foreigners. A crowd of about 30 aliens of varied nationalities was gathered in the assembly room of the new office building of the Consolidation Coal Co., and although by careful examination all were eliminated who had any knowledge of English, yet in about 45 min., Doctor Roberts proved conclusively that he had the foreigners not only using but also thoroughly understanding the first lesson.

All the meetings were held in the large auditorium of the temporary Y. M. C. A. building at Jenkins, and at each meeting, the capacity of the hall was taxed. It was decided in a conference to form classes in English for foreigners and in arithmetic and mine work for miners.

MINE RESCUE CAR NO. 7 AND CLASSES OF CONSOLIDATION COAL CO. EMPLOYEES AT JENKINS, KY.

PETER ROBERTS, AUTHOR OF SYSTEM FOR TEACHING ENGLISH TO ALIENS, INSTRUCTING A CLASS OF FOREIGNERS IN "MINE TALK," FOR CONSOLIDATION COAL CO.

DISCUSSION BY READERS

Reducing Ventilation When Firing

Letter No. 16—The discussion, thus far, seems to have been confined more to the questioning of certain statements of facts, rather than to the ascertaining of the reason for such facts. The experiences recorded in the letters of Mr. McAllister apparently contradict all we have been taught in relation to the prevention of explosions. It has always been considered important to keep the mines free from accumulations of explosive gas, by means of an ample air current, which we have been taught serves two purposes: (1) The pressure causing the circulation of air acts to oppose the expansion of the gases generated in the mines. (2) The air current dilutes, renders harmless and carries away these gases.

One naturally concludes from this teaching that when circulation ceases, the gases held back by the ventilating pressure expand and fill the working places of the mine, forming with the air explosive mixtures of firedamp. That this teaching and conclusion are true, and that an explosion would occur if such firedamp mixtures came in contact with flame or become otherwise ignited, is unquestionable. That an explosion did not occur, in the experiments of Mr. McAllister, is sufficient indication that these conditions favoring an explosion did not exist.

We observe Mr. McAllister states that when the fan was stopped there was still an air current of 30,000 cu.ft. per min. passing in the mine, produced by natural ventilation. He rightly regards this as a dangerous condition, because such a current, even in an ample airway, would have a velocity sufficient to carry dangerous quantities of coal dust in suspension in the air, besides supplying the danger zone in the mine with a large quantity of oxygen, which is the supporter of combustion. There were thus present the two elements regarded by all mining men as the most potent in the propagation of an explosion. The danger in this case was overcome, as stated, by sealing up the upcast shaft with heavy doors, which stopped this natural circulation.

It may be assumed that as long as the temperatures producing the natural air column in the mine remained unchanged, the pressure producing the natural circulation still existed. The outlet being closed, the condition in the mine would be the same as when a forced fan is working on a closed drift or mine. The pressure would be maintained and would be, perhaps, more effective in preventing the expansion of the gases than when the air was in motion.

If this reasoning is correct, the mine at the time of the experiment presented the following conditions: (1) A constant pressure opposing the expansion of the gases and thus far acting to prevent an explosion. (2) A limited supply of oxygen, the quantity being determined by the capacity of the airways in the danger zone. (3) The absence, to a greater or lesser extent, of coal dust in the mine atmosphere, owing to the lack of circulation of air.

I believe such conditions must have an important bearing on the limitation and prevention of an explosion. While the experience of Mr. McAllister is unique, I do not consider it contradictory or inconsistent with the conditions known to be characteristic of explosions. He seemingly succeeded in turning an element of danger into a factor of safety, which was possible to do in his case, because the pressure was maintained while the circulation was stopped. On the other hand, had the circulation been stopped by sealing up the intake opening instead of the return opening, I believe we will all agree that the experiment would have resulted disastrously.

Coal mining has no greater problem demanding a solution than that of the prevention of explosions—the king of terrors underground. I am inclined to think that experiments should be conducted along the lines suggested by this discussion, to prove the efficacy of the proposition and to show its limitations in practice, or to expose the error of such a method.

I. C. Parfitt.

Jerome, Penn.

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Letter No. 17—Referring to the discussion on reducing ventilation when firing, I would say that while there have been some points advanced in favor of such practice, and these were seemingly supported by experience and the results reported were good, the arguments are not strong enough to induce me to abandon the old-school practice. Like the man from Missouri, I think enough has been said against the system and I can add but little.

In case a mine is generating explosive gas, it would be very unsafe to stop the ventilating fan or reduce its speed. When the shots are fired after all the men, except the shotfirers, are out of the mine; or when a number of shots are fired at one time on a single entry, I am in favor of having the shotfirers begin firing on the return end of the air current and advance with their work against the air. By so doing, the smoke and gases will not be carried past any place yet to be shot; and this eliminates the chances of flame being projected into what might be a dangerously explosive atmosphere. The shotfirer thus always has a clear atmosphere for his work and can make the proper test for gas and feel satisfied with his examination; whereas, if the places were full of smoke and gas, he would be doubtful in making the necessary examination before firing the shot.

When this system is strictly carried out, with an air current sufficient to keep the split or mine in a healthy condition; or, in a dusty mine, if the place where a shot is to be fired is well watered for a distance back from the face, say 25 or 30 yd., the chance of an explosion taking place will be reduced to such an extent that I would feel much safer in the mine while shotfiring was in progress, than if the speed of the fan were to be reduced or the fan shut down.

For example, I will cite one case, that of the Harwick mine explosion, in 1904, when 179 men were k[illed].

The air current in the mine was nearly shut off by the freezing up of the airshaft, and very little air was traveling through the mine, especially in that portion of the mine where the explosion took place; here the air current was hardly perceptible. I think this instance may serve, at least, to offset similar ones that have been given in favor of reducing the ventilation when firing.

F. W. CUNNINGHAM.
Mine Inspector, 21st Bituminous Dist.
Charleroi, Penn.

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Letter No. 18—The question of reducing the ventilation in a mine, at the time of firing shots, is so foreign to the average mining man's belief, that at first glance it seems absurd. There are mines where this experiment can never be tried, for the reason that the miners would leave their places in a hurry the moment they discovered the fan had been slowed down.

To reduce or shut down the ventilation, in any mine producing a large amount of gas at the working face, would be to court disaster. On the other hand, former Mine Inspector Verner and others have called attention to this subject, for some time; and this, together with the experiences described by Mr. McAllister, in his recent letters in COAL AGE, has placed this subject beyond the category of mere conjecture. If there is any truth in the theory, its practical application must be ascertained and the conditions clearly demonstrated.

More or less of the same theory has been recently strenuously advocated by Prof. Harger, in a series of lectures, in England. Prof. Harger contends that the lowering of the oxygen content in the mine atmosphere, will reduce the liability to explosion. While I am unable to believe that the arguments advanced apply to mines generating gas freely, I can see that the theory may have an important application in mines subject to the dangers of a coal-dust explosion. A coal-dust explosion is merely a rapid form of combustion and must require a large amount of oxygen to propagate the explosive wave. Under these conditions, it is reasonable to believe that the chance of a dust explosion will be naturally lessened by reducing the supply of oxygen.

While it may be shown, later, that the same argument can be applied likewise to a gas explosion, I fear such a conclusion would surely lead to disaster. My opinion now is that, in a mine free from gas but liable to dust explosion, greater safety may be secured by reducing or entirely stopping the ventilation when firing shots. I do not, however, accept this theory as a panacea for all the ills of coal mining.

JAMES HOLDEN, Supt.,
Princeton Coal & Land Co., Ltd.
Princeton, B. C., Canada.

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Letter No. 19—I have read with great interest the discussion of the question of reducing ventilation in mines when firing. I am employed, every afternoon, in the work of inspecting shots. I note some writers favor reducing the ventilation, while others would increase it, at firing time.

My opinion is that when conditions will permit, the ventilation should be entirely stopped before firing is begun; that is to say, provided there is a proper system of shot inspection maintained in the mine. Every hole should be examined by a competent person to ascertain that it is properly placed and cleaned out before it is charged. Only permissible powder should be used in blasting and the holes should be tamped with wet clay.

I believe in electric firing when everybody is out of the mine. I do not believe in the employment of shotfirers who must make their rounds, firing one or two shots at a time, when all the men have left the mine but themselves. If the mine is not safe for the men, it is not safe for the shotfirers; and what is more dangerous still, the mine air is often heated and loaded with coal dust, which makes it ready for an explosion to occur upon the slightest mistake of a shotfirer.

We have in our mines one of the best systems of firing possible. Each afternoon, the firebosses, carrying the electric detonators in a leather bag, visit every working place, examine each hole to be fired, see that the place is well sprinkled with water, make up the necessary charge of powder and see that it is put to the back of the hole and the hole properly tamped with wet wood pulp, which we use for tamping.

All electric currents are turned off at the end of each shift. The wiremen then go around, couple up the shots, put in the switches and return to the surface. The fan is then stopped for 30 min., before firing, and remains so for a few minutes after the shots have been fired. After starting the fan again and giving time for the air to clear, in the mine, the wiremen go below to examine for fire and take out the switches.

We fire, in this way, from 150 to 200 shots, at the end of each shift; and I have never yet found the least evidence of any trouble having occurred, when making my morning examination as fireboss.

WILLIAM ROTHWELL, Fireboss.
Castle Gate, Utah.

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Letter No. 20—In regard to reducing ventilation when firing shots in a mine, I would say at once and without any qualification that I consider such a proposition a retrograde step. It is a parallel to the suggestions of Dr. Harger, as expressed in his recent book on the "Prevention of Explosions and Mine Fires."

Assuming, however, that the shots are to be fired in the working places and not on the roadways, the danger of explosion would be less, owing to the coarseness of the dust at the face. Also, whether we consider a longwall face or a bratticed room, the air current is seldom a serious obstacle to the expansion of the gases produced in firing.

In a mine generating firedamp, I cannot imagine that any sane man would advocate closing off the ventilation either wholly or in part, at any time. The Mines Regulation Act (Canada) and the mining laws of most states require the maintenance of a current of air sufficient to dilute, render harmless and carry away the gases generated in the mine. If this rule is to be disregarded, mine officials would be at liberty to adopt the "Harger theory," and reduce the oxygen content of the air current to 17 per cent., and introduce, say 1¼ per cent. of carbon dioxide into the air current.

In my own experience, I have never had charge of a mine where it was possible to shut down the ventilating current without causing an immediate accumulation of firedamp in the workings. Besides the accumulation of firedamp, the shutting down of the ventilation would

introduce another danger; namely, large quantities of carbon-monoxide gas, produced by firing in a dust-laden atmosphere and a limited supply of air, would accumulate in the rooms and chambers to an extent that might prove fatal to the shotfirers should they have to return to a room where shots had been fired.

The reading of some of the letters, especially those of Mr. McAllister leads one to conclude that the mine air, in the cases mentioned, must have contained a low percentage of oxygen. It would be interesting to know the exact composition of the air in the mine at various points, at the time indicated in Mr. McAllister's letters. To make the investigation complete, an analysis of the coal should also be given to show the inert dirt contained in the seam, and which probably played an important part in preventing an explosion.

In closing, permit me to say that the whole proposition of reducing ventilation in mines, at firing time, appeals to me only as an excuse for reckless blasting. Although the theory seems to have some support, from the instances given, the details are insufficient to be conclusive.

JAMES ASHWORTH,
Mining Engineer.

Vancouver, B. C., Canada.

Oxygen Supply as Affecting Mine Explosions

The discussion on reducing ventilation when firing naturally draws attention to the oxygen supply necessary to support combustion in mines where coal dust or firedamp abounds.

In mines where the coal is blasted, the explosion of a large quantity of powder, at one time, undoubtedly has a tendency to decrease the percentage of oxygen in the mine air, at the working face. This is due, not to the consumption of the oxygen of the air by the powder in explosion, as the powder is supposed to contain its own oxygen supply; but the large quantities of carbon dioxide produced by the explosion of the powder naturally reduce the percentage of oxygen in the mine air in the immediate vicinity.

At present, authorities differ as to the reduction of oxygen percentage that is necessary to prevent the ignition and explosion of otherwise explosive mixtures. Dr. J. Harger, England, states that *comparative* safety in mines may be obtained by a reduction of from 1 to 2 per cent. in the oxygen content of the air and the introduction of about ¾ per cent. of carbon dioxide; and adds that *absolute* safety will be secured by a reduction of 3½ per cent. in the oxygen content and the introduction of from ½ to 1 per cent. of carbon dioxide.

G. A. Burrell, chemist of the Bureau of Mines, gives, as a result of his laboratory experiments, a much larger percentage of reduction in the oxygen content of air as necessary to prevent the ignition of an explosive firedamp mixture. In fact, Mr. Burrell's figures are, approximately, double those of Mr. Harger (COAL AGE, Jan. 18, p. 105). The oxygen content given by Mr. Burrell as necessary to prevent the ignition of firedamp, would not probably support human life. In commenting upon the results of his experiments, Mr. Burrell states (p. 106): "If all conditions are identical the mixture will explode less violently and less completely in proportion to the decrease of oxygen percentage."

Mine air always contains less oxygen than outside air. The deficiency of oxygen, in the air that is traveling through the mine, may vary from 0.1 to 0.2 per cent. or even more, while at advancing faces, under ordinary conditions, the deficiency may reach 2 per cent. or even more in extreme cases.

It is to be sincerely hoped that more uniformity of results will be obtained by future experiments. If it is true that, under certain conditions possible in mining, the deficiency of oxygen may amount to 2 or more per cent., it might be assumed that in such workings an explosion of gas would be practically impossible, according to Doctor Harger's figures, inasmuch as we may be reasonably sure that from ½ to 1 per cent. of carbon dioxide will also be found at the face of such workings. It is in this connection we are to look for whatever benefits may be derived from reducing the ventilation at the time of firing in mines, since, by reducing the air supply, the oxygen percentage will be decreased and the carbon-dioxide percentage increased.

Experience shows that mine explosions frequently originate on the first of the air and the explosive wave travels toward the intake or fresh air. While this fact is significant, it is true that there are frequent exceptions to the rule. If the recoil of a violent explosion extends inby from the point or origin, there is generally found little evidence of flame, particularly in territories where shots have recently been fired.

Investigations of a few dust explosions in the Pittsburg (Kansas) field proved that, in every case, the explosion originated on the first of the air and traveled toward the intake. The significant feature, in this connection, was that the dust on the intake was not as dry as that at the working faces. It is the general practice in this field to change the direction of the air current whenever the section on the first of the air is giving trouble. By this change, the troublesome sections of the mine are placed on the last of the air, and the trouble ceases.

While I am fully aware of the danger that might arise, in gaseous mines, if the circulation were to be materially reduced at the time of firing shots, I am still of the opinion that, in a dusty mine, there is a benefit to be derived from limiting the oxygen supply at the time of firing, as described in the letters of Mr. McAllister, recently published in COAL AGE.

I wish to heartily endorse the suggestion that has been made that the Bureau of Mines, which is well equipped for carrying on extensive experiments, should undertake the experiments necessary to prove or disprove the theory that greater safety is obtained by the reduction of the circulation of air at the time of firing shots, in mines, under different conditions.

Although, it is true that cutting off or reducing the ventilation, in an experimental mine, might not produce a mine atmosphere precisely similar to that found in a regular working mine, where the air becomes diluted with a noticeable percentage of carbon dioxide very quickly after the ventilation is reduced. In this connection, we will be glad to afford opportunity to any representative of the Bureau of Mines to obtain samples of the air, in mines where the fan is entirely stopped for from 30 min. to 1 hr. before firing shots.

C. W. WATERMAN,
Genl. Supt., The Fleming Coal Co.

Pittsburg, Kan.

EXAMINATION QUESTIONS

Rescue Work and Appliances

Ques.—How would you proceed to enter a mine after an explosion, and how would you conduct the rescue operations?

Ans.—Much will depend on the extent and violence of the explosion. The first step is to ascertain what damage, if any, has been done to the mine openings and the ventilating apparatus. Any damage to the fan or fan drifts should be promptly repaired, or temporary arrangements should be made for producing the necessary ventilating current in the mine. Observe if the air current is taking the same direction as usual, or if it has been reversed by the explosion.

It is important in entering the mine to follow the fresh air current, and the above observations are generally of importance, even though rescue apparatus is available and a trained rescue corps is at hand ready to enter the mine by any available opening. There is generally more hope of rescue by following the air, but this course may be modified by the conditions existing in any particular mine.

In the absence of an organized rescue corps, an immediate call should be sent out for volunteers and, from these, experienced men should be selected and a rescue party organized under the leadership of a competent miner who is thoroughly acquainted with the mine and the conditions existing in the workings. The party should be equipped with approved safety lamps and tools, such as picks, axes and hammers, necessary for the work.

Upon entering the mine, careful tests should be made of the mine air, to ascertain what poisonous qualities it may have aside from its explosive condition. For this purpose, the rescue party should carry with them, in addition to safety lamps, caged mice or birds, and constantly observe how these are affected by the atmosphere of the mine.

The aim of this first rescue party is to make as rapid advance as possible; exploring, as they go, every nook and corner where it is possible someone may still have survived the explosion. Only such work of repairing doors and stoppings and erecting brattices should be performed, at this time, as is necessary to conduct the air current forward so as to make it possible to explore the rooms and headings.

A second party should be organized, at the surface, to follow the first party and supply them with whatever is needful to expedite the work of rescue. As survivors are found, they should be promptly treated by first-aid methods and removed from the mine.

Ques.—Would you allow any class of workmen to enter a return airway contaminated by gases coming from a mine fire; and, if so, for what purpose would you allow them to enter?

Ans.—No one but the most experienced miners should be permitted to enter a return airway, under these conditions and, then, only when protected with an approved form of rescue apparatus that will permit the wearer to live surrounded by a poisonous atmosphere. Such a return airway should be entered only for the purpose of rescue or for the performance of such work as is absolutely necessary for the extinction of the fire or preventing its spread.

Ques.—If the safety lamp gives no indication of the presence of gas, is this fact proof that the atmosphere is safe to enter?

Ans.—No. The atmosphere, in a mine, may be poisonous to that extent as to be instantly fatal, owing to the presence of carbon monoxide in the air. The percentage of the gas present may be so small that the gas will escape detection on the lamp. Its presence can only be ascertained by the blood test; or by observing the effect of the gas on small caged animals, such as mice or birds. These small animals are much more quickly affected by this gas than is the human system. Their action will therefore serve as a warning for men to vacate the place and seek fresh air.

Ques.—How would you determine which of two different kinds of rescue apparatus is the better for given conditions in the mine?

Ans.—Before entering the mine the wearer should test each apparatus in the smoke room and find out which is the most suitable to him. The conditions in the mine, however, largely determine which type should be worn. If the conditions within the mine are known and no irritating gases are likely to be met, I would prefer the Fluess apparatus; but if fires have to be contended with I prefer one of the helmet type.

Ques.—Suppose you were wearing a rescue apparatus while hurrying into a mine to save a man; and you suddenly felt as though you could not get your breath, under normal working conditions. What would probably be the cause and what would you do?

Ans.—As the apparatus is regulated to give 122 cu.in of oxygen per minute, which is the amount necessary under normal working conditions, it is probable that by hurrying more was required and this supply of oxygen, therefore, was not sufficient; and he found that he could not breathe. To overcome this condition sit down and rest until the supply of oxygen is again sufficient. Then be careful not to exert yourself more than is required to perform the work.

Ques.—How would you test a rescue apparatus before giving it to a man to wear?

Ans.—Make sure that the apparatus is properly charged. The apparatus should be tested to see that it is giving off the required amount of oxygen per minute, and to see that the pressure on the intake tube and the vacuum on the return tube is not, in either case, greater than 3.94 in. water gage. Be careful to note also, that all connections are air-tight.

Before going into a mine, the man should be required to put on the apparatus and go into a room filled with the fumes of burning sulphur. This will detect any leakage in the apparatus.

COAL AND COKE NEWS

Washington, D. C.

The action of Attorney-General Wickersham in filing a new suit on Feb. 13 against the Delaware, Lackawanna & Western Ry. Co. and the Delaware, Lackawanna & Western Coal Co. under the Sherman anti-trust law had been expected for some time past. J. C. MacReynolds, counsel for the Government in this suit, explains the purpose of the action as that of securing from the Court a judgment on the question whether persons in control of a railroad company can organize among themselves a corporation which continues under their management and through the form of a contract escape the prohibitions of the commodities clause of the Interstate Commerce law, while it was also intended to apply the Sherman act so as to restrict railroads to the business of common carriers by preventing them from entering into contracts or arrangements tending to interfere with the performance of their duties under such contracts.

Attorney-General Wickersham in outlining the object of the suit says:

The purpose of the railroad company and those who controlled it in organizing the defendant coal company was to use the latter as a mere instrumentality for retaining under their direction and for their profit the business of selling coal theretofore carried on by the railroad; and under the agreement of Aug. 2, 1909, this purpose has been carried into fruition.

They have always constituted its dominant stockholders and probably always will. They elect its officers, determine its policies, and, moreover, they may take away its sold business upon six months' notice. If its conduct should fail to meet their approval, it may be deprived of all benefits under the sales contract and its business quickly destroyed. In such event a similar subterfuge could be organized and the profits of the entire business still be secured to the stockholders of the railroad.

The arrangement under which the defendant companies are operating in no proper or legal sense destroys the interest which the railroad company has in the output of the mines which it owns and operates or in the coal which it purchases from others before the same starts in the course of interstate or foreign transportation, but during the entire course of such transportation the carrier has an interest therein within the true meaning of the statute.

The two companies are but the instrumentalities of the same group of stockholders; the arrangements and contracts between them are but devices to avoid the prohibitions of the Interstate act, and operations under them are more damaging to the public than those under the old plan prior to August, 1909.

They have enabled the coal company to acquire a monopoly of the sales of coal produced along the defendant railroad, and through the exclusive use of the instrumentalities leased by the latter, and otherwise this monopoly will be continued.

Having secured for itself a monopoly, the defendant railroad successfully undertook to transfer this to the coal company, and, unless prevented, such monopoly will continue to the great detriment of the public.

Furthermore the contract between defendants necessarily hinders the railroad from freely fixing its rates for transporting coal according to recognized and legitimate standards, and introduces a factor into the determination of questions relating thereto which may not be considered consistently with the rights of the public, and which necessarily tends to keep such rates unduly high. For since under the contract the railroad company receives for its coal at the mines a percentage of the price at New York harbor, which price is largely determined by the freight rates, it follows that the higher the freight rate from the mines to New York harbor the higher the price received by the railroad company at the mines, and, on the other hand, as the freight rate decreases such price decreases.

The contract is thus not only a barrier against any reduction in the railroad company's freight rates to New York, however justified by the conditions, but is an inducement to higher rates regardless of any change in the cost or character of the service. It is in undue, unreasonable and unlawful restraint of interstate and foreign trade and commerce.

Municipal Coal Mines

Mr. Taylor, of Colorado has offered the following bill for the establishment of a "municipal coal mine."

That the following-described coal land or so much thereof as the city of Grand Junction, Colorado, may apply for within six months after the approval of this Act, is thereby granted to said city as a source of coal supply for the use of said city and for the use therein of the inhabitants and industries thereof, to wit:

In section ten, the east half of the east half.

In section eleven, the southwest quarter and the southwest quarter of the southeast quarter, the west half of the northwest quarter and the southeast quarter of the northwest quarter.

In section fourteen, the north half of the northwest quarter and northwest quarter of the northeast quarter.

And in section fifteen, the northeast quarter of the northeast quarter, all in township one north, range one east, of the Ute meridian, containing six hundred and forty acres, more or less, upon the following conditions, that is to say: That said city shall, within two years from the approval of this Act, open a workable vein of coal upon said land and shall continuously thereafter develop and operate a practical coal mine thereon for the purpose aforesaid; shall not assign or transfer said land or any interest therein; shall comply with such rules and regulations as may from time to time be prescribed by the United States Bureau of Mines and approved by the Secretary of the Interior. . . . . .

Mr. Taylor has also continued this same policy in a general way by offering the following measure:

That the Secretary of the Interior is hereby authorized, in his discretion, to patent lands of the United States classified as coal lands within any State or Territory to any city or incorporated town therein, duly authorized in this behalf, as a source of coal supply for the use of such city or town and for the use therein of the inhabitants and industries thereof, the lands so patented to be conveniently situated with reference to such city or town. Every such patent shall include not to exceed six hundred and forty acres for each city and one hundred and sixty acres for each town. It shall be appropriately conditioned to provide for prompt and continuous development of the coal, the prevention of any assignment or transfer of the land, the safeguarding of the health and safety of laborers mining or handling the coal, the prevention of undue waste of mineral resources, and the securing of full reports and publicity as to the mining and disposal of coal mined under the patent, including costs of construction, of maintenance, and of operation, use for municipal purposes, sales, and receipts from sales, all in such manner and form and at such times as the Secretary of the Interior may by rules and regulations prescribe.

PENNSYLVANIA

The mine inspectors' examination in the bituminous region of Pennsylvania will occur in March. The examinations for mine foreman, assistant mine foreman and firebosses, in the bituminous districts of the state, will take place in April. The dates of these examinations will be announced later.

Anthracite

Wilkes-Barre—The Bliss colliery was idle Feb. 4 as a result of the smashing of the cage. Work was resumed, however, the following day.

Questions of importance to the Miners' Union were considered Feb. 12, when the members of the three anthracite district boards met. The call was issued Feb. 11. President White attended.

In addition to the provisions for rescue and first-aid work now in force in the anthracite coal mines, the Lehigh Valley Coal Co. is now putting into service a mine-rescue car which can be rushed at a moment's notice to any colliery in case of accident. This car consists of a remodelled passenger car equipped with oxygen breathing apparatus and several kinds of first-aid equipment.

Scranton—The Scranton school board has gone to court in an effort to force the Scranton Coal Co. to furnish them with maps showing the underground condition at the corner of Washington and Vine Sts., where the board is contemplating the erection of a new school building, and about which they have been unable to obtain any information from the coal company.

Bituminous

Harrisburg—Senator Sensenich, of Westmoreland County, has presented a bill aimed to take the appointment of mine inspectors in the bituminous region out of politics. It makes specific provision that the Governor must appoint inspectors in the order of rank of percentage. The candidates making the highest mark must be appointed first. This bill has been endorsed by several coal operators, while others oppose it. The present law gives the Governor the option of appointing as inspector any man passing the examination with an average over 90 per cent.

Beulah—The Beulah Coal Co. has filed suit in the United States District Court against the Pennsylvania R.R. Co. to recover $50,000. The coal company alleges that the Pennsylvania company illegally discriminated against them in awarding and distributing of coal cars to their mines in the Clearfield district.

Indiana—Six thousand acres, including practically all of the unsold coal in Green township, this county, has been optioned by Elmer E. Davis, of Johnstown, representing Philadelphia capitalists. In the tract is a solid block of 2000 acres near Pine Flats, which was obtained at $70 an acre. The options expire May 1.

WEST VIRGINIA

Charleston—Manufacturers of South Carolina have united in a complaint to the Interstate Commerce Commission of alleged excessive and unreasonable freight rates on coal from West Virginia fields to cities in South Carolina. The petition is directed against the Norfolk & Western and its connecting lines.

Bluefield—An appropriation of $70,000 will be made for the purpose of establishing a mine-rescue station at Norton. A rescue car will be stationed there and will have easy access to mines in the West Virginia fields.

Bridgeport—Arrangements have been completed for the transfer of 1500 men and 22 locals from this district of the United Mine Workers to District No. 3, which centers about Mansfield. Mar. 29 has been set as the date for the district convention, and New Philadelphia as the place for meeting. The action taken will then be ratified. The reason for the transfer is said to be that the miners involved do not work the Pittsburgh No. 8 vein, which is worked by the miners of the eastern portion of the district. As a result, difficulty in adjusting the scale is always arising.

Tiltonville—Work has been resumed at the Red Mud mine north of Martin's Ferry after a ten days' strike. A mass meeting was held and the members voted to abide by the order issued by John Moore, president of the Ohio miners, and return to their work.

MARYLAND

Baltimore—Announcement has been made of the establishment of a joint new coal rate by the New York Central & Western Maryland R.R., from the Pittsburgh district to Baltimore piers. For the first time in the history of the Pittsburgh coal industry, competition with other coal fields is thus made possible in seaboard coal markets. This action also opened to Pittsburgh the growing coal export trade.

TENNESSEE

Knoxville—The fourth annual banquet of the Southern Appalachian Coal Operators' Association was held in Knoxville, Tenn., on the evening of Feb. 11, at the Colonial Hotel, with a fine attendance. Col. James R. Wooldridge, of Wooldridge, Tenn., presided as toastmaster.

KENTUCKY

Lexington—The recent order of the Interstate Commerce Commission suspending railroad schedules providing for cancellation of point rates for the transportation of coal from Kentucky and West Virginia mines to Wisconsin points via the Pere Marquette R.R. has been attacked in a brief filed by the Chesapeake & Ohio Ry. Co. The company contends that no public necessity exists for the establishment or continuance of a through route from the fields indicated to northwestern territory via Toledo and the Michigan lake lines. The commission is asked to vacate its order, and to permit the company to haul its coal over its own lines to Chicago.

OHIO

Columbus—Fire of unknown origin destroyed the offices and yards of the Murray City Coal Co. and the Hocking Valley Ry. tracks, Columbus, early Saturday morning, Feb. 15.

General Mine Inspector John C. Davies has appointed Thomas E. Grogan, of Cardington, Ohio, as district mine inspector in Belmont County to succeed Thomas Hennessy, who resigned on account of ill health.

INDIANA

Indianapolis—The coal-mine operators of Indiana are greatly interested in the proposed transportation of coal from the Indiana and Illinois coal mines to Chicago by pipe line. This scheme is said to be well under way by Chicago financiers. The plan is to pump the coal by hydraulic power, which it is claimed can be done at a cost impossible for the railroads to meet.

Isham Randolph, engineer, the expert behind the project, is emphatic in declaring the plan perfectly feasible, and that coal could be delivered in Chicago cheaper than at present and that the new process will revolutionize the coal-carrying trade. It is said that the right-of-way for the pipe line and branches has been quietly obtained.

Bloomfield—The Summit coal mine, one of the oldest in the Greene County field, has been flooded ten days or more, and all efforts to lower the water have proved futile. The mine is on low ground, and it is believed water from some abandoned mine is pouring into the Summit. The owners have almost decided to abandon the place, which means a loss of several thousand dollars worth of mining machinery, to say nothing of the unmined coal and the miners' loss for lack of employment.

Petersburg—The Ingle Coal & Coke Co. is taking leases on hundreds of acres of coal land in the vicinity of Augusta, Pike County. They are paying $20 an acre for the coal. The Ingle company is now operating seven mines along the Southern R.R., and employs seven hundred miners.

MISSOURI

Kansas City—An order has been granted by United States District Judge McPherson, in the Federal Court, restraining the Chicago, Burlington & Quincy R.R. from tearing up seven miles of track on the spur known as the Adair County R.R., which runs seven miles northeast from Youngstown to the property of the Great Northern Fuel Co., at Novinger. It is claimed that the absence of a railroad there would make the Great Northern property worthless.

COLORADO

Denver—The itinerary of the Denver Rescue Car No. 2 is given as follows:

Town	Arrive	Leave
Frederick (mail Segundo), Colo.....	Feb. 23	Mar. 1
Madrid, N. M. (Alberquergue & Cerillos Coal Co.)	Mar. 2	Mar. 8
Carthage, N. M. (Carthage Fuel Co.)...	Mar. 9	Mar. 15
Gallup, N. M. (Diamond Coal Co.) (Victor-American Fuel Co.).....	Mar. 16	Apr. 5

FOREIGN NEWS

Brussels, Belgium—King Albert has stepped into the breach in an effort to avert the general strike which has been called to go into effect throughout Belgium in April. The King has advised the cabinet to make concessions to the Labor Party and Socialists. The 200,000 Belgian miners who have grievances are anxious to go out.

PERSONALS

A. F. Harper has been transferred as resident engineer of the Woodward Iron Co.'s coal mines from Dolomite, Ala., to Mulga, Ala.

King J. Ellicott has assumed active management of the Operator's Coal Co., taking the place recently made vacant by the resignation of E. O. Hoover.

J. Q. Clarke has severed his connection with the Pittsburgh Coal Co. as assistant sales manager at Buffalo, and has opened an office there on his own account under the name of the Monongahela-Youghiogheny Coal Co.

In the latter part of May President John Moore, of the Ohio mine workers, expects to leave for Europe to attend the International Mining Contest. During his absence Vice-President John Valenka, of Bridgeport, will be in charge of the state organization.

Wemyss Jackson has been appointed general sales agent of the Consolidated Indiana Coal Co., with headquarters at 139 West Van Buren St., Chicago. Mr. Jackson is to be in general charge of the sale of coal in place of Frank Ragan, who at his request, is appointed district sales agent, with headquarters at 403 Terminal Traction Building, Indianapolis, Ind.

TRADE CATALOGS

THE ALBERGER PUMP & CONDENSER CO., 140 Cedar St., New York City. The Hammond water meter. 8 p., 8½x11 in., ill.

CONSTRUCTION NEWS

Akron, Mich.—Tracks are being laid by the Handy Bros. Mining Co., of Bay City, to a point near here, where two coal shafts will soon be sunk.

Wilkes-Barre, Penn.—The D. and H. company is contemplating erecting a washery some time in the near future between Honesdale and Waymart.

Philadelphia, Penn.—The Keystone State Construction Co. has secured a permit for a coal trestle 22x220 ft. on the east side of Broad street south of Sedgley avenue, for the Pennsylvania Railroad; cost, $12,500.

Fort Wayne, Ind.—Kendallville business men have a

proposition to establish a factory for the manufacture of peat fuel from bogs. It is the desire to establish a factory with a capacity of 50 tons per day.

Shamokin, Penn.—Local mining engineers of the Reading Coal & Iron Co. today completed plans for the sinking of a new shaft at the Sterling colliery. The company is also preparing other plans for the greatest improvements in the history of collieries in this region.

Waynesburg, Penn.—Engineers are making the location for new mines and coke plants about a mile above the Poland Coal Co.'s new works up Dunkard Creek, new developments are to be made by the Henderson and Kennedy interests of Pittsburgh. About 400 coke ovens are to be built at once.

Shenandoah, Penn.—Plans for the breaker to be built for the Locust Mountain Coal Co., which will operate the new Girard Estate lease, are nearing completion and materials and machinery will be brought in February so that construction can be commenced about April 1. A 6000-ft. drainage tunnel will be started about the first of March.

Scranton, Penn.—The Minooka Coal Co. has leased from the Delaware & Hudson Co. a tract of land containing more than 70 acres, situated South of Minooka Park. The location is known as the old Corey Tract.

It is the intention of the Minooka company to erect a $25,000 breaker on this site. The company also expects to mine more than 200,000 tons of coal from the land, and this product will be prepared at the new breaker.

St. Louis, Mo.—A byproduct coke oven and recovery plant is to be erected by the Laclede Gas Light Co. on a 200-acre tract of land at the junction of the River Desteres with the Mississippi. The cost is to be approximately $5,000,000, and the plant will have a capacity of 250,000 tons annually.

In connection with the coke-oven plant, the company will build an additional water-gas plant, power stations, pumping stations, and machinery for handling the 500,000 tons of coal that will be consumed every year for the manufacture of coke and the byproducts.

Ironton, Ohio—It is reported that the Semet Solvay Co., of Syracuse, N. Y., is negotiating with the Rogers-Brown Co. for the installation of a coke plant similar to their million dollar plant at Ashland, Ky., for supplying coke for the local furnaces. The Ashland plant has a capacity of about 700 tons daily, and a plant of similar capacity would supply coke for the furnaces of this city. It is also stated that the Rogers Brown Co. will erect a large blast furnace at Ashland. Should another coking plant be installed here, it will prevent the frequent coke shortages at the furnaces.

Brownsville, W. Va.—A contract has been let to R. J. McFadden by the Hitchman Coal Co. for the sinking of a new shaft to connect with the new coal which that firm owns at the Glendale mine. The contract price is said to be about $10,000, and it is aimed to complete the work by the 1st of May.

The new opening will be made on the Bell property, on Little Grave Creek. It is said that a new uptodate structural-steel tipple will be erected upon the completion of the new shaft. The mine will be equippd with the most modern machinery, and will have one of the largest outputs in this section of the state.

NEW INCORPORATIONS

Paris, Ohio—The Caney Cannel Coal Co.; capital stock, $1000. Incorporators: P. J. Johnson, Wm. Kenney and F. M. Farres.

Mayo, Ohio—The Hampton Timber Coal and Land Co.; capital stock, $25,000. Incorporators: B. M. Craft, John M. Allen and C. C. Craft.

Pittsburgh, Penn.—The Buffalo Creek Coal Co.; capital stock, $25,000; to operate in Butler and Armstrong Counties. Incorporators: C. A. Ross, C. B. Clark, C. L. Glass, C. E. Meyer and G. M. Bilger.

Greensburg, Penn.—A charter was granted the Greensburg Coal & Coke Co. at Harrisburg Saturday, $200,000. The new company will operate a tract of about 600 acres of coal north and west of this city.

Pittsburgh, Penn.—A special meeting of the stockholders of the Wellsley Oil Co. will be held Mar. 27 for the purpose of voting on a proposed decrease in the capital stock of the company from $500,000 to $5000.

Boston, Mass.—The Belmont-Monroe Coal Mining Co.; capital stock, $1,000,000. Promoters: William B. Crowther, James O. Evans, Pittsburgh, Penn., C. L. Andrews, L. L. Coleman and R. S. Buzzell, Augusta.

Montgomery, Ala.—Papers have been filed reporting the incorporation of the Syracuaga Ice and Coal Co. of Talladega County; capital stock, $15,000. Incorporators: F. W. Ledbetter, A. B. Parker, and Ethel Ledbetter.

Fairmont, W. Va.—The Mineral Fuel Co.; capital stock, $1,200,000; to develop coal and other mineral lands in Letcher County. Incorporators: A. B. Young, G. M. Alexander, Brooke Fleming, Jr., J. O. Watson and Walter Miller.

Vaughan, W. Va.—The Lewis Land & Coal Co.; capital stock, $400,000; to develop mineral land and deal in real estate in Nicholas County. Incorporators: E. W. Knight, G. S. Couch, Jr., F. F. Brown, A. W. McDonald, and O. P. Fitzgerald.

Wheeling, W. Va.—The Washington Oil & Gas Co.; capital stock, $15,000; to acquire real estate and explore for gas, coal and other minerals. Incorporators: B. E. Thompson, R. J. Desch, Geo. Haid, R. S. Magie, J. R. Rowan and J. E. Hughes.

Wilmington, Del.—The Coal Savings & Smoke Consuming Co., $1,000,000. To establish foundries for the purpose of manufacturing coal saving devices and install the same on stoves, etc. Incorporators: R. Boyd Cooling, Clarence J. Jacobs, Harry W. Davis, all of Wilmington, Del.

Pittsburgh, Penn.—Alberta Development Co.; to deal in all kinds of mineral lands in the state of New Mexico and elsewhere. Capital stock, $300,000: Incorporators: Preston B. Ewing, Thomas H. McKay, E. W. Ewing, and J. Albert McKay, of Pittsburgh and Lloyd L. Little, of Emsworth, Penn.

Connellsville, Penn.—The Northumberland Coal & Coke Co., operating three miles south of Somerset, will apply for a charter on Feb. 25. The incorporators are R. C. Fiss and James Christian, of Shamokin; E. G. Jones and V. S. Truckenmiller, of Watsontown, Penn. and E. H. Mayer of Somerset. The company has opened mines on the Frank Walter and Robert C. Bittner farms in Milford Township. W. H. Mayer has charge.

Hartford, Conn.—The Schniewind Coke Oven Co., of Hartford, has been formed to manufacture illuminating gas and coke and use the by products. Capital stock, $500,000. Incorporators: Robert C. Metcalfe, of Newark, N. J., and Alvan Waldo Hyde and Charles Welles Gross, of Hartford.

Allen, Ky.—The Mayo-Hampton Timber, Coal & Land Co. has been organized by B. M. Craft and others, with a capital stock of $25,000. The company proposes to acquire timber and coal lands for development.

INDUSTRIAL NEWS

Easton, Penn.—The Easton Coal & Coke Co. will occupy a site at Belmont and McKeen streets. Frank McInerney is president.

Fairmont, W. Va.—The Consolidation Coal Co., will equip its collieries at McRoberts, Ky., with five 10-ton 42-inch gage electric mining locomotives.

Indiana, Penn.—The Armerford Coal Mining Co. have opened coal developments on Blacklick Creek, on the site of the old John R. Wilson farm.

Huntington, W. Va.—Twelve mines are now operating on the Buffalo extension of the G. V. Ry. above Logan and put out something like a hundred cars of coal daily.

Waynesburg, Penn.—Attorney G. C. Drake has purchased 50 acres of coal land in Gilmore township at $160 per acre. The tract was formerly known as the John D. Russell farm.

Marshall, Mich.—While sinking a shaft at the Sheridan township mine, coal was struck at a depth of 72 ft. The seam is 5½ ft. thick, and the operators believe that the strike will prove profitable.

Punxsutawney, Penn.—W. S. Blaisdell expects to be shipping coal from the mines which are just being opened on Williams Run, near No. 6 mine, of the Anita Coal Mining Co. about midway between Punxsutawney and Horatio.

Morgantown, Ky.—G. L. Drury, C. E. Sullivan, J. C. Haney, of Union County, have purchased the West Aberdeen Coal Co.'s property, and are now repairing the mines to be put in to operation.

Philadelphia, Penn.—Colonel T. Coleman du Pont, the powder manufacturer, with many diversified interests, has effected a merger of six bituminous coal companies with an annual output of more than 10,000,000 tons a year. The capital is $6,000,000.

Derby, England—John Davis & Son (Derby), Limited, of All Saints' Works, Derby, England, and care of Messrs. J. F

McCoy Co., of 157 Chambers St., New York, have been granted letters patent by the U. S. Patent Office for their "Davis-Biram" anemometer.

Pittsburgh, Penn.—At a special meeting of the stockholders of the four States Coal & Coke Co., the first stock of the company was increased from one and a half million to two and a half million dollars. This concern was the 11th in production in West Virginia for 1912.

Carrolltown, Penn.—It is reported that the Logan Coal Co. is negotiating for the purchase of a 150-acre coal tract near the operation of the Black Diamond company at this place. It is reported that John Hayes and William Mardemer of this place may take over the mine.

Grafton, W. Va.—The Preston Fuel Co. is owner of about 5000 acres of coal land at Independence and is opening up the same. A shaft is to be sunk to a depth of 210 ft. and a steel tipple will be built. The work is in charge of R. B. Stewart, superintendent and manager.

Huntington, W. Va.—A deal involving $500,000 and the transfer of a tract of valuable coal and timber land in Logan County was closed recently. Six thousand six hundred acres on Buffalo Creek were sold by Huntington and Charleston capitalists to the Buffalo Coal & Coke Co.

Connellsville, Penn.—The Knickerbocker Fuel Co., with mines at Hooversville, Somerset County is a new firm in that field. The company expects to mine 600,000 tons during 1913. Officers Jas. A. Hill, New York, president Frank M. Graff, Blairsville, treasurer, Telford Lewis, Johnstown, secretary.

Waynesboro, Penn.—J. E. Barnes, of Pittsburgh, has secured options on 2500 acres of coal land in Whitley township, at $400 an acre. It is reported that he secured the option for the Pittsburgh Coal & Coke Co., and that the option extends for 90 days.

Waynesburg, Penn.—J. B. F. Rinehart of this place closed a deal recently with Justice W. S. Mankey, of East Waynesburg, whereby he was granted title to the Pittsburgh vein of coal underlying a tract of land containing a little over 100 acres, situated near Nineveh, Morris township, the price per acre being $125.

Summerset, Penn.—Captain Sanner, L. G. Lambert and J. Shaver have listed their options on a tract of 6000 acres of coal in this county. The option price was $50 an acre. The purchasers of the tract have not been made known, but it has been given out that the men holding the option have sold out to a firm which will develop the tract.

Tuscaloosa, Ala.—A. S. Costellono and associates from Jacksonville, Fla., have purchased 320 acres of coal land at Shira's Station near Tuscaloosa, on the Tuscaloosa Mineral L. & N. Railroad from Miss Margaret Miller and Messrs. John T. Bradford and C. M. Peterson. Purchasers expect to ship much of the coal which they will soon mine.

Windsor, Mo.—The Brownington Coal Co. expects to begin operation soon on a large scale. They have been stripping some coal for the past several weeks with teams and scrapers, but expect that their new 95,000-lb. steam shovel will soon be on the ground. They have a fine 4-ft. seam of coal near the surface, the depth ranging from 9 to 13 feet.

Connellsville, Penn.—Announcement has been made that the Pennsylvania Coal & Coke Co. is prepared to fire up 1000 ovens in the Allegheny Mountain coking region. Greene County coal will probably be used. The ovens have a capacity of about 12,000 tons per month Byproduct ovens will also be built at Midland to run on this coal which is floated down the river in barges.

St. Louis, Mo.—Dr. J. C. Parrish, representing the Audrain Coal Co. of Vandalia, Mo., announced the closing of a deal with the Laclede-Christy Clay Products Co., of St. Louis, by which about 300 acres of coal lands in northeast Missouri, overlying a rich vein of fire clay are transferred. For the present the fire clay will be shipped to the St. Louis factory of the company.

Newark, N. J.—The H. W. Johns-Manville Co. announce the removal of its Newark office to 239 Halsey St. Its new office and salesroom is located on the ground floor of a modern building right in the heart of the city's business center. With a floor area of 4000 sq.ft., ample space is afforded for the display of a varied line of J-M asbestos roofings, packings, pipe coverings, etc.

Colorado Springs, Colo.—Alexander Patterson has exposed a body of coal one mile north of Pikeview on the land owned by Dorr, Flosson & Meridan. The value of new seam is estimated at several hundred thousand dollars. A shaft 14x7 ft. was in the course of construction when this bed was struck at a depth of 371 ft. Mr. Patterson says that he will arrange to extract 1000 tones a day.

Des Moines, Ia.—The Madison coal mine at Twentieth street and Hickman avenue sustained a $3000 loss when the engine house and boiler room wher destroyed by fire. The origin of the fire, which was discovered by Carl Miller, night watchman, is unknown. The loss is partly covered by insurance. Repairs were begun at once and the company will continue operations.

Salt Lake City, Utah—By the middle of February the Spring Valley Coal Co. expects to have its coal upon the market of the West. This is the enterprise brought into being by the Jesse Knight interests of Provo, and a wide market for the coal is being prepared by Lewis M. Cannon, the general sales agent for the company. The company has equipped the mines for a daily coal production of 2000 tons.

Pineville, Ky.—The Continental Coal Corporation has recently sold, at its offices in Pineville, Ky., all of the standing oak and poplar on 10,000 acres of its coal properties in Bell and Knox Counties, in this state, to Carr Bros., of Nashville, Tenn. The purchasers propose to erect on Straight Creek a large mill for the immediate working up of the timber in that vicinity. It is estimated that it will take several years to go over all of the timber purchased.

Reynoldsville, Penn.—Two years ago the McConnell Coal Co., of Reynoldsville, secured the mining rights of the Dennison and Ross tracts above Coal Glen, consisting of about 300 acres of coal and established a colliery on the tract. This mine has developed into a large producer. A few weeks ago the McConnell coal interests secured a large tract near Sugar Hill and a force of men is now putting in drifts and equipment for the development of the tract. A new tipple is being erected.

Clarksburg, W. Va.—W. W. Fowler, owner of the Calvert Coal & Coke Co. and the Calvert Coal Mining Co., has purchased two mines now in operation and producing 600 tons of Kanawha splint coal daily. Mr. Fowler took over the entire holdings of the Ceste-Kanawha Coal Co. and the Ceste-Kanawha Merchandise Co. The acquisition of the two splint mines gives Mr. Fowler's company the advantage of being the only company in West Virginia producing the four best varieties of coal mined in the state.

New York, N. Y.—The sales of the Western Electric Co. will be between 71 and 72 millions for the year 1912, which is slightly more than in 1906, the previous largest year in the company's business. The increase has been in American sales ontside of the Bell System, which have increased about 100% over 1906, and in European sales, which were the largest in the company's history. The results have been accomplished by an energetic selling campaign in the face of increased and increasing competition.

Harbourville, Ky.—Local coal operators, among them W. M., S. H. and J. R. Jones, have acquired a valuable coal acreage on the outskirts of Hazard, Perry county, and will install one of the largest mining plants in that newly opened district. The mines will be electrically equipped and the company will seek a franchise from the town of Hazard for operating an electric-lighting plant. In the event arrangements are made, the same power plant will be used to operate the mines and furnish the town with electricity.

Stoyestown, Penn.—Owners of a tract of about 6000 acres of coal land lying between Stoyestown and Shanksville have been notified that options taken about three months ago will be lifted and that the money, $50 an acre, will be received by the owners probably within a week. The company making the purchase is not known, but the agent who has been working in the field is A. G. Smith, of Lehigh County. The options were taken by Capt. Sanner, L. G. Lambert, and Joseph Shaver, all Somerset County men. Deal will mean the transfer of about $300,000.

Chicago, Ill.—The Western Electric Co. has recently placed upon the market a new dry battery to be known as the red label blue bell battery. It is designed for intermittent service requiring high efficiency and rapid recuperation. This new battery is a result of careful development work extending over a long period.

The Red Label battery is of the high initial amperage and low internal resistance type, giving 25 amperes on short-circuit. These characteristics together with its powers of rapid recovery after use, insure its long life and usefulness wherever this general type of battery is required.

Medford, Ore.—Experiments on the Sunnyside coal mined about three miles from Medford have demonstrated that it will produce illuminating gas and it is probable that it will be used by the Medford Gas Co. in place of crude oil, which is now shipped from California.

F. W. Topkin, of El Paso, Texas, is experimenting with this coal and finds that it will have valuable byproducts in the way of tar and asphaltum and as it is not of a sufficiently high grade to ship will be useful for gas companies.

COAL TRADE REVIEWS

GENERAL REVIEW

In spite of the changed weather conditions, the expected improvement in the hard-coal trade has failed to materialize. Production at the mines is heavy, perhaps close to any previous high record and the coal is being readily absorbed, but there is an absence of snap in the market and indications are strongly in favor of the situation becoming worse. There are rumors of concessions of from 25 to 50c. being offered on individual egg and chestnut, while even stove is selling at less than the circular; such conditions obviously make it difficult for the companies to maintain their regular circulars. Dealers are hoping for a continuation of low temperatures so that they will be able to dispose of their surplus egg and chestnut.

The Coastwise bituminous trade is a shade firmer, but all shippers have coal they are anxious to dispose of, and receipts are not being absorbed very readily. The market is characterized by a feeling of indecision and none seem to be able to formulate an opinion as to which way it will go; at present it is down to approximately a summer basis, and it is quite difficult to arouse any interest among the buyers. Only a few season prices have been announced so far, and contracting seems to be reserved for a later period. On inland contracts considerable business is being done, operators getting a slight advance over last year's figures. There also seems to be more activity there in the spot market, particularly in the North, where the movement on the railroads is quite uncertain; the Canadian trade is divided between a fear of both a surplus and a shortage because of the great uncertainty in the movement. There is little interest being displayed in contracts in the Pittsburgh district and contract prices are being slightly shaded on spot business; there is considerable inquiry, however, and prices are as good or better than formerly.

There is more activity in the Ohio field due to the lower temperature and the increased domestic demand; the movement is also slow and uncertain and shippers are convinced that the railroads are not prepared to do much in the face of adverse conditions, should these materialize. A considerable tonnage is being produced, dealers are busy and insisting upon immediate shipments, with the result that the downward tendency in prices has been checked and producers are holding firm at nominal quotations. In the South the weather continues favorable to a good domestic consumption, stocks are being depleted, and there is a good healthy demand generally. While the trade has not by any means been satisfactory so far this season, because of the unseasonable weather, stocks are rather low, and there is a fairly strong buying movement.

The cold weather in the Middle West has materially reduced stocks in the retailers hands and resulted in a rather concerted buying movement. The demand is unusual and all shipments are being readily absorbed. The Far Western market is in a doubtful condition, due to the impending change in the season; many dealers are putting in stop orders and will not again be interested in the market until next season.

BOSTON, MASS.

The New England market continues practically unchanged from a week ago. Bituminous is perhaps a shade firmer on account of the seasonable weather, but all the shippers have coal they are anxious to sell and the receipts at the piers have not been absorbed very readily. There is not so much doing on contracts as might be supposed; the uncertainty over transportation rates coastwise, is helping to put off closing business at season rates.

Water freights are firm at 95c.@$1 on large vessels, Hampton Roads to Boston. On Long Island Sound barge rates for New York loading are down to 45@50 cents.

Pennsylvania coals are dull and season prices are not yet announced on any but a few of the more popular grades. Those are asking from 5@10c. more than last year, but it is doubtful if they can command it in view of the light demand that will probably prevail between now and September. The Georges Creek shippers have as yet made no announcement, but they are expected to be out for comprehensive business within a short time. There is a general air of indecision about the bituminous market just at this time and all hands seem to be wondering what moves to make.

All-rail there is little doing. Even fuel contracts seem to be reserved for a later time and the trade is so nearly on a summer basis that it is difficult arousing any interest on the part of buyers. Then, too, most steam plants are carrying over considerable stocks of what they have called their "reserve" during the winter months.

Anthracite trade from now until April will depend wholly on the weather. If the present cold spell continues there will be some orders for Eastern shipment, but if warm weather sets in soon it will be dull, indeed. Dealers are hoping for seasonable temperatures so they can work off the surplus supplies of egg and chestnut they took on earlier in order to secure stove. Some of the New York companies have receded from the 15c. advance on company barge freight, New York to Boston, and are making efforts to sell on the old 50@55c. basis. It will be interesting to see what attitude the same companies take Apr. 1. Pea size is still in short supply.

Wholesale quotations are about as follows:

Clearfields, f.o.b. mine	$1 20@$1 40
Clearfields, f.o.b. Philadelphia	2 45@ 2 65
Clearfields, f.o.b. New York	2 75@ 2 95
Cambrias, Somersets, f.o.b mines	1 30@ 1 55
Cambrias, Somersets, f.o.b. Philadelphia	2 55@ 2 80
Cambias, Somersets, f.o.b. New York	2 85@ 3 10
Georges Creeks, f.o.b. Philadelphia	2 87@ 3 10
Pocahontas, New River, f.o.b. Hampton Roads	2 70@ 2 80
Pocahontas, New River, on cars Boston	3 85@ 4 10

NEW YORK

Anthracite—The cold weather has been holding out more or less continually throughout the month and has resulted in an active business in the local retail trade. Conditions have also been favorable for a large distribution, and this branch of the business has been quite prosperous over the last two or three weeks. This prosperity has not, however, extended to the wholesale end. Practically all sizes are in easy supply with egg quite heavy. Premium coal is entirely unheard of, and with the individual cutting prices, the large companies are experiencing a great deal of difficulty in moving certain grades at circular; they are already putting some of these into storage, although this has not by any means become general yet.

Had it not been for the recent stretch of cold weather, it is difficult to say what condition the trade would have been in at this time. Production has been quite heavy at the mines, there being a plentiful car supply, while the petty strikes, which so seriously interfered with the output during last month, have not been so much in evidence. As a result shipments have been quite large and these, added to the reserve stocks accumulated by many dealers on speculation, make an enormous tonnage that the market has not been able to absorb.

New York quotations remain practically unchanged from last week. Price variations are noticeable both up and down, but average prices continue as before. We quote the nominal market as follows, with consignments possibly a little more difficult to obtain, and quotations a trifle firmer:

	Anthracite		Bituminous	
	Circular	Individual		
Broken*	$5 00	4 75	West Virginia, steam	$2 65@2 75
Egg	5 25	4 90	Fair grades, Penna	2 75@2 85
Stove	5 25	5 25	Good grade, Penna.	2 90@3 00
Chestnut†	5 50	5 50	Best miller, Penna.	3 05@3 15
Pea*	3 50	3 75	Georges Creek	3 25@3 30
Buckwheat**	2 75	2 50		
Buckwheat†	2 45	2 35		
Rice**	2 25	2 25		
Rice†	1 95	1 90		
Barley†	1 75	1 20		

* Scranton and Lehigh. ** Scranton. † Lehigh and Schuykill.

Bituminous—The soft-coal market at this point continues off, and weak, in spite of almost three weeks of practically continuous low temperatures. While this has resulted in an active retail trade, it has not helped the large wholesalers. Large stocks have accumulated at tide which the companies are finding it almost impossible to move. Some of these have been standing for so long, that demurrage charges are piling up on them, and among these are some high priced coals.

For prompt delivery, the market is uncertain and irregular, with prices fluctuating a great deal, according to the urgency of the demand from the consumer. As a whole, quotations are off from last week for spot coal and buyers are displaying an entire absence of interest in the market. Much the same condition applies to contracting, although there has been some slight evidence of activity in this branch; only tentative figures have so far been advanced, and the market cannot, as yet, be said to be quotable. There are rumors of the operators holding out for from 10 to 20c. above last year's figures, but there is nothing definite of anything being closed at these prices, and it is highly improbable that they will be able to maintain this level for the season.

PHILADELPHIA, PENN.

Notwithstanding the changed weather conditions, the expected improvement did not materialize in the local market. Although there is considerable coal moving, and the output of stove, chestnut and pea seems to be readily absorbed, yet there is an unmistakable lack of snap in the trade, and this seems likely to continue, or grow even worse, unless unusual conditions prevail.

The reported strike of the firemen on all the roads leading into this city has not taken hold of either the dealer or the public as might be expected. It would undoubtedly bring about a distressing condition, if continued for any length of time, but there has been no apparent activity manifested so far. The papers are not giving any undue prominence to this matter, which undoubtedly has its effect on the public at large, but scare heads of a strike which would result in an almost complete tie-up of any additional supplies, would likely cause considerable commotion, and this would not apply to the anthracite business alone.

Taking the trade as a whole, it is inclined to be rather dull. Current gossip hints at cuts of anywhere from 25c. to 50c. per ton on the individual egg and chestnut coal, and stove is reported to be selling at less than circular. This is a condition that has to be met at this season, although earlier than usual this year, and with the added output of individual coal that has been turned loose on the market, owing to the recent decision of the Supreme Court, it makes rough sledding for the large companies who uphold the prices on their circulars.

The bituminous market does not seem to improve in any respect, and coals that were being offered at from $1.60@1.65 are now selling at anywhere from 25c. to 35c. less, and current reports indicate no immediate improvements.

PITTSBURGH, PENN.

Bituminous—Demand for prompt coal has improved, and especially the demand for slack. There is considerably more inquiry, and sales are more numerous, with prices fully as good as formerly, and in some instances better, while slack is quotably higher. Slack was rarely bringing above the circular price of 90c., but in the past week it has occasionally brought $1.10, and $1 has been done even on desirable tonnages. There is little interest in contracts. For prompt lots shading of the regular contract prices is altogether exceptional, while prompt slack, as indicated, is quotable at $1@1.10. Contract prices remain as follows: Slack, 90c.; nut and slack, $1.05; nut, $1.25; mine-run, $1.30; ¾-in., $1.40; 1¼-in., $1.55, per ton at mine, Pittsburgh district.

Connellsville Coke—The coke market is beginning to show slight signs of a reaction after its precipitate decline in the past few weeks. Last week saw new low prices for prompt coke, $2.25 being reached, though probably on indifferent grade, since $2.50 has been obtained for standard grades in several instances. While there has been no negotiating of importance on contracts, it would appear in the circumstances that about $2.25 would represent the closing basis were buyers and sellers able to get together on common ground. There is curtailment of production, both by some of the standard operators running only four or five days, as well as by some operations, those making inferior cokes, being forced to blow out ovens. The consensus of opinion in the trade is that the situation will have to be righted by this means, there having been coke produced in the past few months of such quality that it cannot be marketed at any price in normal times when consumers can choose. The using up of stock coke will have its influence also. Consumption all along the line is as heavy as ever. We quote: Prompt furnace, $2.25@2.50; contract (nominal), $2.25; prompt foundry, $3; contract foundry, $3@3.25, per ton at ovens.

BALTIMORE, MD.

Except for some contracting at an advance over last year's figures, the Baltimore market has been devoid of interest during the week. It is generally believed that practically all contracts will call for an advance of from 10 to 15c.

During the remainder of February, many contracts will be closed up here, but the majority of them will not be renewed until the latter part of March or around the first of April.

The supply of fuel at the present time is sufficient, but the demand is lacking. Consumers appear to be entirely out of the market so far as spot business is concerned. Consumers who wanted low-grade coal during the week had no trouble in getting it around $1 per ton and even less.

The cold weather brought about a slight improvement in the demand for anthracite, but the market was by no means active, as many households were well stocked. West Virginia mines are still facing an acute labor shortage.

BUFFALO, N. Y.

For some time the Grand Trunk has been struggling with more coal than it could move. Occasionally it would take a large tonnage and seem to be out of its difficulties; then it would refuse everything again and allow the coal to accumulate at East Buffalo and Black Rock; it is reported that the East Buffalo yards are full of coal trains, made up for the Grand Trunk, ready to run over to it the moment it will take anything. Of late the Canadian Pacific has been taking so much coal that was routed over the Grand Trunk that it is also occasionally blocked.

The Canadian trade has been divided between an oversupply and a fear that the stocks would run out before the roads were back to normal conditions again; at last accounts there was still a surplus, but the demand was improving rapidly. Buffalo has not suffered in that way; in former years it was used as a dumping ground, but the local dealers became tired of having the market ruined by consignment coal and refused to handle it. Car service charges did the rest.

There is a heavy demand for bituminous and, if the production is not allowed to run away with the trade there is a good margin of profit in sight for both operator and jobber right along. It is generally conceded that this is going to be a good bituminous year, if only because of the necessity for readjusting wages again next year; some jobbers are already making calculations based on a shutdown at that time.

There is a disposition to accept the figures of the Pittsburgh Coal Co. as a basis of quotations here, merely adding the freight rate of $1.25 to those prices as follows: Pittsburgh select lump, $2.80; three-quarter, $2.65; mine-run, $2.55; slack, $2.15, with Allegheny Valley 15@25c. lower. Coke is still declining, chiefly on account of having gone too high. Best Connellsville is quotable at $5.50.

The anthracite trade is strong, but the excitement is gone. The cold weather has insured a heavy consumption and it is not quite late enough in the season for consumers to consider the possibility of being stuck with some of their stock. Only chestnut is at all scarce; the independents are getting a small margin on it. The Lehigh Valley Co. has begun to load its surplus egg into vessels, having loaded some two cargoes already.

COLUMBUS, OHIO

More activity developed in the coal trade in Ohio during the past week, due to lower temperatures which stimulated the domestic demand. Dealers in Hocking Valley coal were busy and insisting upon immediate shipment, with the net result that a considerable tonnage was produced.

One of the best features of the trade is the good demand from steam users. Factories are good buyers, and since the general industrial prosperity continues, are taking a larger tonnage than ever. Then there is a good demand from apartment houses and office buildings for steam sizes. Taking it all in all the trade is in excellent condition, and a complete recovery from the dullness of the past few weeks has taken place.

Retail business has been active and dealers are busy making deliveries. Some small advances have been made in quotations, but not sufficient to shut off buying in the least. The icy condition of the streets has interfered with deliveries.

Production in various Ohio fields has been rather good. In the Hocking Valley the output is estimated at about 85 per cent. of usual, and the same is reported from the Pomeroy Bend district; in eastern Ohio the output has been about 75 per cent. Little or no complaint has been heard of the lack of cars, although there is a shortage of motive power on some of the roads touching the coal regions.

Quotations in the Ohio fields are as follows:

	Hocking	Pittsburgh	Pomeroy	Kanawha
Domestic lump	$1.50	.....	$1.50	$1.50
¾-inch	1.35	$1.20	1.40	1.30
Nut	1.50	.....	1.25	....
Mine-run	1.20	1.05	1.15	1.15
Nut, pea and slack	1.10	.....	1.15	1.00
Coarse slack	1.00	0.95	0.90	0.90

CLEVELAND, OHIO

The situation in this district has improved to a large degree and prices continue to advance. The movement is slow and uncertain, and shippers are convinced that Northern carriers are not fortified against abnormal conditions. The trouble is most noticeable on shipments from the Youghiogheny district to points in this territory. This condition has caused considerable of a hardship to shippers and consumers; in many cases deliveries are 72 hr. overdue and public service and large manufacturing plants report their storage supply running dangerously low. All shippers are wire-tracing coal en route and have impressed upon the railroad people the necessity of better movement.

Mines in the Youghiogheny and Pittsburgh No. 8 district did not operate over 80% this week on account of the scarcity of railroad equipment, and operators are not assured of an increased supply for the present.

Wholesale quotations per net ton f.o.b. cars at the mines are as follows:

District.	Freight rate	¾-in.lump	Mine-run	Slack
Youghiogheny	$1.00	$1.40	$1.30	$1.10
Pittsburgh No. 8	0.90	1.20	1.10	1.15
Goshen No. 6	0.70	1.35	1.25	1.30
Coshocton	0.70	1.55	1.35	1.30

Massillon domestic lump is quoted at $2.50 f.o.b. mines. Pocahontas lump and egg is selling at $2, run-of-mine $1.25, and slack $1.10. Hocking lump advanced from $1.50 to $1.60 mines. The coke market has weakened considerably, furnace coke has dropped to $2.50 f.o.b. ovens; about 75c. is added for the foundry grades.

The downward tendency of prices has been checked and producers of Youghiogheny coal are firm in their quotations on contract business for the ensuing year. Inch and a quarter lump is quoted at $1.55; three-quarter, $1.40; run-of-mine, $1.30, and slack, 90c., f.o.b. cars at the mines. Consumers do not seem to be overanxious to sign at these figures, but shippers claim they will not experience any difficulty in contracting for their entire production at these prices. The demand for Youghiogheny gas coal increases as the lake season approaches.

BIRMINGHAM, ALA.

There has been no material change in the local market during the current week. The weather continues to be gratifying to retailers, who are fast depleting their stocks. Incidentally, this condition is pleasing to producers of domestic coal who would surely have found trouble in inducing the dealers to stock up early had they not been able to dispose of the supplies on hand.

Many of the mines are having more or less trouble with water, but such trouble is not out of the ordinary at this season of the year. The foundry coke market has softened slightly, and while prices have not been reduced, orders are now being taken by the ovens with the promise of immediate shipment. Domestic nut coke can be had more freely, although prices remain very firm.

LOUISVILLE, KY.

A few operating companies and sales agents report some light and cautious storage on the part of dealers whose fall purchases were not sufficient to carry them through the months of November and December, during which time the car shortage was at its worst, and leave a surplus for the rest of the winter. The comparatively few dealers in this class have fared rather well, altogether, inasmuch as they have disposed of their stock coal at the regular winter prices, and are now enabled to supply their trade with coal purchased at phenomenally low figures, considering the date.

The best grades of block are quoted at $2, while the second and lower qualities shade down to as low as $1.50, especially in western Kentucky. Lump and block from the eastern Kentucky district is 10 or 15c. lower than the prices indicated for block, with a poor demand; for the best grades of round, prices vary from $1.20 to $1.40. Straight mine-run is quoted at $1.10, and No. 2 at $1. Nut and slack are in active demand, at prices ranging all the way from 75c. to $1 and a little better, for the best grades, depending upon location and other factors, and from 60 to 75c. on second grades. A few sales are reported of Indiana screenings, as usual when the supply is inadequate on this side of the river; the sales agents of the river companies state they could dispose of practically their entire stocks of steam coal at good prices if they cared to do so at this time.

KNOXVILLE, TENN.

The last half of January and the first of February have been characterized by little or no demand for domestic grades, and what was promising to be one of the most prosperous winters in the history of the Kentucky-Tennessee field has been turned into a most unsatisfactory one, so far as the last four weeks are concerned. However, that retailers have no stocks is revealed by the fact that a few cold days in succession quickly brought some orders for immediate delivery.

The demand for steam, especially the smaller sizes, has held up well, but they are not as high as they were 30 days ago. The active steel and iron market in the South assures a fairly good demand for steam, as considerable is used in making coke, thus relieving the commercial market, but the trade is taxed to take care of grades that ordinarily would be marketed as domestic coal.

INDIANAPOLIS, IND.

The cold weather has lasted about two weeks, with the temperature hovering not far from zero. Necessarily it has helped the coal trade by reducing stocks in the dealers' yards and among the larger users in factory districts where large piles are kept in reserve. The retail yards were well loaded before the cold snap came, sales having been quite restricted in January.

The optimists, both among operators and dealers, believe there is still to be some winter weather, and that retailers who stocked up heavily in October and November will be able to clear their yards. The smaller dealers who did not load up with coal in the fall, when cars were scarce and prices stiff, have been benefiting by the situation since the first of the year, buying at summer schedule practically and underselling the larger dealers 50c. to $1 a ton. There is no trouble now about cars, the mines being promptly supplied.

The following represents closely the Indiana f.o.b. mine prices, Indianapolis f.o.b. prices being 50c. higher, to cover freight:

No. 4 mine-run	$1.15	Domestic lump 5- and 6-in.	$1 65
Nos. 5 and 6 mine-run	1.05	Screenings, No. 4	0 80
No. 4 steam lump, 1½-in.	1 30	Screenings No. 5 and 6	0 70
Nut, No. 4	1.40	Washed coal, Nos. 1 & 2	$1.75@2 00
Egg	1.45	Brazil block	2 20
Domestic lump 2½-in.	1.50		

DETROIT, MICH.

Bituminous—Conditions at Detroit and in the southern part of the state have shown a marked improvement during the past week, owing to the cold weather that has recently set in. Steam trade still remains the strong feature at this time, and the domestic line has taken a decided increase in sales also in the past week. Operators in the south are beginning to make much larger shipments on steam coal, while the dealers on the other hand are getting rid of domestic stocks in a more satisfactory manner. The domestic line has improved to such a great extent that the retailers are now disposing of a great deal more fuel than was predicted they would.

	W.Va. Splint	Gas	Hocking	Cambridge	Pitts. No. 8	Pocahontas	Jackson Hill
Domestic lump	$1.50	....	....	....	....	$1 75	$2.00
Egg	1.50	....	....	....	....	1.75	2.00
Nut	1.40	....	$1.50	....	....	....	....
1½-in. lump	1.25					....	....
¾-in. lump	1.15	$1.15	1 20	$1 20	$1.20	....	....
Mine-run	1.05	1 05	1 00	1.00	1.00	1.25	....
Slack	1.00	1.00	1.00	1.00	1 00	1.10	....

Anthracite—The demand for this product is unusually heavy, and shipments do not seem as free as heretofore. Some of the operators are now charging a 60c. premium on all sizes, but if the weather should moderate, Detroit will be oversupplied with this grade.

Coke—All the ovens are working to their utmost capacity, and the demand is unusual for domestic coke. Quotations are advancing, and the product is bringing a top-notch price for this time of year. There seems to be a scarcity of Connellsville in this market, and it is being quoted at $4.50 per ton, with Semet Solvay at $4.25, and gashouse at $4 per ton f.o.b. ovens.

CHICAGO

There has been an unusual demand in the Chicago market for coal, and regular shipments from the mines are being readily absorbed. There is continued strength in the steam trade. So far as smokeless coal is concerned, the demand is so heavy that dealers find it difficult to supply the trade. The market on mine-run is quotable all the way from $1.25@1.40, f.o.b. the mines. The anthracite situation is stronger, while the coke market is slack.

Prevailing prices in Chicago are:

	Sullivan Co.	Springfield	Clinton	W. Va.
Domestic lump	$2 47	$2.07 @ 2.32	$2.27	....
Egg	2 47	....	....	$3.95
Steam lump	$2 12 @ 2.37	1 92 @ 1 97	2 17	....
Mine-run	....	1 97	1 97	3.30
Screenings	1.67 @ 1 72	1 57 @ 1 62	1 67	....

Prevailing prices for coke are: Connellsville and Wise County, $6@6.25; by-product egg, stove, nut and gas house, $5.75@5.85.

ST. LOUIS, MO.

Continued spring weather has left its mark on the trade during the past ten days; it has resulted in the closing down of many mines in the Carterville and Franklin County fields and others in the Standard and Inner District, and some of these operations claim that they will not resume work until some time next August or September.

In both the Carterville and Franklin County fields, as well as the Standard, coal is being sold below the cost of production. How long some of the operators can hold out with this policy is a question, and it begins to look as if some of the St. Louis shippers were skating on thin ice.

The prevailing prices, however, are:

	Carterville and Franklin Co.	Trenton and Big Muddy	Mt. Olive	Standard
2-in. lump				$0.90 @ 0 95
3-in. lump			$1.25	
6-in. lump	$1 25		1.35	1.00 @ 1.10
Lump and egg	1 25	$2 00		
No. 1 nut	0 85			
Screenings	1 10			0.60 @ 0 65
Mine-run	1 20			
No. 1 washed nut	1 35			
No. 2 washed nut	1.30			
No. 3 washed nut	1 25			
No. 4 washed nut	1 20			
No. 5 washed nut	1 10			

Coke is strong at $5.25 and up, and some smokeless is offered, but there is little moving.

MINNEAPOLIS—ST. PAUL

While the weather in the past two weeks has helped considerably in forcing the consumption of coal, it has not been of great benefit to the wholesale trade as far as demand and prices are concerned. The dealers in the country are benefitted to a certain extent, but they have not been able to clean up stocks and consequently there has been no occasion to order any coal. It is thought that a large percentage of the dealers in the Northwest will not be able to clean up their bins this winter and all grades of coal including anthracite will be carried over.

Prices on the various grades are hard to quote as the different mines in the different localities vary a great deal. Mines which have no contracts have flooded the territory with coal at low prices, while those that have, are only running part time and are in most cases, asking a fair price. Dock prices are steady, owing to the low stocks at Milwaukee and the head-of-the-lake points. Nearly all of the docks are swept clean and only here and there can be found any coal to speak of that is not under contract.

In the Twin Cities hard-coal stocks are low, especially in the nut size. One car of nut was received on track recently which had been passed at the docks through a stone crusher and before it could be switched onto the side track there was a line-up of from 15 to 20 dealers waiting to get at it.

OGDEN, UTAH

The market in the Intermountain territory is in a doubtful position. While there are no indications of an early spring, most of the dealers expect the demand for domestic coal to break soon, and they hesitate to get much in transit. A large number of small dealers who entered the market in the fall have discontinued shipments entirely, and will not again be in the market until next season.

The mines in Wyoming and Utah have caught up on all unfilled orders and have their salesmen out looking for business. Nut and slack coal are hard to dispose of, and quite a number of loaded cars are accumulating at the mines. The larger producers of the steam grades are now unloading at the mines, as there is practically no market for these grades. Nut should commence moving in the near future, as it is an excellent summer coal for use in ranges and small heating stoves.

FOREIGN MARKETS

GREAT BRITAIN

Feb. 7—Steam-coal market conditions are quiet and easy, on account of tonnage delays. Substantial reductions can be obtained by buyers who are in a position to nominate spot tonnage. For forward loading, sellers are holding firmly for higher figures. Quotations are approximately as follows:

Best Welsh steam	$4 38@4 50	Best Monmouthshires	$4.08@4.14
Best seconds	4 20@4.32	Seconds	4 02@4 08
Seconds	4 08@4 20	Best Cardiff smalls	3 60@3 66
Best dry coals	4.20@4.38	Seconds	3.18@3 42

The prices for Cardiff coals are f.o.b. Cardiff, Penarth or Barry, while those for Monmouthshire descriptions are f.o.b. Newport; both exclusive of wharfage, and for cash in 30 days—less 2½%.

GERMAN EMPIRE

The following is a statement of the German production, imports and exports during November, 1912:

	Production	Imports	Exports
Coal	14,805,443	1,002,271	2,551,839
Lignite	7,558,561	676,065	5,629
Coke	2,596,768	50,130	505,844
Briquettes	2,119,594	21,443	242,008

PRODUCTION AND TRANSPORTATION STATISTICS

CHESAPEAKE & OHIO RY.

The following is a comparative statement of the coal and coke traffic over the lines of the C. & O. Ry., for December, and the six months ending Dec. 31, 1911-12, in short tons:

	December		Six Months	
Destination	1911	1912	1911	1912
Tidewater	367,310	223,833	1,970,464	1,690,591
East	200,434	251,819	1,069,625	1,215,205
West	937,038	724,867	5,735,565	4,917,470
Total	1,504,782	1,200,519	8,775,654	7,853,266
Coke	17,557	23,544	110,597	134,936
From Connections				
Bituminous	23,204	65,984	117,326	241,000
Antracite	3,338	1,541	18,749	6,971

NORFOLK & WESTERN RY.

The following is a statement of tonnages shipped over this road from mines in West Virginia and the commercial and company coal, for the month of January, in short tons:

Field	Shipped	Tipple	Total	Commercial	Company
Pocahontas	1,262,869	18,579	1,281,448	1,216,218	124,213
Tug River	191,896	4,021	195,917	158,209	37,708
Thacker	277,018	6,944	283,962	217,555	66,407
Kenova	78,371	5,620	83,991	72,573	11,418
Clinch Valley				156,189	9,384
	1,810,154	35,164	1,845,518	1,820,744	249,130

Shipments of coke, entirely from the Pocahontas field, were 117,305.

COAL SECURITIES

The following table gives the range of various active coal securities and dividends paid during the week ending Feb. 15:

Stocks	Week's Range High	Low	Last	Year's Range High	Low
American Coal Products			94	94	94
American Coal Products Pref			109¼	109¼	109¼
Colorado Fuel & Iron	39⅞	34½	36¼	41¼	31
Colorado Fuel & Iron Pref			155	155	130
Consolidation Coal of Maryland	102½	102½	102½	102⅝	102½
Island Creek Coal Pref	86	85	85		
Lehigh Valley Coal Sales	240	204	204		
Pittsburgh Coal	22⅜	20⅞	21⅛	24⅛	20⅞
Pittsburgh Coal Pref	91⅜	88¼	89½	95	87
Pond Creek	26	24½	25	28⅛	24½
Reading	165½	159½	160⅜	168⅛	159⅜
Reading 1st Pref	91	90½	90½	91½	90
Reading 2nd Pref	91	91	91	93	91
Virginia Iron, Coal & Coke	52½	50	50	54	50

Bonds	Closing Bid	Asked	Week's Range or Last Sale		Year's Range	
Colo. F. & I. gen. s.f.g 5s	99	Sale	99	99	98	99½
Colo. F. & I. gen. 6s	107⅞		107½	June '12		
Col. Ind. 1st & coll. 5s. gu	84	Sale	84	84⅛	83⅛	85
Cons. Ind. Coal Me. 1s 5s			85	June '11		
Cons. Coal 1st and ref. 5s		94	93	Oct. '12		
Gr. Riv. Coal & C. 1st g 6s	95		102½	Apr. '06		
K. & H. C. & C. 1st s f g 5s			98	Jan. '13	98	98
Pocah. Con. Coll. 1st s f 5s	87½	88¼	87½	Feb. '13	87⅛	87½
St. L. Rky. Mt. & Pac. 1st 5s	76	78	76½		76½	80
Tenn. Coal gen. 5s	102	103	103	Jan. '13	102½	103
Birm. Div. 1st consol. 6s	102⅞	103⅜	102⅞	102½	102⅞	103
Tenn. Div. 1st g 6s	101	103½	101½	Dec. '12		
Cah. C. M. Co. 1st g 6s			110	Jan. '09		
Utah Fuel 1st g 5s						
Victor Fuel 1st s f 5s		79½	79½	79⅞	79½	79½
Va. I. Coal & Coke 1st g 5s	97½	98	97½	97½	96½	98

American Coal—Dividend of 3% payable Mar. 1, to holders of record Feb. 28.

Colorado Fuel & Iron Co.—Dividend on preferred of 35% (on account accumulated dividends) payable Mar. 20, to holders of record Mar. 1.

COAL AGE

Vol. 3 NEW YORK, MARCH 1, 1913 No. 9

ALL the nations that have died have perished through privilege. Never before have men grasped such powerful levers against the snags of special benefit as at present. There is no parallel in history for the deep hatred of injustice that exists in human hearts today.

Recall the golden age of Pericles. Greece leads civilization; Athens is pre-eminent, mistress of the world. In no other nation had the gods raised philosophy, morals and physical courage to such heights. Men said: Does not intellect govern the earth? How can Greek supremacy fail? Other civilizations have faded and gone out, but with such a constellation of genius how can Greek progress falter?

Yet it did. An aristocracy held as private property the soil and all the avenues of production. The community was divided into mutually hating classes—those who possessed special privileges and those who toiled in poverty. The inevitable happened. Greece fell from her exalted independent station in the world, and now, through the perspective of time, we can see how impossible it was for this proud people to continue their glory.

From a similar cause came the downfall of imperial Rome. Of 450,000 citizens, only 2000 possessed anything of real value. Eleven Italians owned the Province of Africa. The French Revolution resulted from a like condition, where only one per cent. of the nation's population constituted the privileged class.

The lesson is plain: We people of the United States have become a world power. Individuals here have built up greater fortunes than were ever dreamed of in ages past. A privileged class has come with our rapid development. And, in opposition to these more fortunate citizens, we have our discontented masses who live in semi-poverty. In many places, industrial slavery exists; class hates class; discord and bitterness prevail.

Many employers today are of the newer school. They have seen the handwriting on the wall and want to do what is fair by their men, but the latter have been fooled so often they are suspicious of every move. Humane motives are questioned. Distrust is everywhere evident. Labor has discovered its power and is determined to force a state where we shall associate in a condition of greater equality.

Some employers are pulling for shore. A greater number are sitting tight, drifting they know not where. A few of the more charitable and more intelligent ones, however, are trying to steer the social craft, realizing that the success of their mining operations is dependent on something more than ideal physical conditions and modern mechanical equipment at their properties. They recognize that a satisfied body of workmen—which means regular production—is just as essential as good ventilation or efficient haulage.

Whether we follow the way of Greece and Rome depends on whether special privilege is eliminated by reason or expelled by force. No man need bend his ear to the ground to hear the rumble of the approaching storm. Labor matters in the coal industry, as in most other lines of business, are unsettled. The anthracite field today is a hotbed of strife, notwithstanding the contracts recently signed. Conditions in West Virginia border on civil war.

It is a time to come out in the open and advocate a square deal all around. Half the troubles of our present mine managers are inherited from their arbitrary, all-sufficient predecessors, who invariably placed the corporation before the individual. Too many of us converse in whispers and tremble lest the truth be spoken aloud. What we need is not more education, but rather an injection of humanity mixed with equal parts courage and patriotism.

At no time on this planet has a nation made social gains that have not been lost. However, there has never been a *real* democracy before. We started right by going after the biggest culprits first, but we must not forget the corner grocer who gives short weight, the milk-dealer who sells one-third water, or the labor union that says: "I have no responsibility; a contract only binds the other fellow." An age of real permanent progress cannot come until we sweep clean from top to bottom. Might as well try to make our mines safe by eliminating big disasters only. They draw the bold headlines in the papers, but it's the little falls of roof we do not hear about which make our death toll so great.

A 6000 Horsepower Steam Hoist

By Frank H. Kneeland

SYNOPSIS—A tandem frictional rope steam hoisting engine which hauls the output of 48 collieries up Mahanoy Plane. In the design of this machine no means were neglected to make it as reliable as possible.

The trend of modern steam engineering has been almost universally toward efficiency. It is only in exceptional cases when it is desired to accomplish special results, that the consumption of steam is made a secondary consideration.

The Lesson of Previous Installations

All the previous experience (extending over a period of something like 40 years) of the Reading Ry. Co. operating this plane has gone to prove that the cost of a failure of the plane engine could by no means be measured by the expense of the necessary repairs. In the design of the present machine, therefore, neither time, pains nor expense was spared to make it as reliable as possible.

The engine is designed to hoist an unbalanced load of 190 long tons, up a plane 2500 ft. long with an 18% maximum grade, at a piston speed of 600 ft. per minute. Under test it has already hoisted 161 tons of unbalanced load at a piston speed of 450 ft. per minute, and a rope speed of 2250 ft. per minute, developing an indicated horsepower of 5100. At various other times 190 tons have been hoisted.

Weigh House and Engineer's Room at Top of Mahanoy Plane

Certain uses to which the steam engine has been adapted have required the development of special forms and devices in order to accomplish the desired results wherein the consumption of steam per horsepower-hour is to all intents and purposes a negligible quantity. Perhaps the best example of this is a modern steam fire engine, which must be light, rapid and reliable in action.

Another instance of a machine wherein reliability is of much more importance than great efficiency, is to be found in hoisting engines which handle a large amount of material and are required to operate over long periods of time without shutdown or repairs.

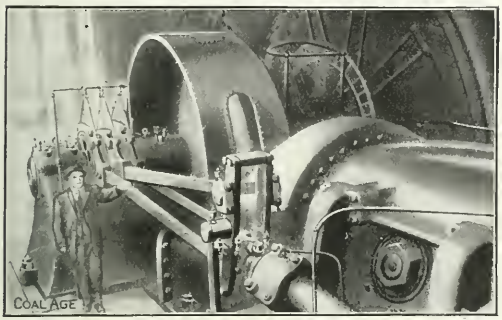
A good example of this latter type of engine is to be found at the Mahanoy Plane, near Pottsville, Penn. An idea of the importance of reliability in this installation may be gained from the fact that the output of 48 collieries located in the Mahanoy and Shamokin valleys is here hoisted to the top of Broad Mountain, from whence it is transported to tidewater by the Philadelphia & Reading Ry. Co.

The engine was designed by John Wood, superintendent of shops and machinery of the Philadelphia & Reading Coal & Iron Co., and built jointly by the Reading Iron Co., Scott Foundry Dept. and the Pottsville Shops of the Philadelphia & Reading Coal & Iron Co. It is of the heavy rolling-mill type with piston slide valves, located on the outside of the engines. These valves are operated by the ordinary Stevenson link reversing motion from eccentrics driven by a return crank from the main crankpin of the engine.

Each of the two simple cylinders is 54 in. in diameter with a 72-in. stroke. The piston rods, which are hollow medium high carbon forged steel, are 11 in. in diameter. These pass through the pistons, forming tail rods

10 in. in diameter, while the hole through the center is 4 in. in diameter. The crosshead or wristpins are 11 in. in diameter and 16¼ in. long, while the crankpins are 16x16 in. with a 6-in. hole through the center. These are of forged steel also.

The hollow medium high carbon forged steel crankshaft is 17 ft. 8 in. long, and is 32 in. square for a distance of 3 ft. 8 in. between the friction rollers. To a square section of this size the driving and idler drums



View in Engine Room. Note Comparative Size of Man

are securely clamped in halves to their respective shafts. The main bearings are 26 in. in diameter and 18 in. long. A hole 11 in. in diameter runs through the entire length of this shaft.

A shaft similar to the crankshaft, except that it is 14 ft. 8½ in. long and carries no crank, is placed 20 ft. 6 in. from the crankshaft. This carries the idler or what might be termed the auxiliary drum.

Inside of each main journal box on each of the main shafts is mounted a friction roller 10 ft. 3 in. in diameter with a 10-in. machine-finished face. This arrangement places a friction roller on each side of both drums.

Midway between the main shafts is located a roller shaft on which is mounted two friction rollers 10 ft. 3 in. in diameter whose faces meet those of the four rollers on the main shafts. This system of rollers can be adjusted to relieve the pressure on the main journals caused by the rope tending to pull the drums together.

The system of hoisting is an endless-rope friction system not dissimilar to the American type of rope transmission. There are two steel built-up rope drums, one of which only is driven by the engine, the other being simply an idler to carry the rope. The rope leads from one track of the plane and makes eight laps around both drums, then to a rendering sheave 17 ft. 2 in. diameter (which is the distance between the center lines of the two plane tracks) and thence down the plane. By this arrangement sufficient rope friction is obtained by eight half laps on the driving drum.

The driving and idler drums are 19 ft. in diameter and 29½ and 33 in. wide respectively. The driving drum is equipped with eight and the idler drum with nine wrought-iron differential rings 18 ft. 4½ in. in internal diameter, each grooved to receive the 2⅝-in. hoisting rope. These rings are not shrunk or fastened to the driving drum, as sufficient friction exists between the eight rings and the driving drum to hoist the load.

The main rope is 2⅝ in. in diameter, made of cast steel and composed of six strands of 19 wires each, upon a wire-rope core. To each end of this large cable is fastened a barney, which travels upon a track of a lesser gage than the railroad cars.

View at Bottom of Plane, Barney Just Taking Hold of Load

View down Plane from Landing

A 1½-in. tail rope passing around a sheave upon a movable carriage connects the two barneys. To this tail sheave carriage is fastened another cable which passes over a back balance, keeping the rope tight at all times.

Upon reaching the bottom of the plane, the barney passes into a pit under the track, where the above mentioned movable carriage is located. The loaded cars are then run by gravity to a point in advance of this barney pit. The engine is started slowly and the barney comes in contact with and pushes against the rear bumper of the rear car, forcing the entire trip up the plane.

The hoist house is located at the head of the plane in such a position that the operator can at all times see the entire length of the incline and, therefore, has a view of the car landing. No brake is provided upon the engine,

and the only levers which the operator is required to handle are the throttle and reverse, which with a distance of 15 ft. between the usual stopping place and the head sheave provides ample means for stopping the hoist. Each cylinder of the engine is provided with a throttle 13½ in. in diameter, both being controlled by the single hand lever. The reverse is operated by a 12-in., horizontal auxiliary, steam cylinder, in conjunction with an 11-in. cataract or oil cylinder, both having an 18-in. stroke. Proper lubrication of all bearings is obtained by a continuous gravity oiling and filtering system.

The Steam Plant

The steam plant consists of eight Stirling boilers, with an aggregate capacity of 2060 rated horsepower. These are fired by improved Cox automatic stokers, the improvement consisting in driving the chain grate from the rear sprocket, thus keeping the upper part of the chain always tight. A loop system of steam piping is employed, the pipe being 12 in. and 16 in. in diameter. They discharge into a steam drum 34 in. in diameter, and about 40 ft. long, which supplies the engine with steam through suitable piping. This steam drum furnishes a storage space, and reduces the pulsation of steam in the pipe connected with the boilers to a considerable extent, thus avoiding a fruitful source of priming. As an additional safeguard against the possibility of a water slug, each engine cylinder is provided with 6-in. water relief valves.

The boiler stokers above referred to burn rice coal, with an air pressure of approximately one-inch water gage, which is furnished by a suitable blast fan. Steam pressure is carried at 125 lb. The ashes are disposed of by means of a scraper line, which conveys them to a point outside of the boiler house, where they are elevated to a bin and then deposited in railroad cars for disposal.

Weight frequently expresses more than lineal dimensions. An idea of the massiveness and solidity of this hoist may be gained from the fact that the weight of the engines and drums as a whole is 500 tons, while that of the main shaft with its drum alone is approximately 90 tons.

As was stated above, the output of 48 collieries passes over this plane. This means a daily average of about 1100 cars in 12 hours. During the month of January, in 25 working days, or a total of 304 hours, 19,874 cars were hoisted.

The Electric Mining Lamp

Special Correspondence

The official statistics of the Prussian government show that 308 out of 341 explosions occurring between 1901 and 1911 in Prussian mines were due directly to the use or rather the abuse of the so called miners' safety lamps. It is needless to say that the Prussian government is particularly strict in its regulation of mining lamps, and in prescribing the precautions to be observed in their installation, maintenance and handling.

The lamps mostly in use—burning benzine or naphtha—can only be called safety lamps when in the hands of old, experienced miners, who are aware of their dangers and consequently know how to handle them with the necessary care. They cannot be regarded as furnishing any absolute immunity from an explosion. They have the advantage that they warn the miner of the presence of gas and put him on his guard if he is intelligent enough to recognize the warning and careful enough to heed it when it is given.

The use of the safety lamp has been approved up to the present time, not so much because it justified its title but because it was the best lamp available. About 10 years ago, efforts were made to introduce electric mining lamps with small accumulators, but the cell rapidly deteriorated and the lamps were heavy and clumsily made. Recent lamps have overcome these difficulties, and the new electric lamps radiate a stronger and brighter light than the old benzine or naphtha lamps.

Among these the Ceag lamp deserves mention. It is made by the C. E. A. G. Co., of Dortmund, Germany, and the American rights are held by the Mannesmann Light Co. of America, with offices at 55 John St., New York City. In an international competition given by the British department of internal affairs known as the Home Office, this lamp was awarded first prize. It is the lamp exclusively used in the most dangerous mining sections in Hamm, Westphalia and also in the mines of England, France and Belgium.

The oil and benzine lamp is the right type of light to entrust to firebosses and foremen. It would be well to give it also to rib bosses but to hand it to every man, regardless of his experience is to put fellow workers of such men in unnecessary jeopardy.

A Successful Scraper Line

The accompanying illustration shows 1500 ft. of Rivetless chain at the washery of the Susquehanna Coal Co., Nanticoke, Penn., which has been conveying from 1600 to 1700 tons of wet culm and coal per day for the past five months without any delay from breakdowns.

The Scraper Line As It Appears in Operation

This conveyor consists of a double line of 9 in. pitch chain of the type known as double outside pin drive. It passes over idlers at the loading point and is propelled by sprockets at the head of the incline. It is driven by the 150-hp. motor, which also operates the washery.

This line displaced one of almost identical capacity, but which had an annoying faculty for breaking down, thus causing delays averaging about 10 per cent. of the time. As stated above, no annoyance from this cause has thus far been experienced since its installation several months ago.

A New Electrically Driven Hoist

EDITORIAL CORRESPONDENCE

SYNOPSIS—A hoist with two 10-ft. drums driven through cut steel herringbone gears by a 700-hp. alternating-current motor. Several other features are embodied in the construction of this machine that are not found in the ordinary hoist.

The concentration of power in central stations in various mining districts and its distribution by means of high voltage alternating currents has rendered it advantageous to operate hoists from these lines without making use of a rotary converter or motor-generator set. Hoists thus operated are, however, exceptional, although the advantages attendant upon their use are immediately manifest.

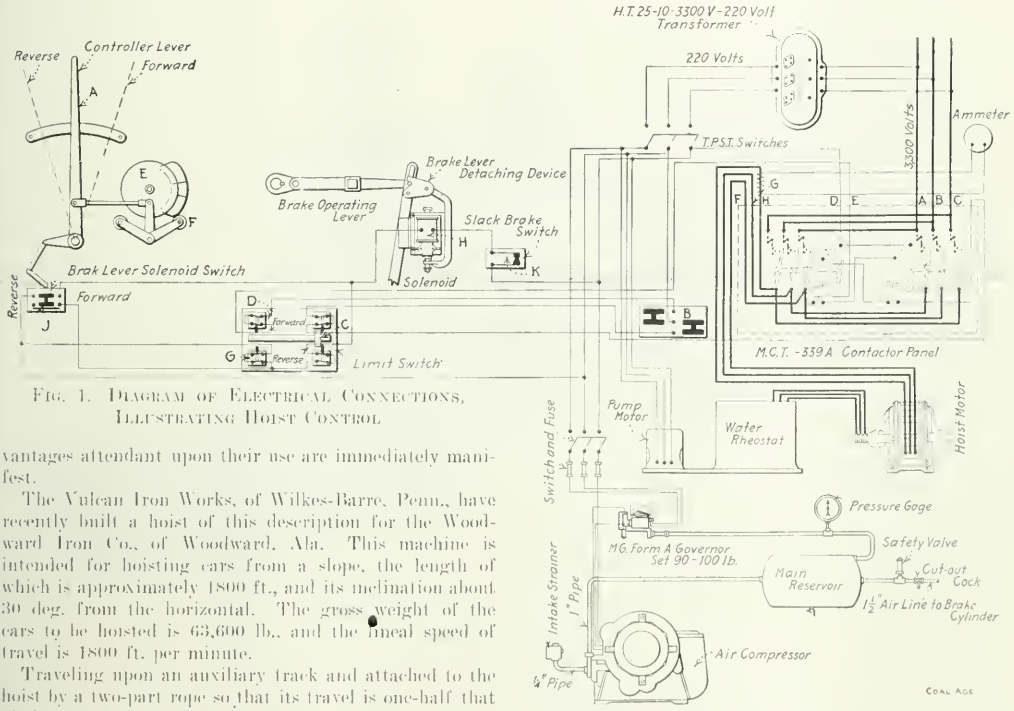


FIG. 1. DIAGRAM OF ELECTRICAL CONNECTIONS, ILLUSTRATING HOIST CONTROL

The Vulcan Iron Works, of Wilkes-Barre, Penn., have recently built a hoist of this description for the Woodward Iron Co., of Woodward, Ala. This machine is intended for hoisting cars from a slope, the length of which is approximately 1800 ft., and its inclination about 30 deg. from the horizontal. The gross weight of the cars to be hoisted is 63,600 lb., and the lineal speed of travel is 1800 ft. per minute.

Traveling upon an auxiliary track and attached to the hoist by a two-part rope so that its travel is one-half that of the cars is a counterbalance weighing 15,000 lb. The hoist is provided with two drums each 10 ft. in diameter, which are grooved to coil 1800 ft. of 1½-in. wire rope in two layers. The motor has a full load speed of 290 r.p.m., and the power is transmitted to the drum shaft by means of single reduction cast-steel machine-cut gears of the herringbone type.

THE MOTOR AND ITS CONTROL

The hoist is driven by a General Electric variable-speed, polar-wound rotor, 700 hp., 10-pole, 3300-volt, three-phase, 25-cycle induction motor, which is connected to the countershaft of the hoist by means of a flexible coupling of the flange and rubber-buffer variety.

The speed of the motor is varied and controlled by cutting resistance into and out of the rotor circuit. This is done by means of a liquid rheostat of the rising and falling weir type. The rate at which the water level may be raised, and, therefore, the rate of acceleration of the motor, can be made independent of the weir, so that automatic acceleration can be obtained, while the lowering of the weir for the retarding of the motor can be done quite rapidly. Each drum is equipped with an extra heavy band brake, one being operated by hand and the other by means of a weighted air cylinder. The weighted brake is of the floating lever type, which permits of the band being only partially applied or set up tight as may be desired. It is possible, therefore, to regulate the pressure on the band, allowing the drum to revolve as slowly as may be wished.

Operating in conjunction with this drum brake, there is a smaller brake on the counter shaft, and both are applied simultaneously. This removes all undue shock or stress due to the inertia of the rapidly moving parts in case the emergency is suddenly thrown on. There is, therefore, no danger of stripping or other injury to the gears from this contingency.

GUARDING AGAINST ACCIDENTS AND OVERWINDS

The means employed to guard against accidents and overwinds upon this hoist are unique and well worthy of attention. That they may be better understood, reference should be made to Fig. 1. We will suppose that the ma-

chine is at rest preparatory to a hoist. The controller lever *A* is moved to its forward position, thus through a shaft closing the circuit in the master switch *B*, which starts the hoist. A further movement reduces the resistance in the liquid rheostat causing the hoist to accelerate in motion.

The traveling nut *C* on the limit switch has a movement corresponding to that of the load being hoisted. Near the landing point, this nut forces apart the contacts *D*, which are connected to contactors and opens them. Simultaneously the cam *E*, which is geared to the drum, has returned the controller lever *A* to its central or off position.

The hoist is now running from momentum, but at an adjustable, predetermined point the nut *C* opens up the switch *G*. This breaks the circuit to the solenoid *H*, allowing its core to fall and disconnect the brake-operating lever from the engineer's lever. This allows the weighted valve in the cylinder controlling the brake to shut off the air supply and exhaust that which is already in the cylinder, thus allowing the weighted brake to come into action bringing the hoist to rest.

Of course, under ordinary circumstances, the operator would have shut off the current and applied the brake through the medium of the air cylinder by hand and none of the emergency devices described as operating above would have come into play. The solenoid is provided solely for case of accident or overwind.

How the Engineer Regains Control of Machine

If an overwind has occurred and the switches *D* and *G* are both open, to again gain control of his machine, the operator moves a lever (which is the air-brake lever and is not shown), to the on position, then throws the controller lever *A* to the first contact in the reverse direction. This closes the main contactors through the controller switch *B*.

At the same time this has short-circuited the limit switch *G* through the switch *J*, thus reënergizing the solenoid *H* and raising its core again giving the engineer control of the brake which may now be released. In case the overwind is with a loaded cage, the machine would now start to reverse; if with an empty cage, the motor would be slightly energized and would sustain the load.

When the brake wears sufficiently to alloy the brake weight to settle to the limit of its travel, the slack brake switch *K* will be opened and the brake cannot be released until the necessary tightening adjustments are made.

As soon as the hoist starts in motion after an overwind, or other accident calling the emergency apparatus into action, the contacts on the limit switch are automatically reset by the nut *C* during its return movement.

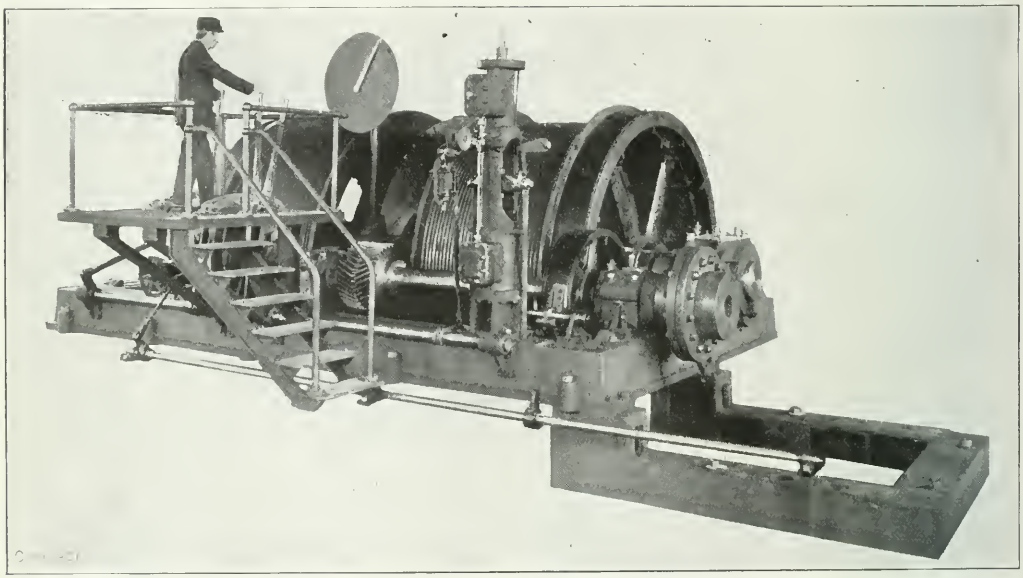


Fig. 2. The Hoist, Showing Bedplate for Motor in Place. Part of Gear Cover Removed, Showing Herringbone Pinion

Any hoist driven by an alternating-current motor cannot ordinarily be made to run too fast, even when lowering a load. The motor then tends to generate current into the line, at the same time it tends to keep in step electrically with the generators from which it draws its supply. This hoist cannot be run in either direction without current on the motor.

As stated above, the line circuit to this machine is 3300 volts. The control circuit is of 220 volts, both are 25 cycle. Air for operating the brake is provided by a General Electric 24½-cu.ft. electric driven auxiliary air compressor, while the resistance employed is a General Electric liquid rheostat.

Number and Position of Control Levers

There are in all three levers employed for the control of this machine. These are all located in a convenient quadrant on the operator's platform, which is elevated at

such a height that he may easily see over the top of the hoisting drums.

The bedplates and pedestals on this machine are both heavy in design and free from sharp angles and projections. The base for the motor is securely bolted to that of the hoist, and the whole may be set up as one unit.

Whatever other impressions may be received by the

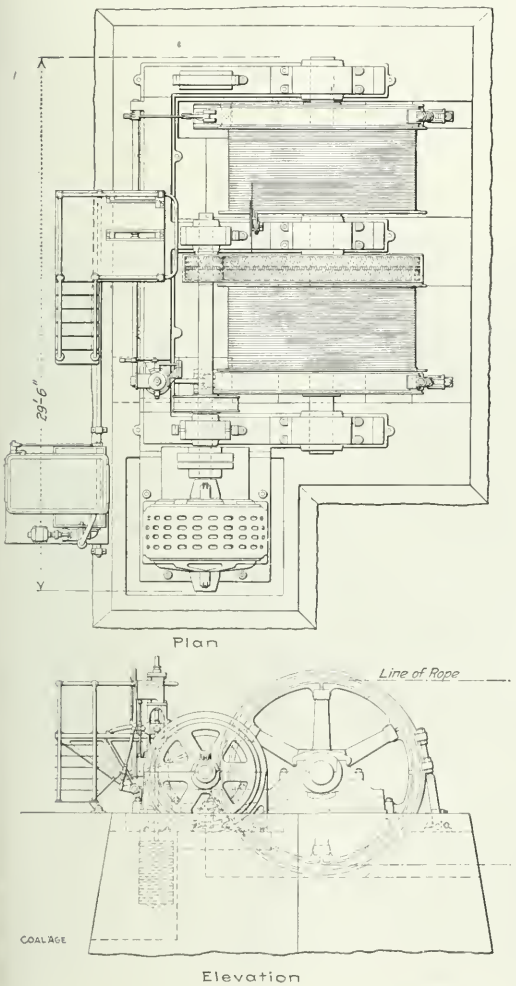


Fig. 3. Plan and Elevation of Hoist and Motor

man who sees this hoist, the idea that will first force itself upon his mind, and probably remain with him the longest, is that the machine was designed and built "for business."

The massiveness and solidity in the design, together with the obvious care and attention that have been given, even to what might be considered unimportant details, give this machine the appearance of one which should stand up indefinitely under any operating conditions to which such a hoist might legitimately be subjected.

Karl F. Schoew

A circular letter, dated Feb. 20, 1913, announces the candidacy of Karl F. Schoew, for the position of chief of the Department of Mines, in West Virginia. The present incumbent of the office, John Laing, has served the state during the past four years. Mr. Laing's term of office expires June 30, 1913. It has been known for some time by Mr. Laing's intimate friends that he does not desire and would not accept an appointment to the office for another term. During his incumbency, Mr. Laing has brought the Department to a high state of efficiency, in which work he has had the unqualified and earnest support of the twelve district mine inspectors, who constitute the present efficient mine-inspection force of West Virginia.

Karl F. Schoew, at present mine inspector for the 1st district, having served the state in that capacity for a term of four years, now desires to succeed his chief. Mr. Schoew has had a practical mining experience of 23 years, 15 of which have been devoted to mining engineering. His work during the past four years, as district mine inspector, has been performed with credit to himself and the department, and has earned for him the unqualified indorsement of all the operators in his district.

As every inspector knows, the work of mine inspection requires more than a thorough mining knowledge and experience on the part of the inspector; he must possess good judgment and tact in dealing with the numberless complicated questions that arise constantly and which are submitted to the mine inspector for his decision. The fact that harmony has prevailed in the first district speaks well for the ability of Mr. Schoew in this respect.

Mr. Schoew reports that during his term of office not a man has been burned or killed by a gas or coal explosion through carelessness. Mr. Schoew makes this statement more in a spirit of thankfulness, realizing that much of the credit for this must be ascribed to good fortune rather than that it should be regarded as the result wholly of good management and efficiency on his part.

Mr. Schoew has the success of the mining industry at heart, and thoroughly indorses the policy followed by Mr. Laing during his term of office. He believes that this policy of educating the miner, which has been followed throughout the state and which has received the hearty indorsement of both inspectors and operators, has reduced the loss of life and increased the value of mining property and contributed more to the success of the industry in the state than any other factor. It is Mr. Schoew's hope that the harmony and prosperity that has existed in the 1st district and, largely, elsewhere in the state can be further advanced by the promotion of good will and a proper use of diplomacy in the treatment of all questions that arise.

During Mr. Schoew's residence in West Virginia, he has lived both in the northern and southern portions of the state, which fact makes him thoroughly familiar with mining conditions in both these fields. If Mr. Schoew is successful in securing the appointment as chief of the Department of Mines in West Virgima, he will receive the hearty coöperation of Coal Age, in every effort to promote education and raise the standard of mining, which is our constant aim and purpose in respect to every mining state and district.

A Large Capacity Electric Hoist

By W. H. Easton*

SYNOPSIS—The difficulties incident to the application of electricity for hoisting purposes are too well known to require comment here. These seem to have been successfully overcome, in the case of the Coalwood hoist, where it is proposed to handle 5000 tons per day of 8 hr. from a depth of 650 ft. Reserve power for overcoming the excessive initial starting load is provided for by means of a flywheel, and perfect control is assured throughout the hoist.

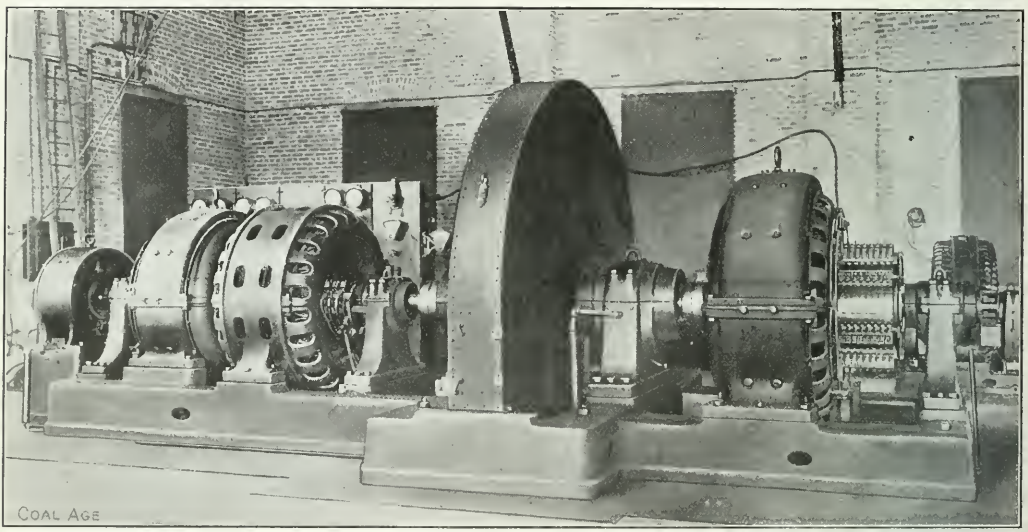
The interesting announcement has just been made that the Virginia-Pocahontas Coal Co. has ordered from the Ottumwa Iron Works and the Westinghouse Electric & Mfg. Co. what will be one of the largest, if not the largest, coal-mine hoists in this country for their new mine at Coalwood, W. Va. This hoist will raise 5000 tons of coal in 8 hr., from a depth of 650 ft. The hoist motor will exert a maximum horsepower of 2200 during each normal hoist.

Those familiar with small electric hoists will ask at once: How can so large a machine be controlled with the necessary ease and certainty? Will there not be a tremendous waste of energy in resistance when the motor is started at slow speed? How can the generating and transmission lines stand the heavy peaks, drawn from the line in starting?

For a hoist of this capacity, patterned after the ordinary installation, in which the hoist motor receives its power directly from the transmission line and is controlled through resistance, the points raised by these questions might prove serious obstacles. But they present none for the Coalwood installation, as it is controlled, by means of a small lever, with perfect ease and complete accuracy. The loss of energy at low speeds is small; in spite of the fact that the hoist will develop 2200 hp. on starting, at no time can more than 700 hp. be drawn from the main transmission lines. These results are unusual and the principles by which they are obtained are worthy of particular note.

Description of the Coalwood Hoist

The Coalwood hoist will be operated by the Westinghouse Flywheel Equalizer System. In this system the current from the transmission line is not received directly by the hoist motor, but by a flywheel motor-generator set, consisting of an alternating-current motor, a direct-current generator, and a heavy flywheel, all mounted on the same shaft. The hoist motor is a direct-current machine and receives its energy from the generator of the flywheel set. The illustrations herewith show the motor-generator set and the hoists of the Cleveland Cliffs Iron Co., which operate on the same principle and constitute what is at present the largest electric hoist of this type in operation in America.



Westinghouse Motor-generator Set, with 25,000-lb. Flywheel, for Cleveland-Cliffs Hoist

The alternating-current motor, of course, drives the direct-current generator and flywheel by the energy it receives from the line. It is so arranged that, whenever there is a demand for power in excess of the average, it will *slow down* automatically, thereby permitting the flywheel to aid in driving the generator. When the heavy demand for power ceases, the motor speeds up automatically, and in doing so restores the expended energy to the flywheel. So nicely are the conditions balanced that when hoisting steadily at the rate of 5000 tons a day, with peaks of 2200 hp. at each hoist, there is not more than 700 hp. drawn from the supply line.

*Pittsburgh, Penn.

The hoist motor is controlled by adjusting the voltage of the generator by means of a field rheostat. This rheostat is small and light and wastes but little current, but by moving its lever, the hoist motor can be run at any speed from zero to maximum in either direction. Acceleration and retardation limits are provided, which, together with the ease of control, reduce the possibility of accident to the minimum, and probably below anything that has been accomplished with steam hoists.

Method of Maintaining Reserve Power

This motor is of the slip-ring type and the three phases are connected to three stationary plates, in earthenware pots filled with a solution of carbonate of soda. Above these plates are movable electrodes, connected together electrically; these electrodes are nearly balanced by an adjustable counterweight and can be raised and lowered by a small motor. This latter receives its current from series transformers in the main line to the main alternating-current motor.

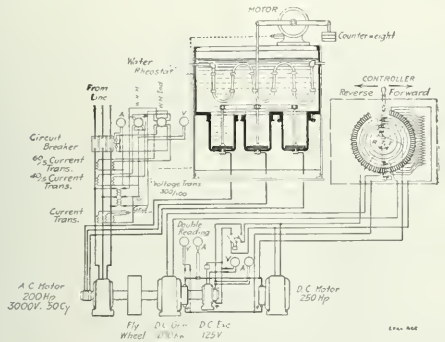


Diagram of Westinghouse Flywheel Equalizer Hoisting System

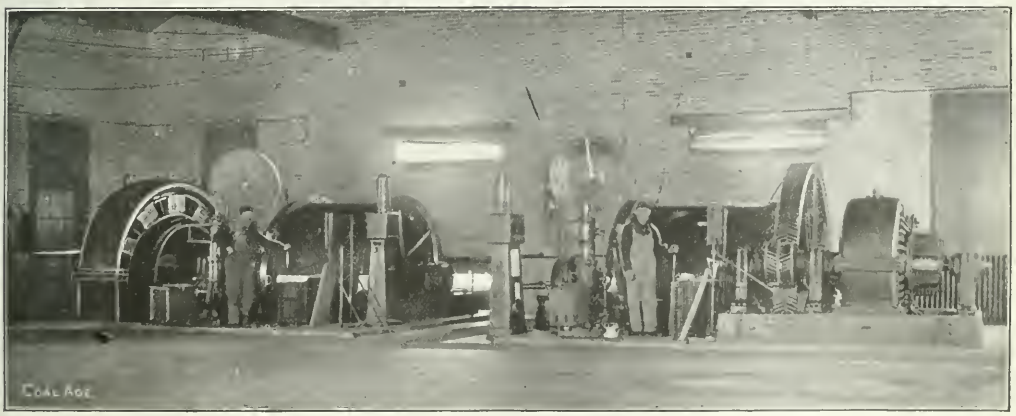
When, on account of an excessive demand for power by the hoist motor, the main alternating-current motor receives more current than that for which the system is adjusted, the current in the small motor also increases, and the movable plates are raised, thus introducing resistance into the rotor circuit of the main motor, reducing its speed and bringing the flywheel into action. When the current to the main motor falls below the adjusted value, the movable electrodes fall, thereby permitting the speed of the flywheel set to increase to normal.

This system has been used in a number of installations and has proved eminently satisfactory. It overcomes many difficulties which would be unsurmountable with steam hoists or with direct-driven electric hoists and enables the mine operator to use hoists of practically unlimited size with a high degree of economy and perfect ease of control.

In the Cleveland Cliffs installation the main hoist motor has a maximum capacity of 1000 hp. It can raise a net load of 10,000 lb. from a depth of 1000 ft. at the rate of 1500 ft. a minute, and can make 40 trips an hour. When the hoist is working steadily at this rate, the alternating-current motor of the flywheel motor-generator set draws not over 365 hp. from the line and its variation in speed is about 15 per cent.

Generator Ratings

Standard ratings of Westinghouse alternating-current turbo-generators are based on two different methods of determining capacity. First, a rating with guarantees covering performance at normal loads and at certain overloads, momentary peak loads being within the guaranteed overload capacity. Second, a rating at the maximum safe operating capacity of the machine, with no guaranteed overload capacity.



Main Cleveland Cliffs Hoist of 1000 hp. and Auxiliary of 400 hp. on the Right

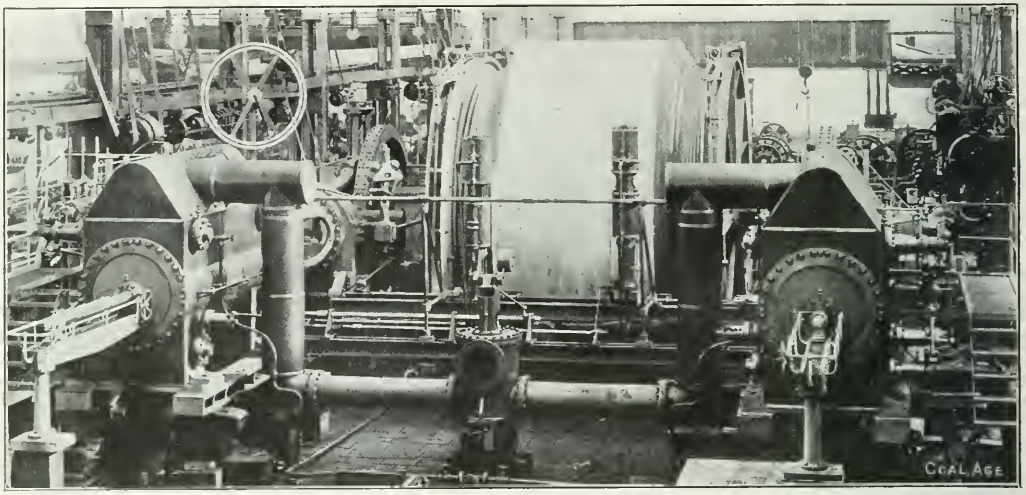
The maximum rating basis is proving to be a highly desirable one, the tendency being to install units of such capacity that as the load on the station varies, additional machines can be cut in or out, and the remaining units operated continuously at or near their maximum rating and efficiency.

It is the simplest to use in making or comparing guarantees, as well as the most satisfactory, from the central-station operator's standpoint, when once it is thoroughly understood.

A Hoisting and Haulage Plant in India

SYNOPSIS—Description of both a hoisting and haulage plant of large capacity. The hoisting engine is designed for a depth of 3700 ft. and has 42-in. cylinders and a stroke of 7 ft. It is equipped with a Gott overwinding device, which has proved particularly effective.

The question of overwind prevention is now receiving considerable attention, and the particulars of a plant constructed for mines in India will be of interest. The information has been specially secured for this journal, and relates to a 5500-hp. corliss winding engine and a 100-h.p. electric haulage gear, the former being constructed for use at a gold mine and the latter for a coal operation.



THE 5500-HP. CORLISS HOIST SET UP IN THE SHOPS FOR TESTING

The corliss winding engine is one of two, both constructed exactly alike as regards size and design, to wind from the same vertical shaft, which has a depth of 3700 ft. The total weight of the engine is 275 tons; it occupies a space of 20 sq.yd., and the speed of winding is 3000 ft. per min., using superheated steam at 120 lb. pressure per square inch. The unbalanced load is 15.5 tons. The cylinders are 42 in. in diameter, with a 7-ft. stroke, and the valve gear is of the improved corliss type, placed on the outer side of the engine.

The valve spindles have spherical metallic packings, the end pressure of the valves being balanced by springs, while the eccentric shafts for operating the valve gear are connected to the crank pins by drag links. Possessing separate liners the cylinders are steam jacketed, each body being cast separately from the two end pieces which carry the valve chambers. The pistons are fitted with metallic packing rings, the outward pressure of which is adjustable, and the piston rods have a diameter of 8 in., being fitted with United States metallic packing. The crossheads are of steel with cast-iron adjustable slippers, the method of attaching the piston rods to the crossheads constituting a special feature. Each rod passes through a steel plate, and heavy nuts on the rod—one on either side of the plate—secure it in position. The plate is bolted to the crosshead by four bolts, a method which retains the advantage of being able to adjust the distance between the centers of the piston and crosshead with ease, when connecting or disconnecting the crosshead from the piston rod.

The guides are of circular form, 41 in. diameter; the beds are of massive design, of what is known as the "Mammoth" type; the drum-shaft bearings, which are cast with the beds, have the steps lined with special metal and are 21 in. in diameter and 33 in. long; the connecting rods have screw and wedge adjustment at both ends; the drum shaft is 25 in. in diameter, having an overall length of 27 ft., and disk brakes are provided, operated from the driver's platform by foot, handwheel and screw.

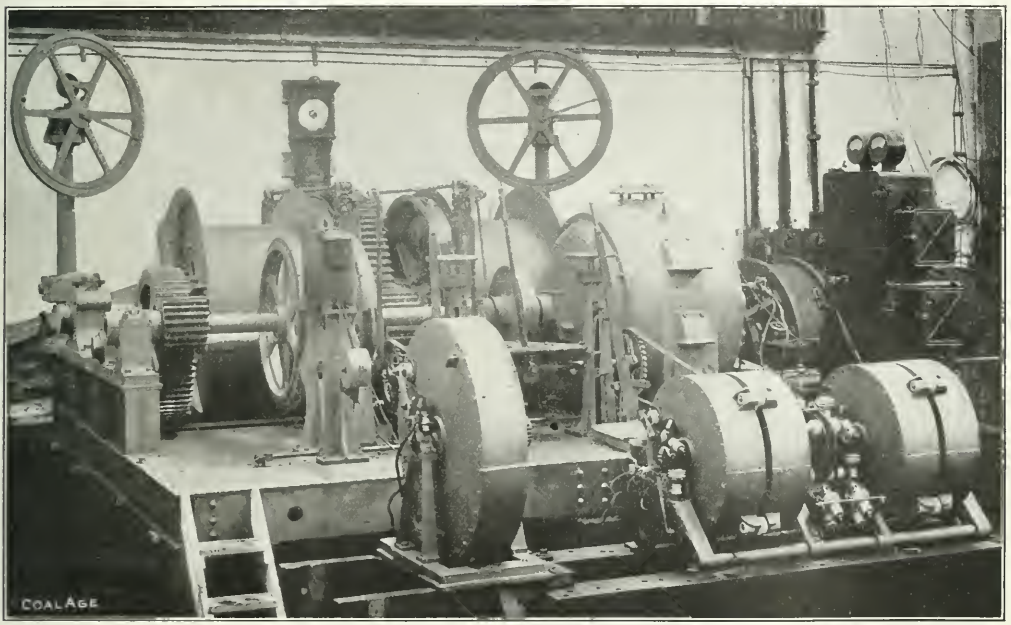
A special feature in the design of the crank disks is that they are each made in two pieces. These disks are 9 ft. 2 in. in diameter, with center hub separate and having a flange cast on one end of it. The disk itself is bored to fit the hub to which it is keyed, and is also bolted to the flange, which makes it very secure and reduces the weight and overall dimensions of the drum shaft for transport. The drum is of the cylindro-conical type, of cast iron, built in sections, the conical part grooved for 1¾-in. diameter rope, the cylindrical part—which is 20 ft. in diameter and 8 ft. 9 in. wide—being plain. Two small internal drums, fitted inside the main drum, carry spare rope, which can be played out as required.

Two main brakes of the suspended curved post type, have power applied to both ends of the posts. They are operated by a steam-brake engine, the brakes being put on by means of a weight and held off by steam, which can

also be put on the top side of the brake-engine piston, if extra pressure is required. The brakes are adjusted automatically as the blocks wear. Reversing the engine is done by means of a steam reversing gear, having an oil locking and controlling cylinders. The main steam valve is 18½ in. in diameter and of the single-beat type, the valve being balanced by a steam piston which makes it easy to operate. On the left-hand side of the engine is placed the driver's platform, with all the operating levers.

The governor is of the spring-loaded, high-speed type, and is very powerful. During acceleration, the engine takes steam up to about seven-eighths of the stroke, but when nearing full speed the governor begins to open, operates the cutoff gear and controlls the speed of the engine. Special attention is given to the lubrication and all steam cylinders and cylinder jackets are drained by means of steam traps.

The engine is fitted with Gott's controlling gear for preventing overspeed, overwind or starting in the wrong direction. In case of overspeed, in any part of the wind, the gear automatically shuts off steam and applies the brakes. It also operates in the same way if, on nearing the surface, the driver has not reduced speed sufficient to land the cage safely, or if the driver starts his wind in the wrong direction; that is, if he is taking the cage into the headgear instead of down the shaft, the brakes are automatically applied and the steam is shut off as before.



Detailed View of the 100-b.hp., Electrically Driven Haulage Gear

Electric Hauling Gear

Coming now to the description of the 100-b.hp., electrically driven, double-drum hauling gear, for the Indian coal mine, the conditions of service are to bring a full set of loaded tubs a distance of 4000 ft. without the help of a descending set of empty tubs (although normally the tubs will run in balance) at an average speed of six miles per hour. The incline is 1 in 5½, with steeper sections up to 1 in 3. One trip comprises 12 tubs, each weighing 6 cwt. and carrying 12 cwt. of coal; occasionally some of the tubs may be loaded with 20 cwt. of rock.

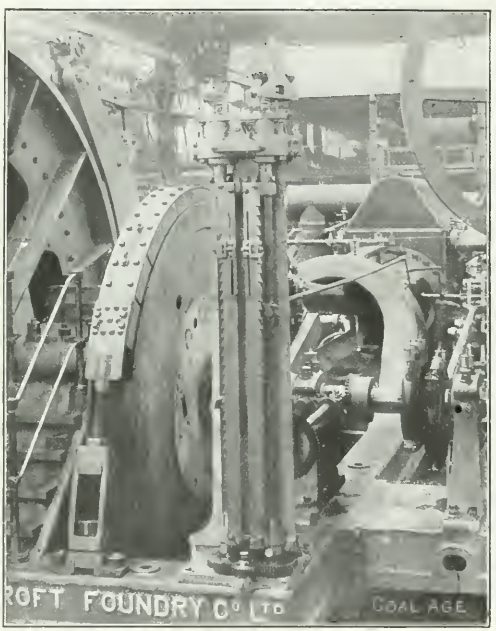
The drums are 4 ft. in diameter by 2 ft. 9 in. wide, each capable of holding 4500 ft. of ⅞-in. rope. The drum centers are of cast steel bushed with gunmetal, the sides being of mild-steel plates in halves bolted to the drum centers and stiffened by steel channels. Lagging for taking the rope is of cast iron in halves, strongly ribbed and bolted to the drum sides by 1⅛-in. bolts, half of which pass right through the drum from one side to the other.

The brake rings are of cast iron, in halves, bolted to the drum sides, the clutches being of the cast-steel jaw type, the moving portion sliding on the hexagons formed on the drum shaft, operated by hand levers on the driver's platform; the drum shaft itself is of Siemens Martin steel, 9 in. in diameter, the outer bearings being 7 in. in diameter by 12 in. long. The countershaft is 5¼ in. in diameter. Each drum is provided with a strong brake of the post type, capable of holding the full load. Each brake can be operated independently by foot levers or by a handwheel and screw on the driver's platform, the latter being an extension of the bedframe and covered with chequered plate. This bedframe is built of mild-steel channels, having machined facings for the bearings and joggles to prevent lateral movement of the same, the side frames being of sufficient

height to raise the drums and gearing above the bottom of the bedframe.

Gearing is double reduction, motor speed 360 r.p.m. and drum speed 40 r.p.m. While the pinion on the motor shaft is of compressed paper, the other pinion and wheels are of cast steel having straight machine cut teeth. On to the extension of the motor shaft a brake operated by hand is fitted, and can be used in case of necessity. A magnetic brake is also fitted on the same shaft, and is automatically lifted off when the current is switched on to the motor, being again applied when the current is interrupted. The position of the tubs on the haulage road is given by a dial-type indicator for each drum.

The engine is driven by a Sandycroft-Hunt Cascade induction motor of the two-speed, pipe ventilated type, the machine being capable of giving a continuous output of



Gott Overwind Prevention Gear in Position

100 b.hp. when running at a speed of 360 r.p.m., or 65 b.hp. at 240 r.p.m. Efficiency at the higher speed is 90 per cent., at the second speed 88 per cent.

The motor, which is controlled by two liquid switches of the Sandycroft patent inclosed type, is wound for a three-phase circuit of 2000 volts, 25 cycles. As the motor has to work in a hot, saturated return mine air, the insulation of the machine has been specially impregnated, and it is capable of giving the output stated continuously, the temperature rise not exceeding 60° F. Further, it can give at either speed an overload of 25 per cent. for two hours immediately following the full-load current—the temperature rise not exceeding 80 deg. F.

The lever mounted on the driver's platform operates the reversing switch by means of a side motion, and when moved backwards it operates a four-phase liquid switch, which is connected to the secondary stator tappings. If it is desired to increase the speed of the winder to its maximum the second lever is brought into operation. This lever operates, by means of a chain, the liquid switch in the rotor circuit, and is connected to the three slip rings.

The magnetic brake is provided in addition to the hand brakes and this comes into operation on the opening of the static circuit or the failure of the supply, or by means of an emergency button in series with a no-volt release. Referring to the photograph, it will be seen that the switch gear is entirely protected by means of a wrought-iron case, containing a double-pole isolating switch.

The Armies of Peace

By Berton Braley

Written expressly for "Coal Age"

No band precedes them on parade, no uniform they wear,
But armed with shovel, fuse and pick the underworld they dare.
They war against the inky dark, the overhanging shale
And all the perils that may mark a miner's burrowed trail.
Each day they seek the pit again to make the seam pay toll,
The armies that go underground to give the world its coal.

They face the ever-lurking damp, that strikes when all seems well
And turns the many workings to a fierce and flaming hell.
They take their chance with cheerful mien in dust and wet and mirk,
They are not heroes to themselves—just workmen at their work.
And so they go about their task—to shoot and cut and hole,
The armies that go underground to give the world its coal.

They mine the gleaming anthracite to meet the need of men
(Forests of ancient ages which are brought to light again).
They mine the soft bituminous, a million boilers burn,
Which keeps the wheels of industry forever on the turn.
Of all the life we live today they are the very soul,
The armies that go underground to give the world its coal.

Our trains that thunder over land, on rails of shining steel;
Our ships that travel over seas, on swift and steady keel.
The fire that warms our houses and the light that keeps them bright
Are spoils of all the battles that these peaceful soldiers light.
So let the trump of triumph sound, they stand on honor's roll,
These armies that go underground to give the world its coal.

A Gasoline Hoist at a Coal Mine

SYNOPSIS—It is ordinarily taken for granted that steam and electricity are the only forms of power that it is advisable to use for stationary work at coal mines. This article describes one of the exceptions to this rule, gasoline being so far ahead of these other sources of power supply that there was no hesitancy in its adoption.

Although small hoists operated by internal-combustion engines have been in use for a number of years at some of the Western metal mines, an installation of this character in the center of a coal-mining region is decidedly an innovation. The Lehigh Valley Coal Co. has recently installed such a hoist at its Blackwood Colliery, near Pottsville, Penn., the machine being designed and built by the Vulcan Iron Works, of Wilkes-Barre.

THE HOIST HOUSE, LOCATED IN A LONELY PLACE IN THE WOODS

The above named coal company was desirous of sinking a proving hole at a point which was a considerable distance away from their power house or any source of electrical supply. A careful investigation was, therefore, made of the cost of hoists embodying each of the three sources of power, namely, steam, electricity and gasoline. This comparison was so far in favor of the gasoline hoist when used in this isolated position, that there was no hesitancy in making its adoption.

The machine was designed for the following service: Single-car trips are handled on a slope approximately 500 ft. long at an inclination of 40 deg. from the horizontal. The gross weight of car and coal is 4000 lb., and the cars are handled at a rope speed of 200 ft. per minute.

Aside from the motive power, the hoist is not materially different from those designed to be operated by electric motors. As will be seen from the photograph, the machine is self-contained, and may be readily transported from place to place. The drum is loose on the shaft, is driven by a band friction clutch, and controlled by the usual type of brake, operated by hand.

The driving engine is of the four-cylinder type, with a rated capacity of 25 hp., having cylinders 5 in. in diameter, with a stroke of 6 in. It is equipped with a speed-regulating governor, magneto, battery, intake and overflow water pipes, water circulating pump and intake and exhaust manifolds.

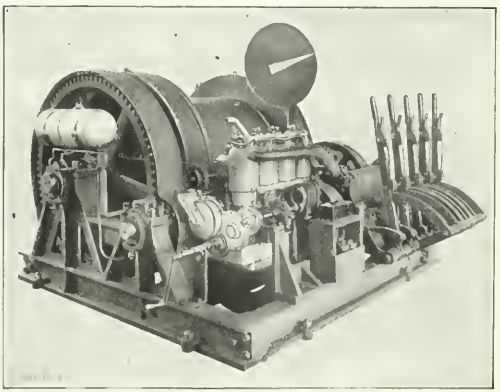
Owing to the conditions under which this machine operates, it is, of course, necessary to change the direction of rotation of the drum, and reversing gears are, therefore, provided for this purpose.

Although the cost of operation of a hoist of this type may be somewhat higher than that of an electrically driven machine of equal capacity the ease and cheapness with which it may be transported and set up more than offsets this when employed in an isolated position.

There is also the advantage that the fuel is easily transported and the danger from fire is probably less than with a steam operated hoist, all of the gasoline except what is in the tank on the machine being stored at some point outside of the hoist house, preferably in an underground vault or tank.

One of the principal difficulties experienced with hoists of this type which have been built heretofore has been that the torque was low in starting. In this particular machine, however, the capacity of the engine is sufficiently great to equal this condition.

This machine has been in operation for some time, and has, thus far, given entire satisfaction. It has, of course, its peculiarities with which the operator must become familiar, and which require decidedly different treatment from either a steam engine or an electric motor.



GASOLINE HOIST, SHOWING ENGINE, FUEL TANK, CONTROL LEVERS, ETC.

For instance, as the cylinders are water-jacketed, it is necessary to carefully drain this part of the apparatus and remove all water therefrom before leaving the hoist at night in cold weather; otherwise, the jacket would be liable to freeze and ruin the engine. This, of course, is one of the details of successful operation, but one which, nevertheless, is different from that of the ordinary motive power usually employed, and which, in winter at least, must not be neglected.

The internal-combustion engine is no longer either an experiment or an uncertainty. It is with us to stay, and, if properly handled, is fully as reliable as a steam engine, if not more so. Of course, it looks like "carrying coals to Newcastle" to employ an expensive liquid fuel at a coal mine, but in an instance like the one above described, where the position in which the machine is to be used is remote from any source of power supply, and, to a certain extent, temporary, the advantages attendant upon the use of this type of engine are self-evident.

An Important Advance in Coal Storage

By William E. Hamilton*

SYNOPSIS—The elimination of breakage in the handling and marketing of anthracite coal is one of the serious problems of the hard-coal operator. Immense savings have been effected by numerous ingenious devices for reducing the severity of handling, with the consequent increase in the percentage of lower-priced grades. This article describes a storage plant of large capacity and embodying some novel and original appliances for the reduction of breakage in both storing and reloading coal.

It is estimated by A. D. W. Smith, of Wilkes-Barre, Penn., and William Griffiths, of Scranton, who have made investigations for the U. S. Geological Survey, that the anthracite coal will be exhausted in 104 years. It will therefore continue to increase in value, and this fact will necessitate more economical systems of handling.

The features to be desired in a plant to store and rehandle anthracite coal are the following:

The least breakage of the coal.
Lowest operating cost.
Low first-cost, per ton of storage capacity.
Least amount of labor employed.
Least amount of machinery involved.
Simplicity, and consequent freedom from breakdowns.
Greatest storage capacity.
Greatest strength in construction.
Protection against fire, either accidental or incendiary.
Protection against the weather.

The system herein described consists of cylindrical tanks, having conical roofs and floors. In the center of each tank is a hollow tower, containing a spiral chute, and a pivoted bucket conveyor, which operates in connection with the chute and a track hopper. Although the plan is new, the details have been heretofore tested and proved. It is a combination of old and well known ideas and principles, and its simplicity insures its successful operation.

The first aim is to reduce the loss in value of the coal, caused by degradation. This is an item, which, on a tonnage basis, often amounts to more than the cost of operation, and the cost of interest on plant investment, combined.† A great deal of machinery, costly to install and operate, expensive to maintain, and destructive to the coal (through its chipping and flaking by abrasion), is dispensed with by this method of handling.

The number of transfers and the fall of the coal at these points has been reduced to a minimum. The rolling or sliding of the product upon itself is also *less*, by reason of the form of the retainer. (See Fig. 1.) The coal is carried on pivoted buckets, traveling on self-oiling wheels. A conveyor such as this, is 50 per cent. more durable and consumes less power than the scraper type.

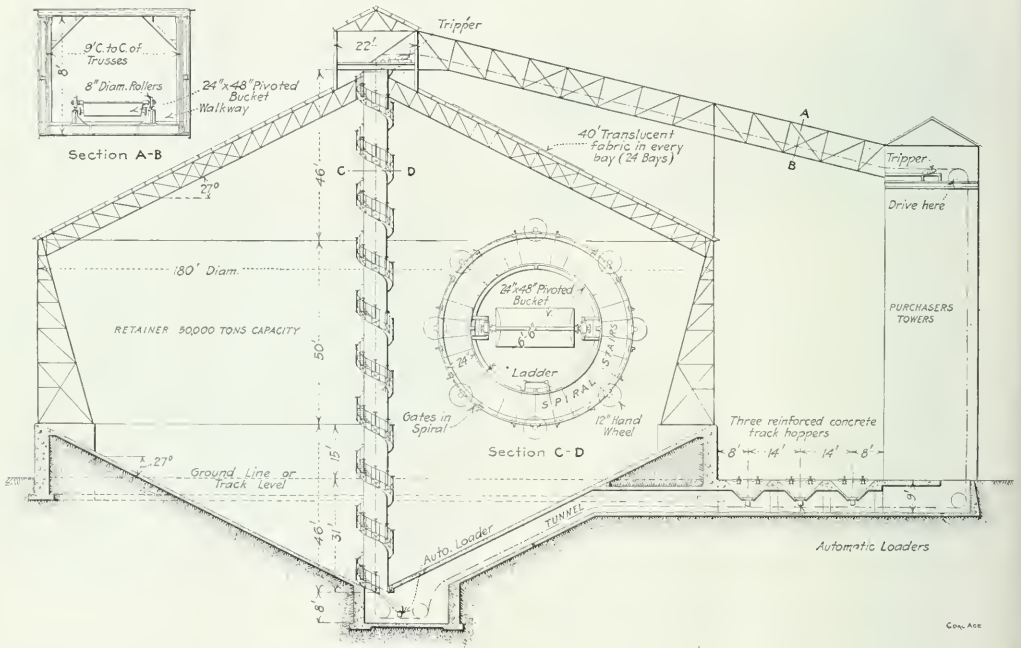


Fig. 1. Cross-section of a Single Unit, Showing Some Details

*Engineer with the Jeffrey Mfg. Co., Columbus, Ohio.

†C. Dorrance, now chief engineer of the Lehigh Coal & Navigation Co., states that an increase of 1 per cent. in the steam sizes means an annual loss of $75,000 to his company. See "Coal Age," bottom of second column, page 659, and also erratum, page 683, Vol. 2.—Editor.

Method of Operation

The coal is received from the mines in cars which are "spotted" over the track hoppers. From these it is carried by wheeled bucket conveyor to the top of the retainers or tanks, where it is discharged into the large hopper of a covered spiral chute. It glides down and fills this chute and then sliding gates are opened successively, which allow the coal to flow out into the retainer or tank.

The spiral chute has a capacity greater than that of the bucket conveyor, and may always be kept full; the angle of inclination insures of the coal sliding, and there is no "internal movement" or "working" of coal within the chute, such as would cause grinding or abrasion. The coal moves down the chute *en masse*, sliding on the smooth surfaces, and not grinding on other coal. The flow through the gates is regulated so as to keep the spiral chute filled, this being shown by its height in the hopper at the top of the tower. The buckets, after discharging into this hopper, travel on guides, down through the center of the hollow tower, and through the coils of the spiral chute. Passing out of the retainer at the bottom, they return under the track hoppers and are again filled and passed on to their discharge.

Facilities for Storing the Coal

At the beginning of the operation of storing, all gates of the spiral chute are closed, except the lowest one, and the coal flows out of this and fills the lower part of the retainer. As soon as the coal has reached its level of repose in the tank, this gate is closed and the next higher opened. The gate-controlled openings are large, and there are eight to each spiral turn, so that the difference in height between one gate and the next is very small, in fact, the top of one gate is higher than the bottom of the one next above it, so there is no falling of the coal. (See diagram.)

The gates are opened and closed, one after another, until the storage retainer is entirely filled, and the coal reaches the top of the tank in a conical pile, of which the hollow tower is the center, and the steel wall of the retainer is the circumference. In this construction the strains occasioned by this great weight of coal are equally distributed on the outer wall of the retainer.

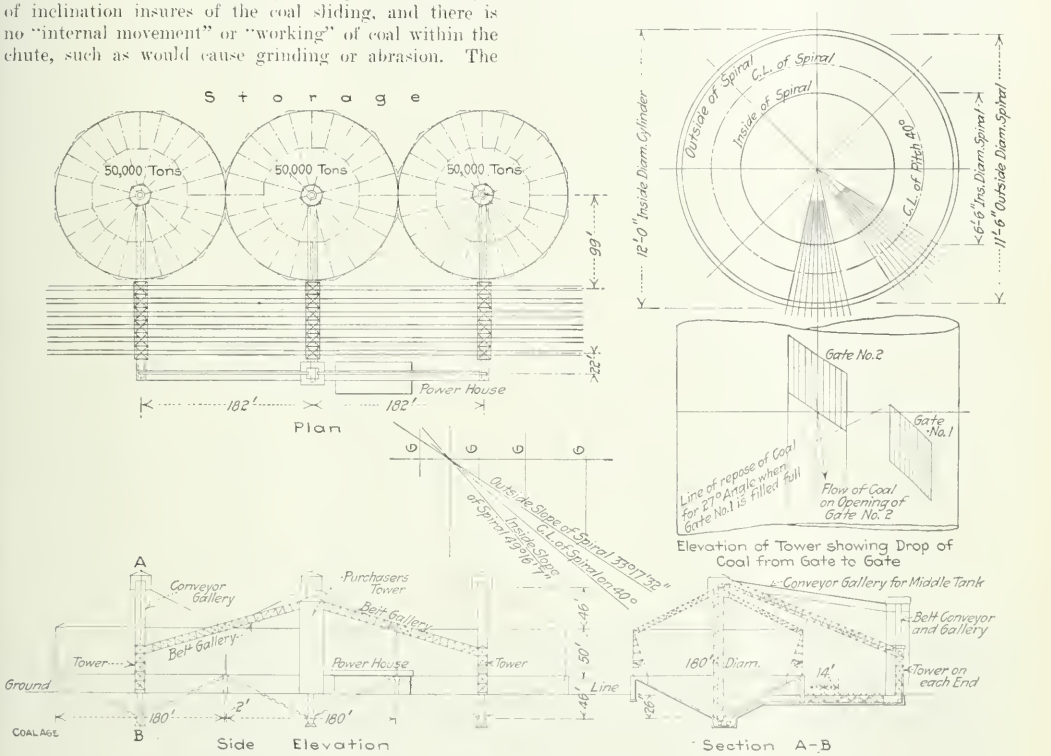


Fig. 2. General Plan of Three Units and Diagrams Showing Maximum Fall of Coal

Reclaiming

In reloading (out of storage), the preceding operation is reversed. Beginning at the top, the gates in the spiral are opened successively as they are uncovered by the lowering of the coal in the retainer; thus the coal is drawn from the top of the pile, and never from the bottom under pressure of overlying coal. The only labor required is for opening and closing the gates, and even this can be done mechanically.

The travel of the coal is retarded by the turns of the spiral, so that the pressure at the bottom of the chute where the coal passes into the pivoted buckets, is only slightly greater than at the top, whereas, if this chute were vertical, straight and smooth, when full of coal, there would be a pressure of 2000 lb. per sq.ft. at the bot-

tom, for each 50 ft. of height. The weight of coal in the spiral chute is practically uniform at every turn, as it is not carried by the coal at the point of discharge; in reloading (out of storage), there is none moved under pressure.

In this plan of "piping" the coal from the top of the pile, it is taken out of the center so that the pressure on the wall of the retainer is reduced equally in all directions, and it is uniform at all time and stages of both operations—like the pressure of water in a tank. The "internal working" of a pile of coal when drawn off from the bottom is apparent. A cone-shaped depression forms at the top and throughout the pile one piece of coal is grinding against another, chipping, flaking and breaking off the edges into particles too small to be of much commercial value.

Plants for the storage and recovery of anthracite coal involve the expenditure of a considerable amount of money. Only a few covered plants have been built, in fact, little advance has been made in this work in comparison with the general progress and improvement in other arts and industries.

From records kept at a number of plants, through several years of operation, the fact is disclosed that neither the first cost nor the operating expense is the principal thing to be considered. The loss in value of the coal from its "degradation" is a cost greater than any other. This degradation has not been materially reduced in late years, as the plants which have been installed have followed the original scheme of storing the coal in conical or rectangular piles and drawing it off either by tunnels, under the great pressure and weight of the overlying coal or by conveyors scraping against the side of the coal pile.

The system herein described provides protection against fire either accidental or incendiary, as no sparks nor flying embers can get into the inclosure; also in case of labor troubles, strikes and riots, there are no doors or other openings that give access to the coal where combustible material can be piled and fires started.

The circular tank or retainer is the strongest construction known. Likewise the capacity is greater than that of any other geometrical form of building, with the exception of a sphere; it also affords the greatest possible storage capacity for the amount of material entering into its construction.

The German Coal Industry

The activity in mining and industrial enterprises in Germany continues unabated. Despite the coal miners' strike of last March and other impediments such as the chronic shortness of railroad cars, political unrest, etc., the production of coal in Germany has come up to 177,094,917 tons in 1912, as against 160,742,000 tons in 1911. Prussia alone produced 167,267,860 tons, of which 93,798,000 tons must be credited to the Dortmund district, while the administrative district of Breslau, comprising Upper and Lower Silesia participated with 17,272,579 tons. The production of coke amounted to 29,141,070 tons, also an increase over 1911, while 5,332,651 tons of coal briquettes were manufactured.

The production of brown coal or lignite likewise shows an increase, to wit, 82,339,588 tons in 1912, as against 73,516,789 tons in 1911. The production of lignite briquettes amounted to 19,058,000 tons.

By the Way

Many foxes grow gray, but few grow good.

One man's story is no story—hear both sides.

Little minds, like weak liquors, are soonest soured.

He who strikes with his tongue must ward with his head.

To believe a thing impossible is the one sure way to make it so.

We are judged, not by our intentions, but by the result of our actions.

We will walk a long time behind a wild goose before we find an ostrich feather.

Wise men are instructed by reason, the ignorant by necessity and beasts by nature.

It is said that Chamberstown, Chambersville and Pottsville, Penn., were all named after the same man.

The man who starts out with the intention of doing no more than his part is apt to be satisfied with doing only a part of that.

A state mine inspector of long experience in gaseous mines characterizes a nonreversible fan operating at a coal mine, as a railway passenger train minus the air-brake equipment. This is too practical an illustration to let slip.

Press reports state that Josiah Van Kirk Thompson, the Pennsylvania coal and coke operator, recently paid $1,000,000 for a divorce. We believe this establishes a new high record and it is worthy of note that coal men can head the list in more than one way.

Morgan Kingston, a Nottinghamshire (England) miner, has signed a contract with Andreas Dippel, of the Chicago Opera Co., to appear as the latter's principal tenor, beginning October, 1913. Kingston was a miner for eleven years, but has been under the care of some of Europe's ablest vocal instructors during the past three years.

The vote registered at a certain Western coal camp in 1910 was: Republican, 40; Democrats, 278. Two years later the vote was: Republican, 304; Democrats, 32. In explanation it is stated that the superintendent changed his politics during the intervening two years. Why such a man should waste his time bossing a mine is more than we can understand.

Curious happenings are recorded even in England. A Nottinghamshire collier sold his wife for 24c. The man was drinking and his wife tried to persuade him to go home. Friends joined their entreaties to hers and this so incensed him that turning to one of them he shouted: "Does tha' want 'er Tha' can 'ave 'er for a 'bob." The offer was promptly accepted and the woman "changed hands." The husband has since repented his sorry bargain, but his wife prefers the new order, and is obdurate and apparently content. The husband has invoked the aid of the guardians of the peace, but in that quarter has met with little sympathy. The woman's husband and present owner are "old friends."

In the discussion of an interesting paper on the "Structure of the Northern Anthracite Basin," presented by N. H. Darton, geologist of the U. S. Bureau of Mines, at the November meeting of the New York Section of the American Institute of Mining Engineers, the question was asked as to the quality of coal that is being mined at present in the anthracite fields. Mr. Darton replied that the operators are endeavoring to conserve the coal fields in that region and are shipping as low a quality of coal as the market will take. He stated further that if the market demands high-grade coal it can be delivered, as there still remain millions of tons yet unmined.

A Monitor Gravity Plane at Penn-Mary

By R. Dawson Hall

SYNOPSIS—No. 7 mine of the Penn-Mary Coal Co. dumps its coal near the drift mouths into a bin. The coal is loaded as required into a large car or monitor holding 15 gross tons, which, running to the bottom of the plane, draws an empty monitor up the hill to take its place. The coal on reaching a bin at the foot of the hill is discharged, and is allowed to fall thence at will into railroad cars.

The Penn-Mary Coal Co. is most successfully operating a monitor gravity plane at its No. 7 mine. The cars after leaving either of the openings pass over automatic scales. One front wheel operating on a lever sets these scales in operation, and the corresponding rear wheel throws the scale out of gear. The weight of the load in the car is automatically registered on a paper tape, as shown in the illustration. The upper printed figures in Fig. 1 represent thousands; thus 3 in the upper part of the diagram denotes 3000 lb.; the lower figures represent hundredweights. It will be seen that the arrow lies between 3200 and 3100 lb. and that the actual weight of the car evidently approximates 3120 lb. because the scale divisions each correspond to 25 lb.

Reducing Weigh Scale Worries

The figures written cursively on the diagram are those placed there by the weighman or clerk and were copied from the check numbers taken off the cars as they passed over the scale. It would not, of course, be necessary to employ a weighman. The check numbers could be placed in order on a file and by reading the values on the tape and the check numbers on the file in due order, the tonnage corresponding to each check number could be ascertained at the end of the day.

erated successfully by unintelligent men, they are sure to be extensively introduced at all tipple scales. They are made by the Streeter-Amet Weighing & Recording Co., of Chicago, Ill.

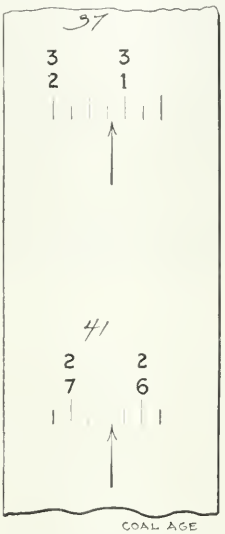


Fig. 1. Record of Coal Tonnage of Individual Cars

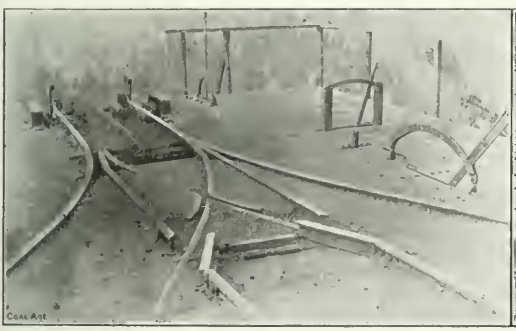


Fig. 2. The Switches over the Upper Bin, Permitting Rapid Dumping of Coal

Fig. 3. An Entrance to No. 7 Mine, Showing Iron-rail Timbers and a Baldwin-Westinghouse Motor

The system is most expeditious, gives satisfactory results and a permanent, unanswerable record, and the Penn Mary Coal Co. is well satisfied with its operation. They do not, however, leave the recording of the check numbers till evening, but note them on the tape as the cars are dumped. Scales of this type have had a far larger application to railroad work than to mining, but because they are automatic, rapid and accurate and can be op-

A Time-saving Tipple Switch

The coal after being weighed passes in the car to the upper bin. A clever arrangement of switches has been devised by H. P. Dowler, the manager of the company. It will be noted that both rails of the straight track leading to the dump are broken so as to form latches. These portions of the rail are connected by spiral springs. When the loaded car is pushed forward, the rails are forced out

FIG. 4. THE MONITOR GRAVITY PLANE AT PENN MARY NO. 7, HEILWOOD, PENN.

into line and the car passes on a solid track. As soon as it has passed, the track is broken and is so disposed that empty cars can pass back on a rail just below the loaded track, either to the right or left.

As the grade of the plane was excessively steep, a simple kickback dump was necessary to save the expense of high trestling which would have been involved had a crossover dump been installed. The switches for the load track and the two empty tracks are all together and are controlled by one and the same lever and are set so close to the dump that the operation of the parting is simple and rapid. This is necessary as the cars are small and have to be handled with rapidity if a large tonnage is to be obtained. By setting the rails in solid concrete, the switch rails are made so stiff that it is impossible for them to get out of alignment. Thus derailments are avoided. The immediate track grades leading to the tipple and away from it, are 2 per cent.

The bin at the head of the plane holds 43 tons and dumps into a monitor with a rated capacity of 12 long tons. It is customary, however, to load it with about 15 tons. The box of this large car—one is almost moved to term it a traveling bin—is 12 ft. long and the height of its upper edge is 7 ft. 10 in. clear of the 60-lb. rail on which it runs. Its length is 15 ft. over all, the wheel base 4 ft. and the gage 4 ft. 8½ in. There is only one switch on the plane and that is near the top. Under the upper bin, the monitors occupy in turn the same rails, but they are switched to a separate track at the parting, to which reference has just been made, and each dumps always into its own portion of the lower bin.

The monitor has three hoppers and these are raised by winches which are held in place by pawls. They can be so arranged that a rod projecting from the end of the car and striking a bumper will release all the pawls at one time and dump the monitor almost instantaneously. This, however, has not been placed up to the present date on the Penn-Mary monitor.

SPOTTING THE RAILROAD CARS

The monitors dump into a large bin holding about 50 tons and having three chutes discharging endwise into

FIG. 5. MONITOR OVER LOWER BIN

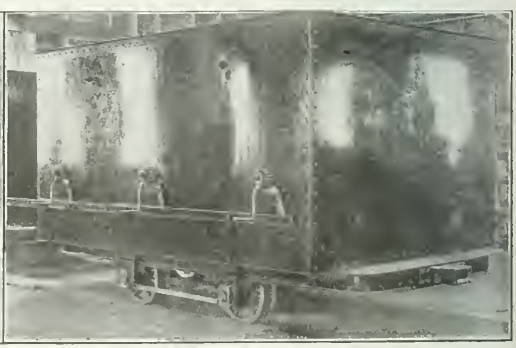


FIG. 6. CAR EQUIPPED FOR AUTOMATIC DUMPING

the railroad cars below them. These chutes are controlled from a dumping platform by the long levers shown in Fig. 7. In order to reduce the labor needed, the railroad tracks are set at a grade of 2 per cent. and the cars are controlled by the use of a Fairmount Machinery Co.'s car retarder, which enables one man to spot the car within a few inches of the desired place. The man in Fig. 7 has his hand on the controlling lever of

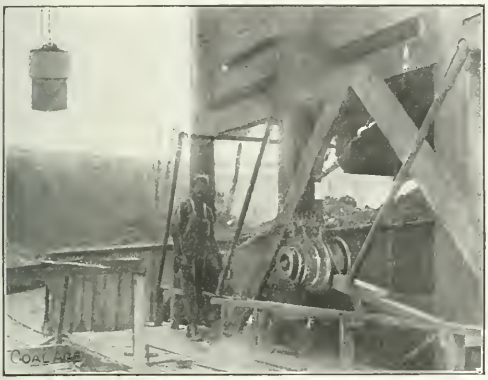


FIG. 7. THE CAR RETARDER AND DUMPING LEVERS

this device. By gently lifting on this controller, he permits the car to travel forward as desired.

The grades near the top of the plane are from 20 to 25 per cent. At the steepest point the grade is 38 per cent. The approach to the tipple is, however, only about 8 per cent. This easy grade at the foot involves allowing the monitors to travel at some speed. At the same time they must be under such control that they can be stopped at any point on their travel. This is done without difficulty with the two sheaves shown in Fig. 8. This photo-

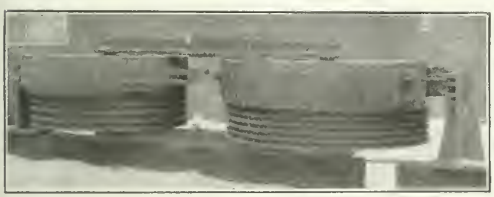


FIG. 8. THE FIGURE-OF-EIGHT SHEAVE WHEELS AND BRAKE

graph was taken in the factory as it was impossible to get a good view of the machine in position.

How the Monitors Are Controlled

The rope winds in the form of a figure-of-eight between the two sheaves and thus has sufficient turns to make a firm contact, so that it is prevented from slipping under the most untoward circumstances. The brake band being cast integral with the sheave wheels absolutely restrains both them and the rope, when the brake is applied. The bands are 18 in. wide and there is only one to each sheave, and as this is on one side only, it would tend to throw the bearing out of line. Attempts have been made to correct this by putting brakes above and below each sheave. This puts the lower bands in an undesirable position.

Consequently, a single band is preferable and in order to avoid the possibility of breaking the wheel or of wearing the bearing by excessive unsupported strain, the band in this machine is reinforced by being connected with four arms to another bearing on the same shaft. This keeps the wheels true and safe under any load the checker can throw onto them. In fact, the monitor system has been rendered so reliable that grades of 70 per cent. have been fitted out and operated with entire success.

At Penn-Mary No. 4, a mine recently worked out, monitors controlled by figure-of-eight sheaves were in use from 1906 to 1912. The outfit was slightly smaller than that now in operation at No. 7, but it handled 322,947 tons in that length of time and cost only $4 a year for renewals. The only parts to be renewed were the brake blocks. No repairs were needed.

Lessening Friction of Fan

No. 7 mine is ventilated by an 8-ft. disk fan with Hyatt roller bearings. There has been no test made to

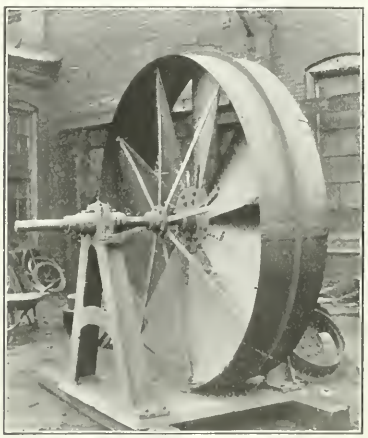


FIG. 9. AN 8-FT. J. C. STINE FAN WITH HYATT ROLLER BEARINGS

determine the saving effected by the use of this antifriction device, but the Penn-Mary Coal Co. is expecting to equip another of its fans in a short while with the same improvement as it is sure that the economy effected in the use of roller bearings fully justifies their use. The fan installed will be replaced by a larger one of the same type when more air is needed. It is rotated by a 7½-hp., shunt-wound, 590-r.p.m., 220-volt motor which takes a full load current of 28.7 amperes. The track running up the side of the plane, Fig. 4, is for the transportation of supplies. A Lidgerwood hoist electric-all driven is kept at the head of the plane for that purpose.

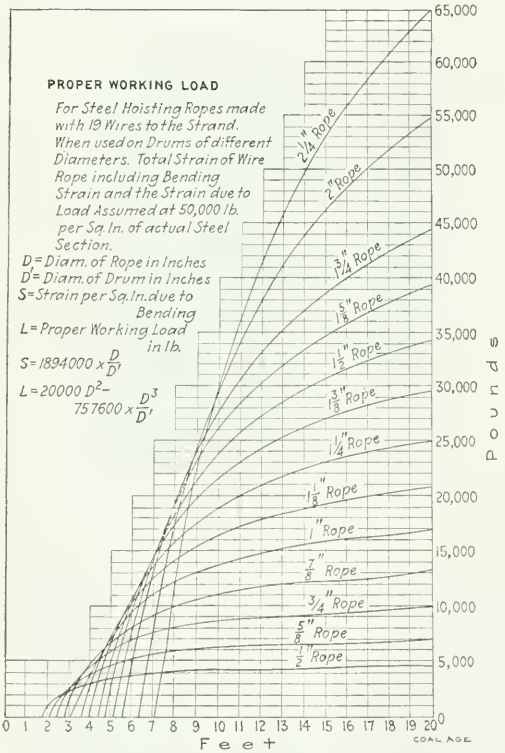
The monitors, figure-of-eight sheaves and the fan mentioned were supplied by J. C. Stine, of Tyrone, Penn. H. P. Dowler is general manager, M. H. Kallaway assistant and J. T. Hoover chief engineer.

Steel Hoisting Ropes

By George L. Phillips*

The agent through which the power developed by the hoisting engine is transferred to the cage with its car of coal anywhere from 50 to 2000 ft. down at the shaft bottom, is the wire hoisting rope, and upon its quality and power of transmission rests the efficiency of the hoisting apparatus.

Steel hoisting ropes are used at all shafts, those best suited to the work having six strands of 19 wires each, of medium steel and having an ultimate strength of from 60,000 to 70,000 lb., the working or safe load being obtained by employing a factor of safety of not less than five. The character and quality of the steel, as well as the lay of the strands, play an important part in the life of the rope, the continuous bending and straining to which it is subjected making it necessary to look closely after these details. A poor steel rope becomes brittle as a result of continuous bending, over a sheave which is perhaps just a trifle too small, and the individual wires soon begin to break.


PROPER WORKING LOAD
For Steel Hoisting Ropes made with 19 Wires to the Strand. When used on Drums of different Diameters. Total Strain of Wire Rope including Bending Strain and the Strain due to Load Assumed at 50,000 lb. per Sq. In. of actual Steel Section.
D = Diam. of Rope in Inches
D' = Diam. of Drum in Inches
S = Strain per Sq. In. due to Bending
L = Proper Working Load in lb.
S = 1894000 x D/D'
L = 20000 D² − 757600 x D³/D'
2¼" Rope
2" Rope
1¾" Rope
1⅝" Rope
1½" Rope
1⅜" Rope
1¼" Rope
1⅛" Rope
1" Rope
⅞" Rope
¾" Rope
⅝" Rope
½" Rope
65,000
60,000
55,000
50,000
45,000
40,000
35,000
30,000
25,000
20,000
15,000
10,000
5,000
Pounds
0 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20
Feet
COAL AGE

Safe Working Loads for Steel Hoisting Ropes

Given the proper kind of rope, as above stated, and with reasonable care as to the kind of oil or lubricant used (one part of linseed oil to one part of lamp black being a good preservative) and the right kind of judgment in the selection of pulleys and sheaves, and the maximum of efficiency can be obtained.

We herewith submit a diagram of the safe loads that can be carried by ropes of a given diameter over sheaves of a given size. The abscissas are sheave diameters in feet and the ordinates safe loads in pounds. Along the curved lines will be found the diameter of rope in inches.

For instance, should we desire to ascertain the safe working load for 2-in. rope on a 12-ft. drum; we find by tracing up the 12 line until it intersects the 2-in. line, that the corresponding ordinate gives 38,000 lb. Where the 2-in. line crosses the 2¼-in. line will be the minimum size of sheave for a 2-in. rope.

*205 South Main Ave., Scranton, Penn.

Production of Coal

Seventeenth Bituminous District (Pennsylvania)

Following is the production of coal in the 17th bituminous district of Pennsylvania, for 1912, showing the tonnage of each mine in the district, and its distribution in the counties:

Company or Operator	Short Tons
Pittsburgh Terminal Railroad and Coal Co.	2,360,163
Pittsburgh Coal Company	1,937,974
New York and Cleveland Gas Coal Company	371,283
Crescent Coal Company	317,401
Pittsburgh-Buffalo Company	275,224
Youghiogheny and Ohio Coal Company	250,803
Monongahela River Consolidated Coal and Coke Company	250,783
Mans Williams Coal Company	28,561
Ollett Brothers	21,452
Paul Coal Company	14,491
Sorg Brothers	11,419
Vogel and Weinman	7,484
Samson and Hormel	7,482
W. S. B. Hays	6,950
Weinman Brothers	5,894
Steele and Scott	5,350
James T. Fox	3,725
Bureau of Mines	3,674
Shearn Brothers	3,423
John Peterman	3,223
Production by Counties	
Allegheny County	5,729,361
Washington County	157,428
Total	5,886,789

Record of Charleroi District, 1912

Last year's coal production in the twenty-first inspection district of Pennsylvania while 3 per cent. (213,322 tons) larger than the year before, would have increased still more had it not been for the freezing of the Monongahela River in the months of January and February, which caused navigation to be suspended for about three weeks. Furthermore, there was another suspension of equal duration in the month of April pending the signing of the scale by the United Mine Workers of America and the operators. The labor shortage also resulted in a further restriction of output.

There were 22 fatal accidents in the mines, 13 less than in 1911. This is a decrease of 37 per cent. They can be classified and compared with those in 1911 as follows:

CAUSES OF DEATH, CHARLEROI DISTRICT

Causes	Per cent. 1911	Per cent. 1912
Falls of coal	11.43	18.18
Falls of drawslate	34.28	13.63
Falls of roof	11.43	9.10
Electricity	11.43	13.63
Mine cars	28.57	36.36
Miscellaneous	2.86 (blasts)	9.10
	100.00	100.00

It will be noticed that accidents from falls have materially decreased, but there has been an increase in accidents from mine cars owing to the large steel cars used in two of the largest mines. Of 6735 persons employed at the mines only 240 are between the ages of 16 and 21 years. The majority of these young men are 19 years old. The number employed above ground between 14 and 21 years of age is 91. None of the mines used compressed-air mining machines. By hand picks, 1,787,697 tons were mined; electric machines undercut the balance of 5,141,536 tons.

EDITORIALS

Hoist Evolution

The methods employed for raising coal from the mines have probably been as numerous and varied as those devised for its transportation upon the surface.

To begin with, baskets or boxes were strapped upon the backs of carriers, usually women, who toiled laboriously up and down ladders or crude stairways. Then came the windlass and rope with a bucket attached to the end; next the winch or sweep mill, to which a horse, mule or ox could be hitched, the bucket being slowly raised by the animal walking endlessly round and round.

Finally, with the utilization of steam and the development of the steam engine, this machine was quickly adapted to the hoisting of coal, which service, until very recent years at least, it has performed to the almost entire exclusion of all other devices.

Within a comparatively short time, however, the electric hoist has come into extensive use and has proved itself as reliable and satisfactory as the time-honored steam engine. Its employment obviates the necessity of providing a boiler plant at each mine, and allows the complete centralization of power, which is always conducive to economy.

The electric hoist possesses other advantages over the steam engine, chief among which might be mentioned its adaptability to distant control. With a motor-driven machine it is quite possible, even convenient from the electrical standpoint, to place the operator near the point where the load hoisted is discharged into the bin or chute. He is thus enabled to watch all that goes on in the dumping process. And, although this arrangement will probably in no wise increase the efficiency of the hoist or affect in any way the number of horsepower-hours necessary to raise or prepare a ton of coal, it will undoubtedly have an influence upon the regularity of hoisting operations and will reduce the liability to hoisting accidents.

Lonely Virtue

The Director of the Bureau of Mines appeared before the Committee on Public Buildings and Grounds, and made the following statement. It is sent to us for publication, and we will not give it a lowly place, but quote it in our editorial columns, for we know our subscribers will want to read it.

What is more we will not edit it as one of our distinguished contemporaries did, before putting it into circulation, and we will not write the words "contributed to" in place of the bolder word "yielded" in the quotation we make. "The work," says Doctor Holmes, "such as we have been able to do in our present location within the past year, has *yielded* a reduction in the annual loss of life of not less than 500, but the great loss is still a discredit to the nation."

This gasconade reminds us of the Andalusian peasant, who, as Washington Irving records, declared, "When I draw my sword, the earth trembles" (tiembla la tierra). We can forgive a little self-esteem in a bureau doing good work like the Bureau of Mines; we can condone a trifle of excess self-adulation in a body seeking to establish itself and needing funds to make such establishment possible; we can excuse some exaggeration, remembering that a diplomat has been described as an honest man who makes misstatements for the good of the commonwealth; but to rob our philanthropic companies, which have spent their millions for safety, of the honor due them, to overlook the original work all over the country, and to remember only the propaganda of foreign experiments which, as far as safety is concerned, has replaced original research in the Bureau of Mines, is ungenerous and unfair.

We hope Doctor Holmes will get his appropriation of a half million of dollars. The Bureau needs it and its members deserve it, but we also hope the claim that the Bureau alone is the cause for the growth in mine safety will never be made good, no matter however faithfully its attachés serve the nation. The mining public will do its part, no matter how severely its Bureau may misrepresent its actions.

To Regulate the World's Output of Coal

The Miners' Federation of Great Britain has recently made public the report of the International Miners' Congress, which was held at Amsterdam, Holland, July 12, to formulate, if possible, an international rule to regulate the world's output of coal.

The British miners are now voting on the question of only working five eight-hour days each week, which is so far reported as follows: For, 231,741; against, 151,-270.

The American report did not make any recommendations, merely giving statistics of American production. After the vote of the English miners has been carefully considered, the International Committee will probably draft a plan which, in their judgment, will be best adapted to regulate the world's output of coal.

It should be remembered, however, that even if a five-days-a-week working policy were adopted in all coal-producing countries, the output, if limited at all, would be so only temporarily. Such a plan could not permanently regulate the supply of coal. New mines would be opened as fast as needed.

If, however, the miners should appoint an international committee having power to recommend at any time a reduction of working days to four, three, or even two per week, for a prescribed period, the production of coal might be regulated as desired. This latter statement, of course, assumes that the unions in the different countries would be able to enforce or carry out the recommendation of the international committee

If such a bold plan on the part of the coal miners in all countries could be consummated, the various governments would then have on their hands a trust of such vital importance as to justify their closest attention. New evidence is being brought forward every day that labor will have to be regulated by federal control precisely as we now attempt to regulate industrial corporations that have become too dangerous for public welfare.

⁂

Mine Telephones Made Compulsory

A law that becomes operative Apr. 1 in Great Britain compels all mines to have telephones installed when the point of entrance is more than 1000 ft. distant from the workings.

Legislation having the same object in view would not be out of place in the United States. There is no device more urgently needed, in case of trouble underground, than the mine telephone. In a few years any mine unequipped with a complete telephone service will be looked upon with the same misgivings as are aroused by a commercial enterprise lacking such service today.

⁂

Railless Coal Transportation

It is rather surprising to find such a well informed publication as the *Wall Street Journal* giving credence to the somewhat visionary plan of transporting coal by pipelines. In a recent issue, however, it publishes a telegram to the *Manufacturers' Record,* from a "drainage engineer" in Chicago, which reads: "Developed a project for transporting coal hydraulically for 96 miles, divided into six equal sections. Pipe 18 in. in diameter; 6 ft. per second; resulting economy very great." Whether the proposition is "developed" on the ground or only in the brain of the inventor, is not stated, but we venture to believe that it has not yet outgrown the latter embryo stage.

The idea apparently originated from watching the results of dredge pumps working in Lake Michigan, where material up to 6 in. in diameter is pumped half a mile. Perhaps it was thought that this was a new departure in the science of engineering, when as a matter of fact it has long been recognized as a standard method of handling material, within certain limits. That these limits have a radius of 96 miles remains for the inventors to prove.

It is hardly to be presumed that they expect to transport anything other than the finest sizes; obviously, the largest lump would be reduced to an almost impalpable powder at the end of its 96-mile jaunt in the restricted confines of an 18-in. pipeline. In fact, innumerable physical conditions might be cited, any one of which would show the utter absurdity of the scheme. For instance, it is doubtful if the inventors have considered the mere detail of wear and tear on the pipeline. This question was first brought into prominence on the mammoth fill made by the Chicago, Milwaukee & Puget Sound Ry. near North Bend, Wash., which was accomplished by hydraulicking. In the sluiceways, sheet-iron, cast-iron and even steel plates were worn away with surprising rapidity, and it finally became necessary to resort to removable wooden blocks.

It has long been conceded that enormous losses are involved in the handling and various processes to which coal is subjected before it is resolved into actual power. But we do not believe this new solution to be worthy of serious consideration. The more conservative engineers are, however, beginning to regard long-distance electrical transmission as a fruitful field for investigations along this line, and the next few years will doubtless see a more general adoption of this method. Already the Lehigh Coal & Navigation Co. has a large installation of this character under construction, which will transmit power over a radius of 175 miles. We recommend this method to the consideration of the "pipeline" promoters.

⁂

How Our Plants Are Built

It is a healthful exercise for a mine superintendent to look around his plant and determine just how many of the features in his operation are the result of his own devising. The number of these is not large. Most of his improvements arose from the prompting of a catalog, a technical journal, a government bulletin, of a sales agent or of someone whom he happened to meet or who strolled into his plant.

His vaunted operation is based on other men's ideas, and his work has been largely that of an adapter, not of an inventor. This being the case, why do we not put ourselves in the way of learning more? Why do we stay in one place till the new idea is forced upon us? We will learn it sooner or later, but if we grasp it and adopt it now, we shall receive enough profit from its use to pay for its installation and for our search after it, long before we would otherwise have been brought face to face with it, had we waited till it traveled our way. We shall make such an improvement before long; why not now?

The bituminous coal field has undergone a different development from the anthracite because its problems have been slightly different. The minds of its superintendents, engineers and manufacturers have been concentrated on these peculiar difficulties, and machinery has been devised to meet these problems. The bituminous region has like questions to solve but in a minor degree. They are overshadowed by other difficulties and have therefore received only casual attention. Consequently, when the bituminous mine manager goes to the anthracite region, he learns how the hard-coal operator has solved many of the problems which also vex him—problems on which he has not concentrated all thought and energy, but which are nevertheless of great importance in the conduct of soft-coal mines. We mention as examples, the matter of sizing and cleaning coal and disposing of waste.

The Coal Mining Institute of America is going to hold its summer meeting at Wilkes-Barre, Penn. There will be an excellent opportunity to see the great anthracite industry at its best and in the most intimate way. It seems fitting that every member of the Institute should be present. We wonder why the operators do not insist on every member going instead of granting a grudging permission to a few. We can almost as readily understand the purpose of a manager who discourages the reading of technical papers or of publications of the Bureau of Mines as we can the intent of one who does not lend every encouragement to those desiring to view practice in other fields.

DISCUSSION BY READERS

Seven Shifts a Week

I am not sure whether it is wise to sympathize with "Mine Foreman," Collinsville, Ill., COAL AGE, Feb. 15, p. 272. The idea of being on the job "almost day and night"; "living, eating and sleeping" on the job; working "48 and 60" hr. (2 to 2½ days) without going home and making "from 7 to 10 shifts a week" is beyond the average human capacity for endurance.

A man might as well be in the penitentiary at once. We may assume from his letter that this man works for a large company and should have assistants. If *he* has brains, he should be able to share the responsibility with his assistants, provided they are not mere imitations of himself. Perhaps their brains have been numbed by the continual grind of work.

I am heartily in accord with the previous article by a Colorado engineer, COAL AGE, Jan. 18, p. 88, in which he describes seven shifts a week as "a fallacy." Statistics have shown that men are more efficient working six shifts a week, instead of seven. The man who takes his rest day every week is the man who is ready for emergencies when they arise.

The man of initiative and the man of ideas is not ordinarily the man who sleeps with his job; but rather the man, who, when the day's work is over, takes up some hobby or other occupation apart from his day's work. This is the man who systematizes his work so that it can generally be accomplished on the regular working days or nights, as the case may be.

There is unquestionably some necessary work that must be performed on Sundays; but the extra "Sunday job" should be made the exception and not the rule. I will guarantee that if the Collinsville "Mine Foreman" will follow this suggestion, and use the six shifts a week to the best advantage, he will prove a more useful and valuable man to his company. In closing, I may express the hope that no calamity of any kind will occur that would make me dependent on the service that this man would be able to offer, as I could scarcely expect any bright ideas or help from him.

STATE MINE INSPECTOR.

————, Illinois.

Allegheny Valley Price Quotations

A number of local operators are desirous of having Punxsutawney price quotations listed separately in COAL AGE, instead of including them in the general Allegheny prices as you do. Will you kindly advise us why you do not do this.

J. G. STEINER.

Knoxdale, Penn.

It appears that the old difficulty in regard to quotations on coal produced in the territory between Buffalo and Pittsburgh has come to the surface again. The plea is that "our coal is so much better than the run of it in the Allegheny Valley and neighboring territory that we ought to be taken out of the list and given a special price in the market quotations." On the face of it, this always appears just and proper, for no doubt the coal in question is above the average.

The trouble is there are others in the business in the same territory who also would like to obtain help in booming their coal. Some of them are entitled to it while others are not, and the worst of it is that there are also certain mine owners who have high-grade coal coming from one mine and quite a different grade from one or more others. Ask any old Allegheny Valley operator about it and he will say that he knows of certain concerns, with a limited amount of really good coal and a lot of poorer grades, who are selling the good fuel four or five times over. The consumer comes to know which mine's output suits him best and he always asks for that coal.

The fact is that in the Allegheny Valley and vicinity there are grades and grades, all of them varying according to some geological condition. All that the public is likely to find out is that such a mine has the reputation of producing good coal, while another does not enjoy that distinction. Now and then there is a jobber or consumer who claims to be so well acquainted with the different coals that he can recognize at sight the mine any coal comes from, but this is subject to doubt in most cases.

It is, therefore, quite out of the question to quote special prices in a general district, unless some mine or mines turn out a very distinctive sort of coal, such as smithing or cannel. There are mines which are known to be better than others, but the producers will not agree as to which they are. There are so many operators who hold their coal above its actual grade that any effort to distinguish between ordinary coals in a single district, for the purposes of quotation in print, is certain to lead to endless disputes. The writer speaks from experience.

"BUFFALO."

[These remarks are well justified. The Allegheny Valley operators mine coals from several different beds, the Upper and Lower Freeports, the Lower Kittanning and the Brookville. In some sections of the East only one bed, the Pittsburgh, is mined, so there is no uncertainty as to the seam from which the seller receives his coal. Of all the beds in the Allegheny Valley region, the Lower Freeport is the best. The Upper Freeport and Lower Kittanning are of about equal value and the Brookville will run the whole gamut from the best to the worst, so varied is its quality. The Lower Kittanning varies considerably from place to place; sometimes it has much bone in the roof coal and sometimes but little. In dips, it is apt to be streaked with sulphur, but it is also, in a few places, extremely dirty on sharp ridges. Most of the large companies are mining both beds of coal and some were at one time dumping them into the same cars, so that they themselves did not know the actual value of the coal they were shipping.—EDITOR.]

Oxygen Supply and Mine Explosions

The recent discussion on reducing ventilation when firing has proved both instructive and suggestive as showing the effect of a limited supply of oxygen in restricting combustion and preventing mine explosions. This seems to me one of the most serious and important subjects connected with coal mining and one calling for the most careful consideration.

The rapidity and intensity of all forms of combustion depend on the amount of oxygen available to support the combustion. Both gas and coal-dust explosions are but forms of very rapid and violent combustion, and there can be little doubt, therefore, that the violence of the explosion can be controlled, to the extent that we are able to regulate the supply of oxygen.

In case the ventilation in a mine has been stopped and no air is moving, there is still sufficient oxygen present, in the mine atmosphere, to support a gas or coal-dust explosion when the first shots are fired. As the firing proceeds, however, where gas or dust is present much of this available oxygen is consumed by the combustion of the gas or dust. Now, if no more air is allowed to enter the mine, during the time the shots are being fired, there can be little doubt but that the chances for an explosion will be lessened; and if an explosion should then occur, its violence and extent would not be as great as if a large volume of air was in circulation.

Again, when the dust is stirred up and blown into the air by the concussion of the shots, it will settle much quicker in still air than when there is a strong air current passing, which holds it in suspension. This soon produces a dusty atmosphere that is readily fired by the flame of a heavy or windy shot should such a shot occur.

If we can take as correct the figures of Dr. J. Harger, which he presented recently to the Society of Chemical Industry, at Liverpool, England, it is surprising what a slight reduction in the oxygen content of the air is necessary to produce a marked effect on combustion. According to these figures, a reduction of from 1 to 2 per cent. in oxygen, together with an addition of from ½ to ¾ per cent. of carbon dioxide, will render a firedamp mixture nonexplosive. This statement is said to apply also to an explosive atmosphere formed of coal dust suspended in the mine air.

Dr. J. S. Haldane, in his description of the Haldane flame test for oxygen, states that the light of a candle or lamp is diminished 30 per cent., by a decrease of 1 per cent. in the oxygen content of the atmosphere. This might be taken as indicating that the flame of the lamp or candle would be wholly extinguished when the oxygen was depleted 3¾ per cent.

REES H. BEDDOW,
State Mine Inspector.

Gallup, N. M.

The Bellevue Mine Explosion Controversy

Referring to the request of J. W. Powell, COAL AGE, Feb. 8, p. 232, that the question as to the actual cause of the second Bellevue mine explosion be further discussed, I would suggest that Mr. Powell give the readers of COAL AGE his own theory accounting for the explosion. In doing this, I would suggest that he give particular attention to the following points:

1. Name the places in the mine where there was evidence of coking or cindering of the dust, or of any abnormal heat.

2. State the place where, in his opinion, No. 2 explosion had its origin. The origin of this explosion, according to Messrs. Stirling and Cadman, was between the third and fourth cross-pitches above No. 73 chute.

3. State what evidence of firedamp, if any, was found at this point.

4. State if it is not a fact that the timber work at the foot of this chute was not blown away.

5. State if this is not proof positive that an explosion of firedamp did not originate at this point.

6. Explain why Mr. Stirling's evidence at the inquiry does not agree with the place mentioned in his paper as being the point of origin of the explosion.

7. State if the pillars were not intact between chutes Nos. 70 and 71 and were there not stoppings in all the crosscuts between these chutes, excepting the top crosscut.

8. State what pillars were being worked between chutes Nos. 71 and 88.

9. State if it is not a fact that no firedamp was found in the fourth cross-pitch between chutes Nos. 71 and 75 according to the examination by Bovio & Cardell, who made a special investigation of the old workings in this part of the mine, before the disaster occurred.

10. Explain the probable effect on the mine, if a body of firedamp such as that assumed by Messrs. Stirling, Heathcote and Cadman to have accumulated here had been ignited by sparks caused by a fall of roof.

11. Where, in your inspection of the mine, did you find the strongest indications of heat, after the second disaster.

12. State which of the high-pressure, air-charging stations were plugged up by your rescue party, and to what extent it was injured.

13. State in what condition you found chutes Nos. 52 and 53, as regards abnormal heat and débris, especially in the cross-pitches on the south side of the chutes.

14. State which chute or chutes were used for dumping and carrying the coal gotten at the south end of the fifth cross-pitch, to the main gangway; and describe the condition of this chute after the disaster.

15. State if you or any other person, to your knowledge, found any traces of flame or coking on the pillars between chutes Nos. 45 and 82.

16. State if Messrs. Stirling and Cadman do not eliminate coal dust from taking any part in the propagation of the flame, in this explosion.

17. State in what condition you found No. 5 cross-pitch, between chutes Nos. 45 and 61, and the main gangway between these points, after the second disaster.

If Mr. Powell will answer these questions in order, I will reply at as early a date as possible. I believe this will help to settle definitely any points at issue as to the real cause of the explosion.

JAMES ASHWORTH,
Mining Engineer.

Vancouver, B. C., Canada.

Explanation

The following letter received from W. M. Thornton, in reference to his article, "Gas Ignition by Electric Sparks," COAL AGE, Vol. 2, pp. 685, 722 and 796, is self explanatory.

In reply to your letter of the 6th inst., in regard to the size of conductors used in my gas-ignition tests, I would say that the same size of conductor was used throughout; viz., iron, 0.075 in.; copper, 0.065 in.; nickel, 0.05 in., except where I have definitely specified otherwise.

You will probably notice some criticism from the chemists to the effect that small quantities of impurities in the gases would influence the result. This, in my opinion, is quite beside the mark; for the value of the results, as a general electrical survey of the ground covered, is not affected by a change of even a few per cent., in any of the constituents, before dilution with air. I have reason to believe that my analyses were well within that limit.

W. M. THORNTON,
Professor of Electrical Engineering, Armstrong College.
Newcastle-upon-Tyne, England.

INQUIRIES OF GENERAL INTEREST

Bending Stress in a Hoisting Rope

Please explain fully what is meant by bending stress, in reference to wire ropes; and state how this affects the safe working load. Will the use of a sheave of larger diameter reduce the bending stress, and how may the required diameter of a head sheave in hoisting be calculated?

MINING ENGINEER.

Pittsburgh, Penn.

The term bending stress, as its name implies, is the greatest stress produced in any of the fibers or wires of a rope, due to its being bent over a sheave or pulley. When a rope is bent over a sheave, the result is the same as in the bending of a loaded beam (Fig. 1). As in the beam the fibers are compressed on one side of a neutral

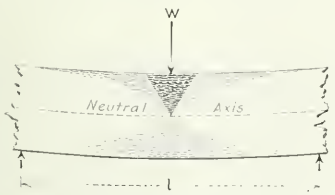


FIG. 1. SHOWING EFFECT OF BENDING ON THE FIBERS OF A HEAVILY LOADED BEAM

axis and extended on the other side of that axis, so when a rope is bent over a sheave some of the wires are compressed while the others are extended. The extension or compression is greatest in the outer fibers of the rope.

A rope is no stronger than its weakest fiber and, for this reason, the bending stress in a rope is always calculated for its ultimate fiber, which is at the outer surface or circumference of the rope. This stress in the outer fiber of the rope, caused by bending, is calculated from a basis of the *modulus of elasticity*, $E = 30{,}000{,}000$ lb. per sq.in., for steel.

The modulus of elasticity expresses the degree of elasticity of the material. For example, a certain force will produce a certain stretch or elongation in a rod of given material and cross-section. The force divided by the area of cross-section is the *unit force;* and the elongation divided by the length of the rod is the *unit elongation*. The modulus of elasticity E is the ratio of the unit force f, to the unit elongation l. Thus,

$$E = \frac{f}{l}; \text{ and } f = El$$

The bending stress must always be considered as a part of the working load and therefore decreases the net working load or the load hoisted. In the use of a sheave of too small diameter, the bending stress in the rope may often equal or even exceed the load hoisted. It is, therefore, of the utmost importance to calculate this stress and add it to the load hoisted, including friction, in order to find the total load on the rope. If this exceeds the safe working load for the rope, a sheave of larger diameter should be used, so as to reduce the bending stress.

In the case of a rope bent over a sheave (Fig. 2), it can be shown that the elongation of the outer fiber of the rope per unit of length, or the unit elongation, is equal to the ratio of the diameter d of the rope, to the diameter

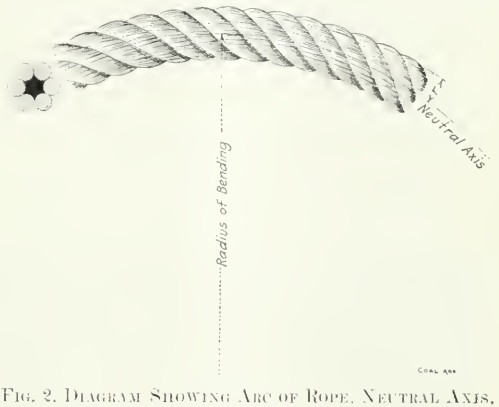


FIG. 2. DIAGRAM SHOWING ARC OF ROPE, NEUTRAL AXIS, RADIUS OF BENDING AND RADIUS OF ROPE

D of the sheave; or $l = \frac{d}{D}$; which gives for the unit bending stress

$$f = E\frac{d}{D}$$

An example will make this clear.

Let it be required to find the smallest diameter of sheave that will be required to hoist a load of 8 tons, including friction, from a shaft 400 ft. deep, using a factor of safety of five.

The first step is to find the diameter of a 6-strand, 19-wire, extra-strong cast-steel hoisting rope, which is calculated for this load, as follows:

$$d = \sqrt{\frac{5 \times 8 \times 2000}{39 \times 2000 - 5\,(1.58 \times 400)}} = 1.03, \textit{ say } 1 \textit{ in.}$$

A 1-in. wire rope weighs 1.58 lb. per lineal foot, and the weight of the rope hanging in the shaft is, therefore, $1.58 \times 400 = 632$ lb. The total load on the rope at the beginning of the hoist, including friction, is then $8 \times 2000 + 632 =$ say 16,630 lb., or 8.315 tons.

For a 6-strand, 19-wire, extra-strong cast-steel hoisting rope, the minimum diameter D of sheave, in inches, is found by dividing the cube of the diameter d of the rope in inches, by the load L on the rope in tons, and multiplying this result by 100, thus:

$$D = 400\frac{d^3}{L} = \frac{400 \times 1^3}{8.315} = 48+, \textit{ say } 50 \textit{ in.}$$

The above formula is based on a value for the modulus of elasticity for steel, $E = 30{,}000{,}000$ lb. per sq.in.

EXAMINATION QUESTIONS

Pertaining to Hoisting

Ques.—What are the essential qualifications of a competent hoisting engineer at a coal mine?

Ans.—The hoisting engineer at a mine must be honest, sober and industrious. He must be prompt in the performance of his duties; observant of small details; quick to answer all signals and must exercise care and judgment in the handling of his engine. He must be intelligent, able to read, write and speak the English language; familiar with the theory of steam and the steam engine and have had sufficient experience to understand the care of boilers and the requirements of firing, to obtain the best results in the generation of steam. He must be able to detect anything wrong in the running of his engine and to make the necessary alterations and repairs.

Ques.—In ordinary coal-mining practice, what style of rope is best adapted to hoisting?

Ans.—A 6-strand, 19-wire, extra-strong cast-steel rope will generally give the best service. The 19-wire ropes (19 wires in each strand, making a total of $6 \times 19 = 114$ wires) are more pliable, because the wires are smaller and, for this reason, they are better adapted to hoisting than the 7-wire ropes (7 wires in a strand, making a total of $7 \times 6 = 42$ wires). For very deep hoisting, plow-steel ropes are often used, on account of their greater tensile strength.

Ques.—Find the diameter of an extra-strong cast-steel, 6-strand, 19-wire rope, for a safe working load of 10 tons.

Ans.—The breaking load of a 1-in., 6-strand, 19-wire, extra-strong cast-steel rope is 39 tons. In ordinary mining practice, it is customary to use a factor of safety of 5. Then, since the strength of ropes varies as the squares of their diameters, the required diameter of rope, for a working load of $L = 10$ tons, may be calculated as follows, using a factor of safety $f = 5$:

$$d = \sqrt{\frac{fL}{39}} = \sqrt{\frac{5 \times 10}{39}} = 1.13 \text{ in.}$$

Therefore, assuming a factor of safety of 5, an extra-strong, cast-steel, 6-strand, 19-wire hoisting rope, 1⅛ in. in diameter, will have a safe working strength of 10 tons.

Ques.—Find the safe working load of a ¾-in., extra-strong, cast-steel hoisting rope having 6 strands and 19 wires.

Ans.—Using the same factor of safety as in the previous question and reversing the formula, the safe working load, in this case is,

$$L = 39\frac{d^2}{f} = \frac{39 \times 0.75^2}{5} = 4.38 \text{ tons}$$

Ques.—What load will be exerted to break the axle of a head sheave when the load on the hoisting rope is 10 tons, including friction; and the rope leading from the winding drum to the head sheave makes an angle of 50 deg. with the horizontal?

Ans.—In this case, the stress in each branch of the hoisting rope is 10 tons (20,000 lb.). If the shaft is vertical, the angle the rope will make in passing over the sheave, or the angle between the two branches of the rope, will be $90 - 50 = 40$ deg. Referring to the accompanying figure, the relation of the forces acting on

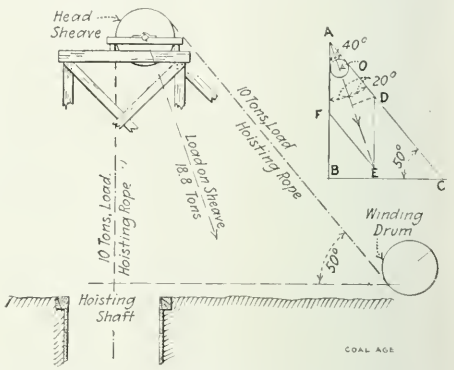


Diagram Showing the Direction and Intensity of the Load on Head Sheave in Hoisting

the sheave and the resulting load on the axle is clearly shown in the small diagram at the right. The center of the sheave being at O, the two branches of the rope are extended to meet at A, and the angle BAC is $90 - 50 = 40$ deg. The parallelogram of forces is represented by the figure, $ADEF$. Since the load on each branch of the rope is the same, $AD = AF$ and the sides of the parallelogram of forces are all equal. The diagonal AE represents the direction and intensity of the resulting load on the axle of the sheave. This load is calculated thus:

$$L = 2\ W\ cos\ \tfrac{1}{2}\ (90° - 50°) = 2 \times 10\ cos\ 20° = 20 \times 0.94 = 18.8\ tons$$

Ques.—Calculate the diameter of an extra-strong, cast-steel, 6-strand, 19-wire rope required for hoisting in a shaft 650 ft. deep. The mine cars weigh 1600 lb. and have a capacity of one ton, each; the weight of the cage is 2400 lb. Allow one-tenth of the total load hoisted, for friction.

Ans.—The load hoisted at one time is coal, 2000 lb.; car, 1600 lb.; cage, 2400 lb.; total, 6000 lb. Allowing one-tenth for friction, the load on the rope is $6000 + 600 = 6600$ lb. Using here a factor of safety of 6 and making allowance in the calculation for the weight of the rope hanging in the shaft, the depth of the shaft being 650 ft.; the required diameter of the rope for this load will be

$$d = \sqrt{\frac{6 \times 6600}{39 \times 2000 - 6\ (1.58 \times 650)}} = 0.74, \text{ say } \tfrac{3}{4} \text{ in}$$

The constant 1.58 is the weight, in pounds per foot, of a 1-in. rope.

SOCIOLOGICAL DEPARTMENT

Safety the First Consideration

By Peter Westleigh*

SYNOPSIS—The United States Coal & Coke Co. has adopted the motto of the other subsidiaries of the United States Steel Corporation as its own and is doing its best to make the mines safe. The importance of having sufficient power in equipment to do the work demanded of it is emphasized as an item in mine safety.

"Safety the first consideration" is the slogan which has been adopted by the United States Coal & Coke Co. and other subsidiaries of the United States Steel Corporation. This company operates 12 mines around Gary, McDowell county, controls several thousand acres of coal lands and has an average daily output of 15,000 tons. All of the mines are easily reached from Gary, the most remote being No. 12, which is twelve miles from the town. At all the mines the cutting and shooting is done at night and the coal is loaded and hauled out during the day.

All the mines are drifts with the exception of mine No. 1, which is a shaft and No. 2, which is a slope. The coal seams vary in thickness from 4 ft. in No. 3, to 9 ft. in No. 12. The mines all receive their power from a central power house located in Gary, the power being transmitted by high-tension feeder lines supported in some places by steel towers and in others by wooden poles. At each of the mines is a substation, at which an electrician is constantly in charge and which is frequently visited and inspected by the chief electrician of the company, who also inspects, once each month or six weeks, the entire electrical equipment and any new wiring which may have been done in any part of the mine.

All employees in or about the various mines are required not only to conform to the state mining laws, but also, with the rules and regulations of this company which are more stringent and more exacting than the former. All their employees are urged to report the presence of any unusual danger which they may encounter, rather than begin work under threatening conditions; thus the number of serious injuries has been reduced to a minimum.

Illuminated Warning

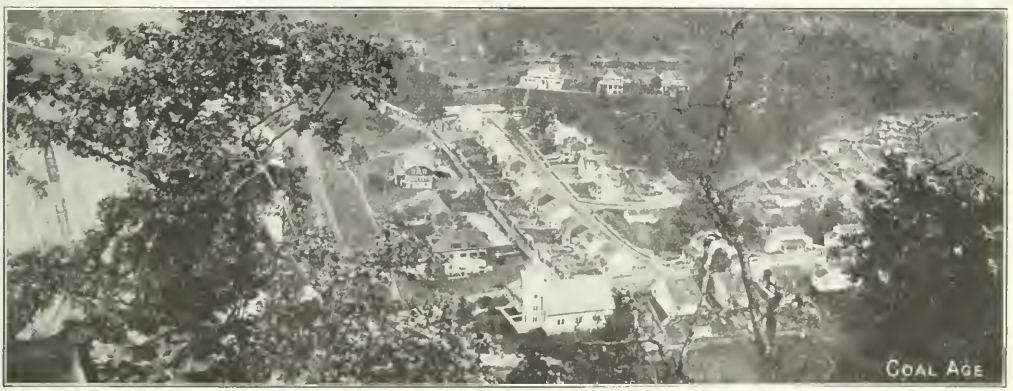
At the entrance of each mine, there is placed a large sign, with conspicuous letters, illuminated at night.

THE PREVENTION OF ACCIDENTS AND
INJURIES BY ALL POSSIBLE
MEANS IS A PERSONAL DUTY
WHICH EVERYONE OWES
NOT TO HIMSELF ALONE, BUT
ALSO TO HIS FELLOW WORKMEN

This sign is the last thing the miners see as they enter the mine, and it serves to remind them constantly that the care of their limbs and lives is important and not to be ignored.

The illustration of mine No. 7 shows how conspicuous these signs are and how continually they confront the miners. One is shown directly over the entrance of the mine, another on the side of the foreman's office.

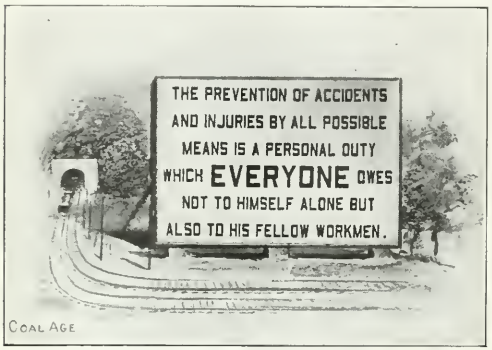
In the actual process of mining the precautions taken by this company are much more stringent than those required by the state mining laws. Crosscuts are driven at such intervals as are considered necessary, regardless of the lesser legal requirement, and the minimum ventilating current is 12,000 cu.ft. per min. in the last breakthrough of every pair of headings, whether working or not. The company requires that props be set within 6 ft. of the working face, although there are but few places where these props are actually necessary.



The Village of Gary Seen from the "Camel's Back," Showing Catholic Church, Office and Clubhouse on the Middle Left

*Columbus, Ohio.

On all roads where more than one car is hauled at a time the haulageway is driven wide enough to allow 2½ ft. clearance on each side of the mine cars so that a trip may be passed in safety at any point. This applies to all parts of the mine with the exception of the rooms. On main haulage roads where large trips are hauled


THE PREVENTION OF ACCIDENTS
AND INJURIES BY ALL POSSIBLE
MEANS IS A PERSONAL DUTY
WHICH EVERYONE OWES
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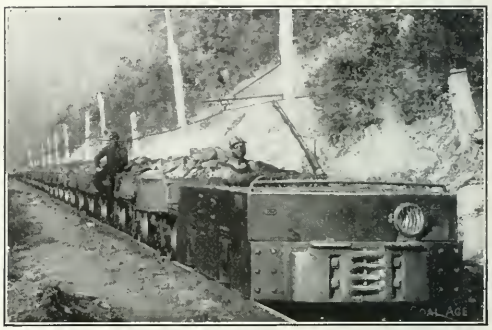
ALSO TO HIS FELLOW WORKMEN.
COAL AGE

THE MOTTO OF THE UNITED STATES COAL & COKE CO., AT GARY, W. VA.



13-TON ARMORPLATE MOTOR HAULING A 212-TON TRIP UP A 1% GRADE

"refuge holes" are provided in addition to the above. These are cut in the coal at stated intervals and kept whitewashed.

GOOD EQUIPMENT AND SAFETY

Every precaution is taken not only in the method of operation, but also in the selection of equipment which has been designed with safety as a prime factor, equipment that will not only give perfect service and afford the maximum output, but will also insure the workmen against the possibility of danger during the operation of the same.

The United States Coal & Coke Co. has adopted the 13-ton "Armorplate" type locomotive as standard haulage equipment, not only because it renders perfect service, but because safety was given careful consideration in its design and construction.

"Safety the first consideration" is also the slogan for the locomotive motorman, as may be seen in the accompanying illustration, showing the motto prominently displayed on the side frame. This legend is repeated on the other side.

Great, powerful locomotives they are, with a frame constructed of solid steel similar to the armorplate used on battleships. This makes the frame absolutely indestructible, and insures the motorman against serious injuries which would ordinarily result from a collision with rolling stock or rib.

The capacity of the motors is such that the locomotives are able to haul heavy trips with great ease, which feature is especially valuable in view of the fact that it permits a schedule to be made for all haulage locomotives.

It is absolutely necessary that they should always be "on time," in order not only to insure the maximum output, but also to prevent personal injuries or serious damage to property, which might result as a failure to heed the importance of this fact. This requires locomotives with a record for reliable service.

The locomotives in operation at this company's mines not only have motors of unusual capacity, but are also designed to control heavy loads on steep grades. This feature itself has averted many accidents.

The power of "Armorplate" type locomotives is shown in the accompanying illustrations, which are reproduced from photographs taken at the mines of the above mentioned company. The illustration of a trip at mine No. 6, south of Gary, shows a 13-ton locomotive approaching the tipple and hauling up a 1 per cent. grade a trip aggregating 212 tons.

A CLEAN AND SANITARY TOWN

The headquarters of the United States Coal & Coke Co. is situated at Gary, McDowell County, on the Norfolk & Western R.R. The offices of the coal company, also their power house and machine shop are located

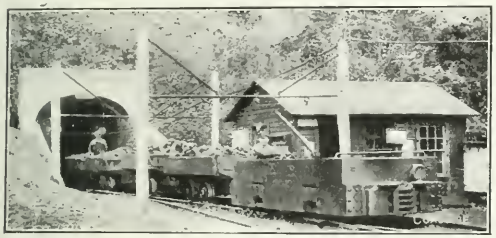
THE SIGN COUNSELING SAFETY DECORATES THE LOCOMOTIVE ON EACH SIDE PLATE. A TRIP AT NO. 3 MINE

there. All are stone buildings, tile roofed and as well constructed and modern throughout as one would find in any city.

The first impression one receives on entering the village is most favorable, as its appearance is far in advance of most mining towns. In fact, it reminds one of a quiet country town, so invisible are the coal mines from most parts of the village. In matter of years the town is as yet in its infancy, but marked improvements are already being made to insure sanitary conditions and nothing is left undone which will promote the health and comfort of its inhabitants, or add to the attractiveness of their homes.

The houses are better equipped than many of those occupied by mechanics in towns and cities. They are all fitted with electric lights and have water in the kitchens, as the company realizes the imposition which is often placed upon the female members of the family in mining communities in having to carry water for long distances and pump it from deep wells. This provision also promotes better sanitary conditions and more cleanliness among the people.

There is also a sanitary committee appointed for each plant, composed of the householders with the resident physician in charge, which makes regular examinations and reports on the sanitary condition of the houses and towns.



No. 7 Mine, United States Coal & Coke Co., with Signs on Drift and Foreman's Office

The houses are built not less than 50 ft. apart, and the yards are all fenced in, giving to each householder ample room for a yard and garden, and a premium at each plant is offered every year by the company to the householder who has the best kept vegetable garden and yard.

Schools and churches of every denomination are found at the plants, and there is now under course of erection at Gary a high-school building which will give parents an opportunity to educate their children at trifling expense.

The rapid advance so readily noticeable is entirely due to the policy of the management of the United States Steel Corporation. That company looks after the welfare of its employees and affords them every convenience possible. The president of the United States Coal & Coke Co., Thomas Lynch, is a man who has had a wide experience in the mining industry, having been in charge of the coal-producing plants of the Carnegie steel companies long before the United States Steel Corporation was formed, and it is entirely due to his untiring efforts that the company has made such rapid advance in the protection of its men from the dangers of the mine and in the development of comfortable villages for its many employees.

Southern Appalachian Coal Operators Association

Special Correspondence

The annual meeting of the Southern Appalachian Coal Operators Association was held in Knoxville on Tuesday, Feb 11. Those who continually harp on the alleged fact that coal men, and especially coal operators, cannot get together should have been present on this occasion. So successful was this meeting, that invited guests who have visited annual meetings of many societies, declared that this association surpassed all others in effective, coöperative work along all lines.

Starting three years ago with a few members who were determined to bring the operators together in a legitimate manner in order to place this field upon a business basis, they increased in numbers and coöperated under the leadership of the president, E. A. Morton, who has been president for these three years, until they developed a strong working body, which has accomplished much for the field.

Upon the refusal of President Morton to stand for re-election, E. C. Mahan, general manager of the sales department of the Southern Coal & Coke Co., was elected to that position. The following operators, all representative men from different districts in the field, make up the official list for 1913:

President, E. C. Mahan, Knoxville; first vice-president, J. L. Boyd, Knoxville; second vice-president, C. S. McManus, Knoxville and Middlesboro; secretary, James E. McCoy, Knoxville; executive board, C. M. Moore, Careyville, Tenn.; E. A. Morton, Knoxville; L. I. Coleman, Knoxville; J. B. Campbell, Atlanta, Ga.; T. I. Stephenson, Knoxville; H. M. La Follette, LaFollette, Tenn.; A. Gatliff, Williamsburg, Ky., James R. Wooldridge, Wooldridge, Tenn.

There are now 80 companies in the association, representing from 80 to 90 per cent. of the tonnage of the field. The report of the secretary showed ample resources to meet all obligations with a handsome surplus on hand, and the financial outlook for 1913 equally bright.

The credit bureau, with a collection department, is much used and acts as a clearing house for credit inquiries and information. The newly elected president, E. C. Mahan, suggested that the association should also act as a clearing house for operating data and that an exchange for ideas and experience in economical operating should be established.

As a number of the large operations in southeastern Kentucky which are just getting into the producing class, produced practically no tonnage in 1912, they will add considerably to the income and importance of the association during the coming year. A traffic bureau, with an expert rate man in charge, is a new feature added during 1912 and it has already shown its value.

A campaign of publicity to create public sentiment in favor of the state abolishing its mine in which convicts are employed, and the placing of them on the roads, is being successfully waged, and it is hoped that some relief will be secured during the legislative session of this year.

A banquet was held at the Hotel Colonial in the evening with James R. Wooldridge as toastmaster. Walter H. Finley spoke on "Scientific Management," and emphasized the point that the human element should be given as careful consideration as the most costly machinery. W. C. Tucker, general manager of the Wisconsin Steel Co., with coal and coke operations at Benham, Ky., spoke on "The Relation of Welfare Work to Production."

C. J. Norwood, chief mine inspector of Kentucky, made "Some Observations Touching Accidents in Coal Mines." J. F. Callbraith, secretary of the American Mining Congress, pleaded for some legislation permitting the operators to combine and arrange prices in a legitimate manner so as to obtain a fair price and profit from their product.

About one hundred and twenty-five members sat down to the banquet table and nearly all were the highest executives in the different departments of their companies.

⁂

Firedamp may be given out from freshly-cut coal, from cracks or fissures in the roof, from the gob or waste, from blowers either in the seam itself or in the strata. In gaseous seams it often escapes with a singing noise and a crackling of the coal. On wet faces small bubbles are often formed by the escaping gas. The presence of firedamp depends in a great measure upon the character of the roof. A soft roof will pack tightly, while a hard roof does not pack so tight, but leaves plenty of space for the collection of gas. Diluted firedamp can be breathed and nothing less than a 50 per cent mixture will affect respiration seriously.

COAL AND COKE NEWS

Washington, D. C.

Developments during the past week indicate that the Federal Government has no intention of abandoning its attack upon the anthracite coal combination, but that it has decided to adopt a new method. As a result of application made by counsel for the Government, the United States Court at Philadelphia, on Feb. 19, dismissed the suit of the Federal Government against the Philadelphia & Reading R.R. Co., in which it was charged that the company was violating the "commodities clause" of the railway rate law.

The Government claimed that the railroad company was violating that section of the law which forbids a line from transporting commodities in which the company has an interest and sought an injunction restraining the road from transporting coal dug from its own mines. In this connection it named as a codefendant the interests allied to the railroad company. The order dismissing the case states that the action taken is without prejudice and will not prevent the Government from bringing another action on the same line.

This dismissal, it is understood, was secured for the purpose of clearing the way for consideration of the position of the road, both under the Sherman law and under the commodities clause of the railroad law. This is the next step in the policy which seems to have been initiated by the civil suit filed a few days ago at Trenton, and charging the Lackawanna R.R. and the Lackawanna Coal Co. with violations both of the Sherman law and the commodities clause. There is no official statement as yet as to how far this policy is likely to be carried.

Bureau of Mines Appropriations

In the Sundry Civil Bill, just reported to the House of Representatives by the Appropriations Committee, the following appropriations are made for the Bureau of Mines for the coming year:

For the general expenses of the Bureau of Mines, including the pay of the director and the necessary assistants, clerks and other employees in the office at Washington, D. C., and in the field, and for every other expense requisite for and incident to the general work of the Bureau of Mines in Washington, D. C., and in the field, to be expended under the direction of the Secretary of the Interior, $70,000.

For the investigation as to the causes of mine explosions, methods of mining, especially in relation to the safety of miners, the appliances best adapted to prevent accidents, the possible improvement of conditions under which mining operations are carried on, the use of explosives and electricity, the prevention of accidents, and other inquiries and technologic investigations pertinent to the mining industry, $347,000.

For the analyzing and testing of the coals, lignites, ores, and other mineral fuel substances belonging to or for the use of the United States, including personal services in the Bureau of Mines at Washington, D. C., not in excess of the number and total compensation of those so employed during the fiscal year nineteen hundred and twelve, $135,000.

For inquiries and investigations into the mining and treatment of ores and other mineral substances, with special reference to safety and waste, $100,000: Provided, that no part thereof may be used for investigation in behalf of any private party, nor shall any part thereof be used for work authorized or required by law to be done by any other branch of the public service.

For one mine inspector for duty in Alaska, $3000.

For per diem, subject to such rules and regulations as the Secretary of the Interior may prescribe, in lieu of subsistence at a rate not exceeding $5 per day when absent on official business from his designated headquarters, and for actual necessary traveling expenses of said inspector, $3500.

For technical and scientific books and publications and books of reference, including payment in advance for subscriptions to publications, $1500.

For the purchase or lease of the necessary land, where and under such conditions as the Secretary of the Interior may direct, for the headquarters of five mine-rescue cars and for the construction of the necessary railway sidings on the same, $2000: Provided, that the Secretary of the Interior is hereby authorized to accept any suitable land or lands that may be donated for said purpose.

In all, for the Bureau of Mines, $662,000.

Concerning the Corporation Tax

After careful inquiry Commissioner of Internal Revenue Cabell has issued the following statement as to the corporation tax:

"There have been several inquiries as to the application of the regulations relative to an allowance for an unearned increment in the ascertainment of net income of mining corporations for the special excise tax on corporations, which indicate that the true intent of the regulations is not understood. The fact has also developed that many corporations, in their attempt to apply the regulations, begin with a current unit valuation of the product concerned instead of the en bloc value as of Jan. 1, 1909, as is required. The manner of entering the ascertained valuation as of record has also been neglected and misunderstood.

In order to make the requirements of this office plainer and to assist corporations in arriving at valuations which shall not be speculative in character nor founded upon the future profits and earnings of the corporations which should belong to the period during which they are earned, and in order that no portion of income which really belongs to any particular year shall be ascribed to or allotted as the earnings of previous years, items Nos. 99, 100, 101 and 103 of T. D. No. 1742 are modified so as to read as follows

"No. 99. The note is amended so that it shall read:

"'Values, as aforesaid, should not be estimated on the basis of the assumed salable value of the output under current operative conditions, less the actual cost of production, because, as hereinbefore stated, the selling price, under such conditions comprehends a profit both for carrying the investment in coals, etc., improvements and working capital, and for conducting operations in respect of production and disposal of product. The value to be determined as stated must be en bloc of the entire deposit of minerals and mineralized property owned, exclusive of improvements and development work, if the same were disposed of in that form.'

"No. 100 is amended to read:

"'The unit value as of Jan. 1, 1909, ascertained as above outlined, would indicate the value to be attached to that date to the capital assets disposed of during any calendar year succeeding. The amount claimed as a deduction from gross income on account of unearned increment shall be shown separately in the deductions from gross income in the return of annual net income.'

"No. 101 is amended to read:

"'The precise detailed manner in which the estimate of value of minerals, etc., as at Jan. 1, 1909, shall be formed, must naturally be determined by each corporation interested. Every corporation claiming and making a deduction for unearned increment as provided in section 100 preceding, shall maintain an official book record of the properties owned by it in connection with which unearned increment is claimed, and which record shall show the general ledger or general balance sheet value thereof, together with the estimated amount of appreciated value in such properties in excess of general balance sheet values, as of Jan. 1, 1909, together with all evidence and information on basis of which such appreciated value was formed. This estimate must be formed on the lines and basis indicated in the 'note,' Section 99, namely, the salable value of the entire deposit considered en bloc. This record should also present clearly and fully the transactions during each year in respect of quantities of minerals disposed of and for which deductions are made, respectively, for depreciation and unearned increment, together with the amount thereof. No deduction for unearned increment will be allowed unless the aforesaid record is kept, nor unless the evidence as to the estimates of quantity of minerals in deposit and the valuation thereof are accepted by the department Values determined and recorded as of Jan. 1, 1909, as aforesaid, should be used in the compilation of all subsequent years' excise tax returns.

"In case it subsequently develops the property possesses a greater quantity of mineral, etc., reserve than was in the aggregate estimated as of Jan. 1, 1909, only such an amount of aggregate value can be assigned to such excess mineral tonnage as of Jan. 1, 1909, as it was at said date estimated by the company attached to the property and was not assigned by it, as hereinbefore provided, to the specified tonnage in the property.

"No. 103 is amended to read:

"'As the amount to be deducted for depletion of deposits (Regulation No. 101) is to be formed on basis of the estimated reserve of minerals, etc., it follows that if it develops such estimate is understated, the cost, investment and estimated unearned increment in the capital asset may be wholly extinguished before all mineral reserves are removed. When this is reached, further deductions for exhaustion of minerals should be discontinued.

"Collectors of internal revenue will make requisition for the necessary number of these amendments and furnish a copy to each corporation interested."

PENNSYLVANIA

Anthracite

Ashland—The Scranton Coal Co. has reported to the Pennsylvania Mine Code Commission that they will allow one-half the value of the property under $3000 if damaged by mine caves. On all properties valued at more than $3000, they will allow half valuation or agree to sell underlying coal subject to royalty agreement.

Archbald—The White Oak colliery of the Delaware & Hudson Co., which resumed operations Feb. 10, after an idleness of eight days, due to a strike, was forced to close down again owing to the burning of the fan house. The company officials arranged to replace the damaged machinery, and an effort was made to operate part of the colliery the following day. There are 800 men and boys employed in the plant. It is supposed that the cause of the fire was a hot journal.

Wilkes-Barre—President White of the United Mine Workers is trying his hand in the anthracite region to stamp out

the petty strike habit. Mr. White says that there has been a tendency to over-step the agreement in the anthracite field by declaring petty strikes. He further states the welfare of the miner's organization depends upon standing firmly by their agreements.

While eight men were being lowered to work in the Alden shaft of the Susquehanna Coal Co., Feb. 13, the drawhead on the mine carriage pulled out and the cage dropped a distance of 200 ft. before the safety devices worked.

The annual summer meeting of the Coal Mining Institute of America will be held in Wilkes-Barre on June 17, 18 and 19. This will mean a gathering of several hundred coal operators, inspectors, engineers, and superintendents from all the soft-coal states, as well as the local men allied with the coal interests. This is the 56th semi-annual meeting of the institute.

Easton—Officials of the Lehigh Valley Coal Co. are canvassing their employees at Mahonoy City for sentiment on a proposition to pay $75 to the widow or dependent of victims of a mine accident, provided the remainder of the men agree to work on the days of funerals.

Bituminous

Mt. Pleasant—Differences between the Brush Run Coal & Coke Co. and their employees have been adjusted and the 40 men who have been idle several days have returned to work. It appears that the men had difficulty with a certain boss whom the company has discharged after a careful investigation of the matter.

Connellsville—Secretary T. B. Dilts, of the State Y. M. C. A. Mining Department, has opened a new Y. M. C. A. building in the mining town of Jerome.

The United Coal Co. has erected the building, a modern two-story structure, 24x100 ft., and has equipped it with bowling alleys, reading rooms and class rooms.

Arcadia—The plant of the Pennsylvania Coal & Coke Corporation at mine No. 41 has been destroyed by fire, entailing a total loss of about $25,000 and throwing 120 men out of work. The company had been making extensive improvements at the plant and intended to abandon that part which the fire destroyed. A new power house, boiler house, and motor barn of brick construction will be completed within a short time.

Pittsburgh—In the recent convention of District No. 5 of the United Mine Workers in the Labor Temple a sympathetic strike of the miners in western Pennsylvania to aid the strikers in West Virginia was urged strongly. The proposal was finally defeated after a stirring debate.

Du Bois—The miners of this region are planning to aid, in a financial way, the strikers of West Virginia fields. Local No. 2722 has decided to assess its members $1 each as a starter for its fund. It is said that $3000 will be sent to the strike zone within the next few weeks.

WEST VIRGINIA

Charleston—Delegate W. W. Wertz has succeeded in forcing his anti-mine guard bill through the house in the face of strong opposition. This measure prohibits the sheriff of any county from appointing deputies to act as mine guards in the pay of private corporations. The measure was carried by a vote of 45 to 31.

It is expected that the Illinois mine workers, in their annual state meeting, will ask President Taft to intervene in the long drawn-out strike in the West Virginia field.

Elk Ridge—A coal tipple of the M. B. Coal Co. was destroyed by fire, Feb. 18, causing a $40,000 loss. There appears to be some doubt about the origin of the fire. The incident at Elk Ridge is the first serious trouble under the present proclamation of martial law.

Military authorities in Paint Creek Junction have announced that, of the 128 prisoners arrested in the strike zone recently, 50 have been released.

ALABAMA

Birmingham—In the effort to enforce the state mining law during the past year, 108 arrests have been made at the instance of the state mine inspector. Certificates of five mine officials have been revoked by the state mining board and certificates of three mine officials are being held, pending the action of the State Board of Examiners.

KENTUCKY

Louisville—An interesting tentative program has been arranged by Prof. H. D. Easton for the annual meeting at Lexington of the Kentucky Mining Institute on May 15, 16 and 17. The first-aid competitions between teams from various mines, which will be one of the most interesting features of the meeting, will probably be held on the first day of the meeting. The second is to be given over to the formal program, and the third to discussions on various questions by mining experts.

OHIO

Bridgeport—The miners employed at the Lansing mine of the Lorain Coal & Dock Co., are on strike because the blacksmith has been discharged. Four hundred men are employed at the mine.

Gallipolis—Three barges of coal belonging to the Campbells Creek Coal Co. were sunk Feb. 13, when the tug boat, Robert T. Gillehan, collided with the cofferdam. Rivermen pronounce the new cofferdam a menace to navigation.

INDIANA

Indianapolis—The shotfirers bill has been passed by the Indiana House by a vote of 84 to 3, and now goes to the Senate. The miners have been trying to get such a bill through for six years. It provides that the shotfirers shall be employed by the operators. The bill provides that the law shall become operative in April, 1914, so that the parties to the next two-year contract between operators and miners, will have full notice of the proposed new law. Under the present shotfirers law, the miners pay the firers, as their appointment is made for the miners' convenience.

Terre Haute—Five hundred cars of coal have been under an embargo on the Big Four road. A complaint was made to the Indiana Railroad Commission and an order was issued for officials of the operating department of the road to appear before the commission and explain why the road had refused to remove the coal. At the offices of the railroad company it is said that the entire tonnage will be removed as soon as possible.

ILLINOIS

Chicago—The Chicago and Northwestern Ry. has awarded a trophy to the rescue team at its mines at Gillespie. This team made the best showing in a contest held recently by the company. The contest is open to all first-aid workers in the state and the winners are declared the champion team of the state of Illinois. Similar contests in the interest of first aid are held by the Superior Coal Co.

Eldarado—Five men were buried by a cave-in caused by an explosion in the Seagraves mine, Feb. 20. Three others were hurt.

Canton—Operations in the mine of the Norris Coal Co. have not yet been resumed, due to the fact that State Mine Inspector Taylor has not completed his investigations to his satisfaction since the time he ordered the mine to be shut down.

MICHIGAN

Grand Rapids—This city is to sell coal at $7.50 per ton to its people. This will afford a saving of $1.60 a ton to the citizens from the price charged by local dealers.

Battle Creek—A rich seam of coal is supposed to be located under a considerable portion of the city and men are attempting to get options on property, beneath which they believe the coal is located. An analysis of this coal has shown it to be of good quality.

KANSAS

Pittsburg—There has been a strike rumor flying over the district for several days to the effect that there is a threatened strike among the coal miners of Cherokee County. It is claimed by those in a position to know that the report is without foundation.

CALIFORNIA

San Francisco—Eight indictments charging criminal conspiracy to defraud the U. S. Government were returned yesterday by a Federal Grand Jury against eight officers and employees of the Western Fuel Co. The investigation disclosed an alleged conspiracy whereby the Government was defrauded out of $450,000 or more in drawing back payments on imported coal resold by the company for use outside the United States.

FOREIGN NEWS

Winnipeg, Can.—It is reported that 72 men have been killed at the Silwash Peak mines at Yale, B. C.

Berlin, Germany—Four miners were killed by an accident Feb. 15 in the Wiecke colliery, near Mulheim, in the Westphallan coalfield.

Vancouver, Can.—The refusal of the Britannia Mining & Smelting Co. to recognize the Western Federation of Miners has resulted in a walk-out in the company's mines. The company employs about 6000 men.

PERSONALS

James F. Thompson, until recently division superintendent of the Colorado Fuel & Iron Co., has been appointed superintendent of the coal mining operations for the Cerrillos Coal Co. at Madrid, N. M.

W. H. Webster has been appointed new traveling coke agent for the Baltimore & Ohio in the Connellsville region, with headquarters at Uniontown. H. C. Tucker, the former representative, has been transferred to Cleveland.

Godwin H. Powel, of Penrallt, Weston-Super-Mare, England, managing director of the Mount Carbon Co., Ltd., arrived in New York on Feb. 18, and is spending the time betwen the 21st and 27th at the company's operations at Powellton, Fayette County, W. Va. Mr. Powel will sail again for England on Mar. 1.

OBITUARY

William E. Cassidy, aged 54, vice-president of the Cassidy Coal Co. and the Bell-Jellico Coal Co., of Lexington, Ky., died recently at his home in that city from a paralytic stroke sustained ten days before his death. Mr. Cassidy had been engaged in the coal business in Lexington for about 16 years. His wife, who has been seriously ill for about a year, survives him, as well as a daughter and a brother, T. D. Cassidy, of Lexington.

PUBLICATIONS RECEIVED

Goulds Rotary Pumps. Bulletin No. 113. Published by the Goulds Mfg. Co., Seneca Falls, N. Y. The bulletin describes the characteristic features of construction and operation of the Goulds rotary pump. 16 pp.; 7¾x10 in.; ill.

Eighth Biennial Report of the State Mine Inspector of the State of Utah, 1911-1912. 170 pp.: 6x9 in.; ill.

Lightning Arresters. The Electric Service Supplies Co., Philadelphia, Chicago and New York, has issued its 1913 edition of catalog of the Garton-Daniels lightning arresters and other lightning protective apparatus.

In this book is given much information relative to lightning phenomena, installation of lightning arresters, grounding, distribution, inspection and other allied subjects

Its pages illustrate and describe the complete line of Garton-Daniels lighning arresters, a new line of panel-board lightning arresters cataloged for the first time by this company, high- and low-voltage choke coils and disconnecting switches, grounding apparatus, etc.

The last eight pages of this catalog are given over to installation diagrams, through which it is possible at a glance not only to learn the proper method for installing lightning arresters on any circuit, either d.c., a.c. or arc, but also to select exactly the type of arrester which is best suited for the protection of any class of circuit.

The catalog as a whole is well gotten up, intensely interesting, beautifully illustrated and printed, and is a book which every electrical man should have.

CONSTRUCTION NEWS

Kansas City, Mo.—An English syndicate is to begin at once to develop the Christy coal tract in the Waverly-Lexington field.

Morgantown, W. Va.—Three large steel companies are interested in coal in Greene County and extensive developments are expected during the early spring. The Crucible Co. has already begun the operation of its 8 holdings.

Salt Lake City, Utah—Within the next year the Utah Ry. Co., which is building a line between Provo and Mohrland will expend more than $1,500,000 for coal cars. The company is now considering the initial purchase of 500 of these cars at a cost of $500,000.

Pottsville, Penn.—The Philadelphia & Reading Coal & Iron Co. has installed steam heating apparatus at the several bottoms and at each of the shanties of the Locust Gap colliery, where the miners congregate at the end of their day's work, while waiting to be hoisted to the surface.

Harlan, Ky.—A new road is being built in Harlan County, Ky., extending from Harlan several miles up Martin's Fork to the Hall and other large coal holdings, which are among the richest in the county. The right-of-way has been secured, and grading will begin as soon as spring opens.

Baltimore, Md.—The Baltimore & Ohio R.R. Co. has under construction a third track between Rockwood and Garrett, Penn., on the Connellsville division of the road. The completion of this track will give the road additional facilities for the movement of its coal traffic out of the Somerset regions.

Charleston, S. C.—The directors of the Carolina, Clinchfield & Ohio R.R. have approved plans for the construction of modern coal piers at Charleston. The work will be started as soon as the bids have been passed on and it is expected that coal will be shipped from the piers by the end of the year.

Philadelphia, Penn.—The Philadelphia & Reading R.R. Co. is constructing a new coal pier at Port Richmond on the site of old pier No. 18. It will be 765 ft. long by 70 ft. wide, and of concrete construction. It is estimated that the work will be completed and the pier in operation some time during the summer or early fall.

Lexington, Ky.—The Lexington & Eastern R.R. proposes immediately to begin the construction of a 4-mile branch up Yount's Fork, of Boone Creek, in Letcher County, in order to tap the extensive holdings of the Mineral Development Co., a Philadelphia corporation. The branch will be rushed to completion as rapidly as possible.

Martin's Ferry, Ohio—Work is progressing rapidly at the new mine of the George M. Jones Co. at Wegee. The main shaft has been sunk and work is being done on the archways of cement. The shaft will also be of concrete. A temporary wooden tipple will be constructed so that there will be no delay while the material for the steel structure is on the way.

Martin's Ferry, Ohio—The Rail & River Coal Co. is planning extensive improvements in all its properties which will involve an expenditure of $250,000. A new steel tipple is to be built at No. 3 mine, which will more than double the output. Power will be supplied to all openings by a central station. The improvements also include the erection of 100 houses.

Livingston, Ky.—A railroad some 30 miles in length is projected between Livingston and McKee, by the owners of coal lands in Rockcastle and Jackson Counties, in order to open up their properties to development and connect with the Louisville & Nashville at Livingston. The road has been incorporated with a capital stock of $10,000 under the name of the Rockcastle R.R. Co.

Fairmont, W. Va.—The Mineral Fuel Co. has purchased between 4500 and 5000 acres of coal land in Letcher County, Kentucky and is planning an expenditure of approximately $700,000 for opening mines, constructing plants, installing machinery, building houses, etc. The annual output is to be 750,000 tons. The property was purchased from the Mineral Development Co., of Philadelphia.

Fosterburg, Ill.—The Clark Bros. syndicate, of Philadelphia, is projecting a railroad from here to Alton, and contemplating the sinking of several mines here to furnish coal for the several electric lines that they control. They have organized the East Side Coal & Mining Co. as the operating end, and have bought a site for a power house in Alton at a cost of $25,000. The coal land in this vicinity has never been worked, on account of lack of transportation facilities.

NEW INCORPORATIONS

Cleveland, Ohio—The Cleveland Western Coal Co.; capital stock, $250,000; to mine and deal in coal.

Connellsville, Penn.—The Stanton Georges Creek Coal Co.; capital stock, $50,000; to mine coal near Frostburg, Md.

Spokane, Wash.—The Peerless Roundup Coal Co.; capital stock, $500,000. Incorporators, L. G. Nash, M. J. Tait, et al.

Memphis, Tenn.—The National Coal Saving Co.; capital stock, $10,000. Incorporators, S. L. Cockroft, Henry Burkurd, W. D. Beam, G. E. Petty and J. W. Wyatt.

Los Angeles, Calif.—Los Robles Land & Fuel Co.; capital stock, $100,000. Incorporators, E. G. Tilton, G. A. Nehrhood, E. F. Staples, J. O. Horton and C. E. Joslin.

E. Taplin, C. F. Taplin, C. N. Fiscus, W. S. Lister and A. C. Wald.

Morgantown, W. Va.—The Morgan Run Coal & Coke Co.; capital stock, $50,000; to carry on a general mining and coke manufacturing business in the Kingwood district. Incorporators, A. L. Foster, C. W. Zinn, N. C. Steel, A. J. Arnett and J. E. Hamilton.

INDUSTRIAL NEWS

Minonk, Ill.—Webber & Sutton have recently purchased a 120-kw. generator for their coal mine at this place.

Emlenton, Penn.—A $1,000,000 coal deal involving 10,000 acres of high-grade fuel in Somerset County is being closed by the Penn-Quemahoning Coal Co.

Collinsville, Penn.—In the Windber field, during the past year, the Berwind-White Co. has had an output of 4,000,000 tons. Fourteen mines are in operation.

Pittsburgh, Penn.—Ten thousand two hundred and six acres of mineral land in Clearfield County have been sold by A. R. Balcom, of Philadelphia, to the Star Portland Cement Co. for approximately $1,000,000.

Tamaqua, Penn.—The Lehigh Coal & Navigation Co. has made a record output for the month of January, in Panther Creek colliery. The figures reached 330,000 tons, the largest for any single month in the history of the company.

Brazil, Ind.—On account of the poor market for domestic block coal, the Plymouth mine No. 1, of the Coal Bluff Mining Co., northwest of this city, has been closed until next fall. The mild winter has caused a big slump in coal markets.

Connellsville, Penn.—The Buffalo, Rochester & Pittsburgh Ry. has under option about 11,000 acres of coal land belonging to the New York Central. It is predicted that the railway will double-track its Indiana branch in the near future.

Washington, Penn.—It is reported that representatives of some of the big coal companies are trying to take out options on the Pittsburgh seam underlying a few farms near Old Concord. It is said that they are offering about $200 per acre.

Duquoin, Ill.—As a result of the general depression of the coal business a number of the largest mines in southern Illinois have suspended operations indefinitely. Two of the largest mines are the Big Muddy and Chicago and Carterville companies.

Connellsville, Penn.—Announcement has been made of the sale of 206 acres of coal underlying the farm of J. M. Clark, in Jefferson Township, to the Washington Coal & Coke Co., for $412,000. The coal will be operated by the purchasing company from the Star Junction plant.

Pineville, Ky.—Judge M. J. Moss and others have procured a lease on 1800 acres of coal land in the Harlan field and plan to begin development work at once. The land is owned by Judge W. F. Hall and lies on Martin's Fork. A 6-ft. seam of coal is to be opened at this time.

McAlister, Okla.—An application has been filed in the Supreme Court requesting the appointment of a receiver for the Choctaw, Newcastle & Western R.R., a small coal road in this section. The petition charges mismanagement and enumerates an alleged indebtedness of about $9000.

Fairmont, W. Va.—The Consolidation Coal Co. has issued its report showing its earnings from all sources for the year, 1912, to be $13,887,410, or an increase of nearly two and one-half million over the preceding year. The surplus for the year was about 10 per cent. of the full capital stock.

Pottsville, Penn.—The St. Clair Coal Co. has purchased a considerable amount of machinery used by the Nolan Bros. in their stripping contract at this place. The coal company will use the material in its own operations. The machinery purchase consists of a steam shovel and a number of locomotives.

Clinton, Ind.—It is reported that the Clinton Coal Co. is using compressed air to pump water from the flooded Crown Hill mine No. 1, west of Clinton. This is said to be the first time the system has been used in the Indiana coalfield. An electric pump hooked up to a 3-in. pipe had failed to reduce the water.

Glenrock, Wyo.—The Fairview Coal Co., which has been operating its mine at this place for the past two years, has recently put in a side track and is now preparing to increase its daily output. The old mines, which have lain idle for several years, have also taken on a new life and one is being operated on a small scale.

Pittsburgh, Penn.—It is reported that the Pennsylvania R.R. is contemplating the extension of its road from Marianna almost directly west to Hackney Station, and to Wheeling, W. Va. This will mean a new and quicker route of transportation from Wheeling to Pittsburgh, than that possessed by the Baltimore & Ohio, its chief competitor.

Whitesburg, Ky.—The Consolidation Coal Co. is now shipping from 20 to 30 cars of coal out from McRoberts per day, an average of from 140 to 175 cars per week. This output will, however, be increased, and it is said that by March 1 they will be shipping about 200 cars per week. They are now shipping more than 500 cars per week from their Jenkins mines.

Shamokin, Penn.—The local engineering department of the Philadelphia & Reading Coal & Iron Co. completed plans today for the sinking of a large new shaft at the Stirling colliery. The new opening will pierce several rich beds of anthracite coal, heretofore untouched or only partly worked. Arrangements were also made to sink a slope at North Franklin colliery.

Jasper, Ala.—The work on the big coal mine, owned by the Jagger Coal Co., is being pushed rapidly and it is expected that the mine will be in operation by the middle of the summer. The mine operates three seams, and each is said to range from 4 to 5 ft. of thickness. The coal is pronounced to be the best grade of steam and domestic coal found in the country.

Ironton, Ohio—The Semet-Solvay Co., of Syracuse, N. Y., is said to be negotiating with the furnace interests of Ironton for the construction of a byproduct coke plant at that place to supply coke in the immediate vicinity. The same interests are now building a plant at Ashland, Ky. It is reported that about $1,000,000 will be involved in the new plant and about 100 byproduct ovens would be included.

Lexington, Ky.—Representatives of 18 bituminous mines in western Kentucky are at Wilmington, Del., in conference with General T. Coleman DuPont, president of the DuPont Powder Co., relative to the consolidation of his large coal interests in that field with their company into one corporation, which will practically control all the large mine properties in that part of the state. The new corporation, if formed will have a capital stock of $15,000,000.

Connellsville, Penn.—Owners of a tract of 6000 acres of coal land lying between Stoyestown and Shanksville have been notified that options which were taken out about three months ago will be listed soon, and that the money, $50 an acre, will be received by the owners within a week. The company making the purchase is not known. The consummation of this deal will mean a transfer of about $300,000. With the exception of a few small mines, the tract of 6000 acres has not been opened; consequently, there is some speculation as to the point from which operations are to be commenced.

Buffalo, N. Y.—The educational force of the Lehigh Valley R.R. Co. has been teaching its firemen how to fire their engines economically. In the face of the fact that the road is running larger and heavier trains than it was a year ago, and that many new firemen were employed in the latter months of 1912, the consumption of coal per ton mile has decreased. In addition to the work of the road foreman of engines, who has the general supervision of this important task, expert firemen are assigned to train the new men and teach them how to economize in the use of coal.

The actual results secured during the last six months of the year 1912, show a net decrease of 5 per cent. in the amount of coal used per ton-mile as compared with the same period of the previous year.

Reading, Penn.—It is said that much money will be spent by coal companies in developing new operations in the Schuylkill district of the anthracite region in 1913.

The prosperous state of the anthracite coal market is inviting the investment of unprecedented amounts of capital in the business. The Philadelphia & Reading Coal & Iron Co., the Lehigh Valley Coal Co., the Lehigh Coal & Navigation Co. and the Pennsylvania Coal Co. are the leaders in developing new fields, but the independent firms are also taking an important part in the work, a feature of which will be the reopening of many collieries whose operation was abandoned as unprofitable.

The Madeira Hill Co. is spending $3,000,000 in opening up new collieries and remodeling old ones. It is suspected that within a year or two they will increase their shipments four fold.

Scranton, Penn.—The old Orangeville mine near Bloomsburg, which has been idle since the civil war, has been reopened and preparations are being made for taking out the coal.

COAL TRADE REVIEWS

GENERAL REVIEW

There is an abundance of individual hard coal being offered at prices well down to the regular Apr. 1 circular and only small tonnages are being placed. Even stove, which was in such heavy demand a short time ago, is now readily obtainable in carload lots. Consumers are keeping their requisitions down to a minimum in order to avoid having any surpluses when the April reduction goes into effect. Orders will gradually contract through the current month, to such an extent, as to force some curtailment in production at the mines.

Bituminous is in good supply, with orders scarce and operators unwilling to make sufficient concessions to move any considerable volume of coal. In the Coastwise trade, contracting is still being confined to inland business, few contracts being closed for water delivery, particularly among the larger consumers. If the high water-freights out of Hampton Roads continue in effect, the Pennsylvania grades all-rail will begin to supersede the West Virginia product at a number of the coastwise points.

The uncertain weather conditions have been such that they would cause a break in the stiffest market. Shipments generally are confined entirely to contracts, although to the north, in Canada, a comparatively heavy local demand has developed, which has tended to steady prices. The railroad movement in that section has also been quite slow and uncertain which has aided the situation materially and is the principal reason for the prices holding so well. There is considerable hesitation over new contracts; consumers are not offering to close and operators are affirming that prices are too low.

There is a fairly good retail demand in the Pittsburgh district, but contract consumers are showing a disposition to hold off because of the prevailing high prices. The trade in Ohio shows little if any improvement. The movement is being seriously restricted, in some instances, and Toledo is badly congested with coal. Ohio operators are eagerly looking forward to the opening of the lake shipping in anticipation of a heavy business the coming season. The Hampton Roads market continues to show a downward tendency and holders of speculative tonnages are in a difficult position. There has been a heavy dumping at the piers, but shipments are mostly on contracts, the demand for snot coal being light.

In the Middlewestern markets, prices were being freely cut in all directions when a drop of temperature and a heavy snowstorm occurred which steadied up the situation materially. The unfavorable conditions in this market were a result of over shipments on speculation and a heavy overproduction.

BOSTON, MASS.

Bituminous is in plentiful supply at all the terminals and orders are scarce. The spot market is lifeless, and the concessions made are not sufficient to move any volume of coal. Contract business has so far been confined for the most part to inland consumers who are supplied from points like Boston and Providence; tide business, especially for the large corporations, has not yet been closed to any extent. Buyers are tempering the situation and in view of the general outlook are likely to be slow coming into the market. Georges Creek is coming down only on orders, and generally there is lack of snap to bituminous in all directions, both all-rail and at tide. Mine prices are down to last year's range for March delivery.

The call for anthracite is spotty. There is an abundance of independent coal being offered at prices well down to the April circular, or 50c. less than the present company figures, but apparently only a small tonnage is being placed. No one wants egg, and the edge is off on the demand for stove and chestnut. Some of the companies, who are equipped with Eastern storage, are sending egg and chestnut to those points and stove coal that only a few weeks ago was next to impossible to get in any but small lots is now being freely offered in straight cargo shipments. Pea is also appearing in increasing quantities, now that the demand is falling off in the large cities.

It is apparent that the distribution business inland is being more and more confined to those agencies that are equipped to make deliveries by the day or by the week. So many of the mills have relatively small storage, as compared with consumption, that the distributor who is in a position to deliver just so much coal at stated intervals has much the advantage. The old method was to rely on rail or barge tonnage to arrive at times that could only be estimated, but now with large steam colliers seldom varying the time in transit or the number of trips in a season, the conditions are much changed. The larger consumers who have large storage facilities will undoubtedly continue to buy a share, at least, of their fuel requirements through the spring and summer, and usually they save a good deal by being in shape to do that.

Current wholesale quotations are about as follows:

Clearfields, f.o.b. mine	$1.25@ 1.40
Clearfields, f.o.b. Philadelphia	2 50@ 2 65
Clearfields, f.o.b. New York	2 80@ 3.00
Cambrias, Somersets, f.o.b. mines	1.35@ 1.60
Cambrias, Somersets, f.o.b. Philadelphia	2.60@ 2.85
Cambrias, Somersets, f.o.b. New York	2.90@ 3.15
Pocahontas, New River, f.o.b. Hampton Roads	2 60@ 2.70
Pocahontas, New River, on cars Boston	3.75@ 3 90
Pocahontas, New River, on cars Providence	3.75@ 3.85

NEW YORK

Bituminous—The bituminous market has shown a tendency to ease off still further during the past week and prices are slightly softer. It is reported in one instance that an indifferent grade of Clearfields has been offered down to $1.05 f.o.b. mine; such cases are, however, more the exception than the rule, and because of the uncertainty in quality, should not be accepted as any accurate criterion of conditions. There are large tonnages on hand at the piers, and rumors state that producers are beginning to curtail production, rather than sell at prevailing low prices.

Little or nothing is being done on next season's contracts, producers and consumers being hopelessly separated on prices. The companies are showing a determined effort to obtain advances over last year's figures of as much as 25c., in exceptional cases. Consumers on the other hand are naturally little interested in these high figures because of the declining spot market and the result is a deadlock. From present indications the buyers will not close contracts until forced to do so, and the ultimate figures will probably be a slight increase, on an average of about 5c. per ton, over last year's figures.

Bituminous prices have experienced a further decline during the week and we quote the nominal local market on both hard and soft coal on the following basis:

	Anthracite		Bituminous
	Circular	Individual	
Broken*	$5 00	4 75	West Virginia, steam	$2.60@2.65
Egg	5.25	4 70	Fair grades, Penna	2.65@2.70
Stove	5 25	5 25	Good grade, Penna	2.75@2 80
Chestnut†	5 50	5 50	Best miller, Penna	3 05@3.15
Pea*	3 50	3 75	Georges Creek	3.25@3.30
Buckwheat**	2.75	2 50		
Buckwheat†	2.45	2 35		
Rice**	2 25	2 25		
Rice†	1 95	1 90		
Barley†	1 75	1 20		

* Scranton and Lehigh. ** Scranton. † Lehigh and Schuykill.

Anthracite—Buying of hard coal is now confined entirely to immediate needs. Consumers are keeping requisitions down to the lowest possible minimum to avoid carrying any tonnages over Apr. 1, when the summer discount goes into effect. The orders will naturally be light from now on until summer stocking begins.

Locally few of the companies appear to be finding it necessary to put any coal in storage as yet. They are, however, already beginning to look forward to an early loading of lake vessels, for shipment into the Northwest. As a rule production at the mines is quite heavy, there being few interruptions. Last week there was some shortage of open cars, but not serious. In view of the reduced circular effective Apr. 1, orders will gradually fall off through this month until operators will be forced to curtail the production.

PHILADELPHIA, PENN.

It is commencing to look now as though the anthracite business, for the winter of 1912-13, was about done. All the dealers here claim to have stocks of coal sufficient to carry them over until the spring or opening prices are announced.

and with the cheap coal offered by the individual operators, there is no reason why they should load themselves up with any more coal at the full circular prices, than is necessary. It would take unusual conditions to bring about any particular active demand. Outside of stove and pea, there does not seem to be any call at all, and there is no waiting in line for stove. Pea coal is still a little short of the demand, although the dealers claim to have no difficulty in keeping up with their current business. It is simply a waiting game and any orders placed now are to piece out, until the usual spring reduction becomes effective.

Bituminous coal still continues in the same apathetic condition. While it is understood that contracts are being renewed at better figures than last year, at the same time current business is far from satisfactory. It is understood that there is a large accumulation of loaded cars at tidewater points, and if demurrage on these grows to any extent, there is likely to be some bargain coal on the market.

PITTSBURGH, PENN.

Bituminous—Retail demand is fairly good, while manufacturing continues rather light. It has been between seasons as to contracts, the next period being the year beginning Apr. 1. Against such contracts there has been only moderate inquiry thus far, consumers showing a disposition to hold off until the last moment, on account of the sizable advance in regular circular prices as compared with those of a year ago. Slack for immediate shipment continues to command a slight premium over the regular contract price of 90c., and is quotable at $1@1.10, while mine-run and screened coal are only moderately firm at regular prices, which we continue to quote as follows: Slack, 90c.; nut and slack, $1.05; nut, $1.25; mine-run, $1.30; ¾-in., $1.40; 1¼-in., $1.55, per ton at mine, Pittsburgh district.

Connellsville Coke—The coke market has continued its stiffening, until $2.50 is the regular asking price for good grades of furnace coke for prompt shipment, and most if not all the operators seem to think they ought to obtain more than this for a contract running to July 1. Curiously enough, there are others, however, who would probably be willing to shade $2.50 for the second half. Demand for prompt coke is light, and the stiffening in the market appears to be due altogether to the recent sales at cut prices which moved a great deal of coke that had been stocked in the region, 25,000 to 35,000 tons, and that production has been somewhat curtailed owing to lessened activity in the production of off grades, chiefly high sulphur coke, which found a ready market during the famine, but which are practically unsalable now. Foundry coke is relatively stiffer than furnace. We quote: Prompt furnace, $2.40@2.50; contract furnace (nominal), $2.50; prompt foundry, $3.25@3.50; contract foundry, $3@3.25, per ton at ovens.

BALTIMORE, MD.

A number of independent operators who work a few mines for a brief period during the season, in order to take advantage of the high prices, have closed down completely, because of the depressed condition of the trade. The elimination of these will tend to benefit the market to a certain extent, as it will decrease the supply of spot coal and enable the other operators to obtain a better supply of men. These intermittent operators offer the miners considerably more than the others can afford to pay, and consequently obtain a better supply of men.

Operators feel that their prices on contracts have been too low, and they are making a determined effort to maintain a higher level and believe they will be successful in doing so. It is generally conceded that it is costing more to produce coal than in previous years and that the profit has of late been exceedingly small. Many of the large consumers believe that there is some justic in the stand taken by the trade, for they registered no complaint against the higher contract prices.

Trade conditions during the week did not undergo any change. Unfavorable reports were heard as to the car situation, and on at least one of the roads, operators stated that conditions were worse than they had been for a month. But little spot business came to the surface, and the only activity apparent was in the contract trade. Low-grade coal was quoted from 90c. to $1 per ton.

There was not much activity at the piers this week, only a few ships loaded here and these were on contract business. Vessel rates for the South were slightly weaker than for weeks previous, owing to the exceptionally favorable weather for sailings. Coke continued strong, the demand for the steel trade holding the market up. Connellsville coke sold around $3.50 and $4. Prices for the West Virginia product also remained firm.

BUFFALO, N. Y.

There was again a weather condition that would flatten out the stiffest coal trade. Still the big demand for bituminous has kept prices much firmer than would be expected, so that some of the leading jobbers are reporting prices about on the level of last week. There is also complaint that the car supply has been down to 40 per cent. of requirements. Many roads have been unable to handle the coal after it had started from the mines. They report all embargoes off, but when urged for prompt delivery of coal in transit it is often found that the cars were so scattered about that it was hard to locate them. Still, as this is the chief reason for coal prices staying up, there may not be much reason for complaint.

Though bituminous prices are weak, they are still based on former quotations and with a return of winter conditions, which may occur any day, the prices would stiffen up and hold indefinitely. Pittsburgh select lump sells at $2.80, three-quarter at $2.63, mine-run at $2.55 and slack at $2.15. Coke hardly holds its own and is not quotable above $5.35 for best Connellsville foundry. When coke goes very high, and then begins to decline, it takes a long time to stop it.

There is still much hesitation over the making of contracts. Consumers are not offering to close and jobbers and operators claim they could not make anything at present figures. They are not often strong enough to resist, though, even if fairly convinced that prices are too low. The demand for anthracite, is, of course, light. Cancelations of orders, made when there was snow on the ground, are common. Buying will hereafter be from hand to mouth.

The coal trade is much steadier than it has been for some time and it promises to remain so if the weather continues seasonable as it has been so far this month. Uncertainties are now confined entirely to the railroads; every day something new comes up to disturb transportation conditions. Sometimes it is a blockade from accidents down the Allegheny Valley or another embargo on the Canadian roads.

If a big snowstorm should appear prices would return to all their former strength, and for this reason the trade is holding tenaciously to old quotations, as it is much harder to restore them when they are off. This is the time when the good salesman earns his salary and the poor one goes to the wall; for quite a long time there has been little for salesmen to do, but they are out again, as the orders are not coming in unsolicited as freely as they were.

COLUMBUS, OHIO

The warmer weather of the past week had the effect of softening the coal trade in Ohio to a certain extent. But the volume of business is still good and the prospects for the future are believed to be fair at least. Prices have not suffered by the warm spell and there is still a fair demand for domestic.

The steam trade continues good as manufacturing is still prosperous. Contracts are expiring now and arrangements are being made to renew at slightly higher figures. Railroads are also taking a large tonnage as the freight movement continues good. The domestic trade is weakening as dealers are not placing orders with operators and shippers as freely as formerly. Stocks on hand are not large and if there should be a spell of cold weather it will be reflected immediately upon the trade.

In the Hocking Valley and in Pomeroy Bend districts the output has been about 80 per cent. of normal. The same is true of other fields with the exception of eastern Ohio where it has been about 75 per cent. Some trouble was reported from a car shortage in eastern Ohio, but other districts appear to have a sufficient supply of equipment.

Quotations in the Ohio fields are as follows.

	Hocking	Pittsburgh	Pomeroy	Kanawha
Domestic lump	$1 40		$1 40	$1 40
2-inch	1 30	$1 20	1 35	1 30
Nut	1 30		1 25	
Mine-run	1 15	1 05	1 15	1 15
Nut, pea and slack	1 00		1 05	1 00
Coarse slack	0 90	0 90	0 95	0 90

There is every indication for an active lake business the coming season. The recent cold snap has resulted in the dock stocks being depleted and there is little probability of any coal being carried over. As a result the lake season will be active if sufficient bottoms can be secured, the chances are good for an active ore trade also.

CLEVELAND, OHIO

The Cleveland market shows little, if any, improvement over a week ago. There is an apparent lull in the demand for coal and many consumers have curtailed their shipments to reduce their storage supply.

While the movement to this district has slightly improved, Pennsylvania and Ohio shippers are experiencing great difficulty on coal routed via Toledo. Six hundred cars are delayed, awaiting acceptance by the Detroit & Toledo Shore Line R.R. on account of the congested condition at Toledo. Eastern carriers have placed an embargo restricting the routing of coal via the D. & T. S. L. when destined to points on the Grand Trunk Ry. This has caused no inconsiderable hardship to shippers and they will be forced to discontinue shipments on many large railroad and corporation contracts until the embargo is raised.

Wholesale quotations per short ton, f.o.b. cars at the mines, are as follows:

District	Freight rate	¾-in.lump	Mine-run	Slack
Youghiogheny	$1 00	$1 40	$1.30	$1 10
Pittsburgh No. 8.	0.90	1.20	1.10	1 10
Goshen No. 6.....	0.70	1.35	1.25	1 20
Coshocton.....	0.70	1.55	1.35	1 20

Pocahontas lump and egg is quoted at $1.75, run-of-mine $1.15, and slack $1, f.o.b. mines. Massillon domestic lump is seling at $2.50 and Hocking lump at $1.55, mines. Furnace coke has dropped to $2.25, f.o.b. ovens; about 75c. is added for the foundry grades.

Shippers of coal from the Youghiogheny belt seem to be highly elated over the recent advance in the price of oil. Many of the large gas plants have been making water gas, but the increase in the price of oil will prohibit, to a large degree, the manufacturing of gas from this product. Many large plants have already changed to coal gas, and this will have a stimulating effect on the Youghiogheny market and high premiums will, undoubtedly be paid on coal from this district. This is regarded as the opportune time for the operator of gas coal to insist on getting a good price for his product. He was handicapped by a scarcity of men and cars and is not getting the returns from his miners that he was when labor was plentiful. Certainly better results should be attained from the great tonnage sent out from this field.

HAMPTON ROADS, VA.

Prices of tidewater coals are still showing a downward tendency, with but small prospects of any increase in the near future. Sales of spot, New River and Pocahontas, have been made during the past week at $2.60 f.o.b. and even at this low figure, there have been but few transactions; the holders of surplus tonnages shipped on speculation, have found themselves in a difficult position.

Notwithstanding quite heavy dumping at the coal piers, there are still large accumulations of loaded cars, nearly all of the coal shipped having been on contract business to New England ports. The situation is worse at Newport News, where the dumping has been slow. The Sewalls Point piers did a fair week's business, but nothing to what they could have done, had there been a good supply of ships. Movement of coal from the mines continues to be good.

The export business still shows an increase and rumors are heard of some large contracts to begin on Apr. 1. The local market is still quiet and buyers are slow to make contracts during the present downward tendency; however, there has been as yet, no break in the local contract price, $1.25 per net ton f.o.b. mines.

BIRMINGHAM, ALA.

The volume of the steam business continues to be large with good prospects of unusual prosperity during the next several months. Operators are cheerful over this and also that general business in the South was never as good as it is at present. An immense amount of construction work is under way and there are shortages of labor; neither are there any labor troubles worthy of mention. A slight car shortage is now apparent with two of the larger lines, although, as a rule, all mines have been well supplied with cars since the first of January.

The coke market remains unchanged, although competition with Virginia producers is keen in some districts. The abnormal Virginia coke market during the past several months has enabled the Alabama producers to cover a broader territory and has been a source of strength to the local trade.

LOUISVILLE, KY.

For some unaccountable reason, the steam market has cased up a trifle. Little heating has been required recently, which may be the cause for a slight slackening of the demand. It is possible that the stringency of the market during the past few weeks has resulted in their being forced to curtail operations somewhat, which would have its effect in a considerably lessened demand.

Eastern Kentucky block and lump varies from $1.60 to $2 a ton f.o.b. mines, indicating that coal is being sold at about what it will bring; round is selling at the usual differential below these prices. Mine-run fluctuates between $1 and $1.20, and nut and slack is now selling at from 75 to 90c. for the better grades, and as low as 50c. for lower qualities. Some Indiana nut and slack is reported selling at 65c., the advantage in freight rates making this a favorable price for delivery to this market, in the absence of better coal. Western Kentucky nut and slack can be had at about the same price.

The trade here is still clinging to the possibility of seasonable weather in March, as that month not infrequently brings cold weather and blizzards, but as the whole winter has been one of disappointments, operators are prepared to face an early spring, and a consequent steady slackening off of business. Practically all dealers will, however, have to put in pretty fair stocks, as their conservative attitude at this time indicates that they are taking no chance of going into the summer with a large quantity of coal on hand, bought at winter prices.

INDIANAPOLIS, IND.

Continued mild weather makes the consumption of coal unusually light for February. Mine prices, which have been practically at summer schedule, have not improved any and it is reported there have been some bargain sales to retailers. However, those who bought heavily in the fall, in an effort to take care of their customers, when it looked as if the car shortage was going to cause a coal famine, have not reduced prices. Smaller yards that were unable to place large orders in the fall have had opportunity to take advantage of the mild-weather cut at the mines and are offering Indiana lump as low as $3, Pocahontas lump at $5.75 and furnace anthracite at $8.50. The mines are curtailing their running schedules again. On account of the poor demand for domestic, Plymouth Mine, No. 1, of the Coal Bluff Mining Co., in the Brazil field, has been closed down until next fall. Indiana prices, f.o.b. mill, are as follows:

No. 4 mine-run..	$1 15	Domestic lump 5- and 6-in..	$1 65
Nos. 5 and 6 mine-run.	1 05	Screenings, No. 4.....	0 80
No. 4 steam lump, 1½-in	1 30	Screenings No. 5 and 6.....	0 70
Nut, No. 4.....	1 40	Washed coal, Nos. 1 & 2.	$1.75@2.00
Egg.....	1 45	Brazil block.....	2.20
Domestic lump 2½-in....	1 50		

DETROIT, MICH.

Cars are coming through quite promptly, and it is predicted that the D. & T. Shore Line will embargo against the Grand Trunk, because of its inability to handle freight billed over the Grand Trunk. There are few new orders being taken at present owing to the unusually warm weather. However, a considerable number of delayed shipments are coming in and flooding this market with track coal. Domestic is unusually bad. Dealers all over Detroit and immediate vicinity are loaded up so fully that it is impossible for them to take in any more, and they are asking the mines to discontinue shipments on their contracts.

If the present cold weather continues it will give the operators and dealers a chance to bring business up to the record of the previous year at this time. There have been several large contracts let, although operators seem a little reluctant to close owing to the disturbed conditions which exist in West Virginia.

The car situation shows a marked improvement, and there seems to be little trouble in supplying equipment or moving shipments.

The prevailing market prices for today are as follows:

	W.Va. Splint	Gas	Hocking	Cambridge	Ohio No. 8	Pocahontas	Jackson Hill
Domestic lump	$1.40		$1 80		....	$1.60	$2.00
Egg.....	1 40		1 80		....	1 60	2 00
Nut	1 25		1 25				....
¾-in. lump.	1 05	$1 05	1 15	$1 05	$1 15	....	....
Mine-run..	0 90	1 00	0 90	1 00	1 00	1.25	..
Slack. ..	1 10	1 15	1.10	1 10	1.10	1.20	1.10

ST. LOUIS, MO.

In the Carterville field, mine-run costs approximately from $1 to $1.10 per ton to produce. Screenings are selling at 80@85c.; 40% at 85c. means 34c. for screenings, and 60% at $1.10 as a maximum, nets 66c., making $1 per ton for mine-run on a screened basis. These are the minimum producing and the maximum selling prices, so it is easy to see what the situation is. In East Louis there were several hundred cars of coal the past week from the Carterville field, which sold at $1@1.05. In the Standard field it costs from 85@90c. to produce the coal, and mine-run is selling at 80c., with the screened coal going at anything from $2½@90c., and screenings at from 60@65c.

The market condition in St. Louis has not changed any for the better, although the earlier part of the week the weather indications were such that there was hope for improvement.

It would take a period of from a week to ten days before cold weather could affect any change.

	Carterville and Franklin Co.	Trenton and Big Muddy	Mt. Olive	Standard
2-in. lump				$0 90 @ 0 95
3-in. lump			$1.25	
6-in. lump	$1.25		1 35	1.00 @ 1.10
Lump and egg	1.25	$2.25		
No. 1 nut	1.20			
Screenings	0 85			0 60 @ 0 65
Mine-run	1 10			
No. 1 washed nut	1 35			
No. 2 washed nut	1.30			
No. 3 washed nut	1 25			
No. 4 washed nut	1 20			
No. 5 washed nut	1.10			

CHICAGO

With a return of snow and a drop in temperature, Chicago coal dealers are expecting a revival in prices. For several days the market has been demoralized and prices slashed right and left. Unusual production and an exceptionally large volume of shipments are credited with being the chief causes for this condition. The over-shipment was due to a speculative campaign. It has been possible to buy all kinds of Springfield coal at $1 and, in some instances, Springfield egg, on shipments direct from the mine, has been offered at 85c. Some Franklin County coal of the lump and egg variety has been for sale in Chicago at $1 and $1.05.

There has been a reduction of prices for mine-run and steam lump as a result of the fact that a great deal of domestic lump has been sold for steam-making purposes. Prices for screenings also have softened. Furnace and foundry coke are active. A drop of about 25c. a ton has been noted in the prices for domestic sizes of byproduct coke.

Prevailing prices in Chicago are:

	Springfield	Franklin Co.	Clinton	W. Va.
Domestic lump	$2 07@2 22	$2 45@2 55	$2 27	
Egg		2 45@2 55		$3 95
Steam lump	1 92@1 97		2 17	
Mine-run	1 87@1 92	2 20@2 30	1 97	3.30
Screenings	1.57@1.62	1.90@1.95	1 67	

Coke—Connellsville and Wise County, $6@6.25; byproduct, egg, stove and nut, $5.50; gas house, $5.50@5.75.

OGDEN, UTAH

The larger dealers who continue buying during the spring and summer have decreased their orders, and are endeavoring to clean up their yards. This period is the hardest on the operators and probably the dullest time of the year. Later, shipments will adjust themselves to regular summer business, and the mines will be able to work accordingly.

The eastern market is still in bad shape and shipments low; in fact, it has been a number of years since the movement has been so small. Nebraska and Kansas have not been visited by a severe winter and this, in connection with the heavy shipments during January, caused by the railroad routing cars east, has given all dealers a good supply of coal, which must be disposed of before spring.

COAL TRADE NEWS

HAMPTON ROADS, VA.

Lambert Point piers established a new high record during the week ending Feb. 22. Slightly over 150,000 tons were dumped. Between 6 p.m., Sunday, and 6 a.m. Tuesday, the dumping totaled 33,000 tons.

ST. LOUIS, MO.

Local operators are being obliged to close down because of slack business. Those having contracts claim they can buy in the spot market cheaper than they can produce. Hence they are making additional profits by keeping mines idle. Other operations closing down indefinitely has been steadily increasing for several weeks.

BOSTON, MASS.

If water freights from Hampton Roads continue on their present high level there is likely to be a somewhat enlarged market for the better known grades in Pennsylvania. In other words, Pocahontas and New River at $2.85 will lose tonnage to Cambrias and Clearfields that range in price from $2.50@2.75 at Philadelphia, for ordinarily anthracite barge transportation can be had from Philadelphia at less than the going rates from the Virginia ports.

CLEVELAND, OHIO

Too much emphasis cannot be given to the great volume of bituminous and anthracite coal, which will be shipped via the Great Lakes during the coming season of navigation. The demand for Youghiogheny coal for lake shipment, continues to hold out and shippers of coal from the gas belt expect to receive high premiums for their product this year. There has been no change in the lake freight rate to Lake Michigan; so far all contracts have been drawn up on the basis of 35c. per net ton. Coal men look for an early opening of navigation; practically all the coal-carrying vessels will be ready for operation by Apr. 10 at the latest.

PRODUCTION AND TRANSPORTATION STATISTICS

NORFOLK & WESTERN RY.

The following is a comparative statement of the coal and coke shipments over the lines of the N. & W. Ry. for the months of December and January of the last two years, in short tons:

	December		January	
Destination	1911	1912	1912	1913
Coal				
Tidewater, foreign	101,118	84,083	112,204	144,062
Tidewater, coastwise	293,850	258,216	248,219	308,918
Domestic	1,413,644	1,355,189	1,327,525	1,616,894
Coke				
Tidewater, foreign	5,713		4,556	5,055
Domestic	116,988	134,763	127,084	143,196
Total	1,931,313	1,832,251	1,819,588	2,218,125

SOUTHWESTERN TONNAGE

The following is a comparative statement of the Southwestern production for August and September, 1911 and 1912:

	August			September		
State	1911	1912	Change	1911	1912	Change
Missouri	186,852	213,603	+26,751	202,404	242,871	40,467
Kansas	400,820	408,947	+8,127	401,536	424,329	22,793
Arkansas	139,762	172,090	+32,328	133,238	169,325	36,087
Oklahoma	257,773	232,768	—25,005	229,300	249,604	20,304
Totals	985,207	1,027,408	+42,201	966,478	1,086,129	119,651

THE CAR SITUATION

American Ry. Association reports surpluses and shortages of coal equipment for two weeks ended Feb. 15 as follows:

	Surplus	Shortage	Surplus or Shortage
New England Lines	203	250	47
N. Y.; New Jersey, Del.; Maryland; Eastern Penn	5,214	153	**5,061**
Ohio; Indiana; Michigan; Western Pennsylvania	5,563	65	**5,498**
West Virginia, Virginia, North & South Carolina	584	1404	820
Kentucky, Tenn.; Miss.; Alabama, Georgia, Florida	596	517	**79**
Iowa, Illinois, Wisconsin, Minn.; North & South Dakota	1,337	100	**1,231**
Montana, Wyoming, Nebraska	0	11	**47**
Kansas, Colorado, Missouri, Arkansas, Oklahoma	1,068	431	**637**
Texas, Louisiana, New Mexico	416	0	**416**
Oregon, Idaho, California, Arizona	1,117	25	**1,392**
Canadian Lines	0	0	0
Totals	16,398	2986	**13,412**

FOREIGN MARKETS

GREAT BRITAIN

Feb. 11—The market rules quiet. The shortage of ready steamers, caused by this week's dense fog, has depressed conditions for prompt loading. For forward loading sellers are holding for higher figures, and there is a disposition to fix requirements for next month. Smalls remain stationary. Quotations are approximately as follows:

Best Welsh steam	$4 38@4 44	Best Monmouthshires	$4 08@4 14
Best seconds	4 20@4 32	Seconds	3 96@4 02
Seconds	4 14@4 20	Best Cardiff smalls	3.54@3 60
Best dry coals	4 38	Seconds	3.24@3.36

The prices for Cardiff coals are f.o.b. Cardiff, Penarth or Barry, while those for Monmouthshire descriptions are f.o.b. Newport; both exclusive of wharfage, and for cash in 30 days—less 2½%.

FINANCIAL DEPARTMENT

Colorado Fuel & Iron Co.

Under date of Oct. 21, President J. F. Welborn issues his report for the fiscal year ended June 30, 1912, from which the following abstract is taken:

Results—Gross earnings from operation were $24,268,452, an increase of $1,333,767, or 6%. Operating expenses absorbed $1,039,835, leaving $293,932 net gain, and making total net from operations $3,772,282, an increase of 8.4%. Adding income from other sources, the net income was $4,448,975. After providing for all fixed charges, sinking funds, etc., there remained a surplus of $1,801,229, out of which a dividend of 5% ($100,000) was declared on the pref. stock, leaving $1,701,229 for profit and loss.

There was a decrease of 195,000 tons in coal output. This is accounted for by a falling off in railroad consumption of somewhat more than that tonnage and an increase in general sales. The result in fuel department earnings was a decrease of $31,092 in gross and an increase of $29,724 in net; as prices of domestic coal were generally lower than in previous years and an advance in miners' wages made effective April, 1912, added at least $20,000 per month to producing cost for three months of the year, this showing is considered particularly favorable.

Charter Renewal—At the stockholders' meeting, Oct. 19, 1912, the charter was renewed for 20 years from Oct. 21, 1912.

STATEMENT OF PRODUCTION FOR YEARS ENDING JUNE 30

Short tons—	1911–12	1910–11	1909–10	1908–09
Coal	4,038,852	4,233,756	4,722,832	4,094,352
Coke	777,993	753,192	905,599	645,545
Iron ore	813,728	841,699	879,630	580,784
Limestone	459,913	425,704	407,517	363,975
Pig iron produced	426,659	397,701	385,602	295,334
Finished iron and steel	485,743	424,421	412,749	359,793

RESULTS FOR YEAR ENDING JUNE 30

Gross Earnings—	1911–12	1910–11	1909–10	1908–09
Iron department	$15,140,523	$13,775,564	$13,604,832	$12,058,228
Industrial dept (fuel)	9,127,929	9,159,021	10,034,981	7,889,910
Denver retail dept				396,492
Total gross earnings	$24,268,452	$22,934,685	$23,639,813	$20,344,631
Net Earnings—				
Iron department	$2,766,775	$2,502,566	$2,492,136	$1,997,384
Industrial dept. (fuel)	1,005,507	975,783	1,250,479	903,627
Total net earnings	$3,772,282	$3,478,349	$3,742,615	$2,901,011
Add—Income from securities	526,270	535,672	490,080	328,341
Interest and exchange	150,423	135,927	127,840	117,420
Total net income	$4,448,975	$4,149,948	$4,369,535	$3,346,772
Deduct—				
Bond interest	$2,039,622	$2,091,610	$2,097,692	$1,054,968
Taxes	226,737	214,785	218,765	177,783
Real estate	138,317	151,263	171,458	61,414
Insurance, sociological, personal injury, etc.	64,105	233,602	154,908	52,346
Equipment renewal	120,000	128,106	164,945	
Loss on Col & Wyo Ry		*b*10,005		194,691
Loss on Crystal R. RR.	36,000	36,000	36,000	*c*32,575
Rentals (Col. Ind. Co. prop.)				896,461
Prospecting	22,965	24,904	18,948	18,158
Pref. dividends (5%)	100,000			
Total deductions	$2,747,746	$2,859,276	$2,862,716	$2,488,396
Balance, surplus	$1,701,229	$1,259,672	$1,506,819	$858,376

b Includes traffic contract guaranty at $25,000 per month ($300,000), less earned from traffic, as per contract for year, $289,995 in 1910–11 and $105,309 in 1908–09.

c Includes traffic guaranty at $3000 per month ($36,000), less earned from traffic as per contract for year, $3425.

BALANCE SHEET JUNE 30

Assets—	1912	1911
Properties and securities	15,749,791	15,742,701
Equipment	27,062,157	27,078,135
Cash on hand	4,543,007	3,590,120
Stocks and bonds	7,381,644	6,215,220
Accounts and bills receivable	3,914,562	3,306,639
Subsidiary cos	2,415,811	2,586,331
Manufactured stocks, etc.	2,682,515	3,175,304
Stripping, etc.	193,609	328,785
Accrued dividends and interest	88,989	78,576
Miscellaneous	145,275	152,195
Total	64,177,360	62,254,006
Liabilities—		
Common stock	34,235,500	34,235,500
Preferred stock	2,000,000	2,000,000
Funded debt	*x*20,813,000	20,816,000
Accounts and bills payable	950,600	889,245
Hospital	14,616	8,558
Accrued bond int.	834,633	857,515
Tax payment fund	100,000	100,000
Preferred dividends	100,000	
Sinking fund—real estate	985,116	932,124
Miscellaneous funds	239,734	177,912
Profit and loss	3,904,161	2,237,152
Total	64,177,360	62,254,006

x Includes Col. Fuel & Iron Co. 5% 10-year convertible gold debs., $14,067,000; Col. Fuel & Iron Co. 5% general mortgage bonds, $5,598,000; Colorado Fuel Co. 6% general mortgage bonds, $280,000; Grand River Coal & Coke Co. 6% first mortgage bonds, $868,000.

The Lehigh Valley Coal Sales Co.

The Lehigh Valley Coal Sales Co. was incorporated under the date of January 22, 1912, for the purpose of shipping and selling the coal mined and purchased by the parent company. The authorized capital stock of the Sales Co. is $10,000,000, of which $6,060,800, or 121,216 shares, with a par value of $50 each, were full subscribed to and issued. The stockholders of the Lehigh Valley R.R. Co. were given the privilege of subscribing at par to an amount equivalent to 10% of their holdings. After the organization of the company was completed, a contract was executed, effective March 1, 1912, between the parent company and the Sales Co., under the terms of which the latter is now purchasing at the breakers and shipping the coal mined and purchased by the parent company.

COAL SECURITIES

The following table gives the range of various active coal securities and dividends paid during the week ending Feb. 22:

Stocks	Week's Range High	Week's Range Low	Week's Range Last	Year's Range High	Year's Range Low
American Coal Products	....	....	94	94	94
American Coal Products Pref.	....	....	100½	100½	100¼
Colorado Fuel & Iron	36	33⅜	34	41⅛	31
Colorado Fuel & Iron Pref.	....	....	155	155	150
Consolidation Coal of Maryland	102½	102¼	102¼	102⅝	102¼
Island Creek Coal Pref.	86	85	85	....	....
Lehigh Valley Coal Sales	240	204	204	....	....
Pittsburgh Coal	21	20	20⅜	24⅜	20
Pittsburgh Coal Pref.	87	84½	85⅜	95	84½
Reading	26	24⅝	25	28¾	24¼
Reading 1st Pref.	160½	157½	157⅝	168⅝	157⅝
Reading 2nd Pref.	90	89½	89½	93	89½
Virginia Iron, Coal & Coke	50½	49	49	54	49

Bonds	Closing Bid	Closing Asked	Week's Range or Last Sale	Year's Range	
Colo. F. & I. gen. s.f.g 5s	99	100	99	98	99½
Colo. F. & I. gen. 6s	....	....	107½ June '12	....	....
Col. Ind. 1st & coll. 5s. gu	82¼	Sale	82¼	82¼	85
Cons. Ind. Coal Me. 1s 5s	....	....	85 June '11	....	....
Cons. Coal 1st and ref. 5s	....	92	93 Oct. '12	....	....
Gr. Riv. Coal & C. 1st g 6s	96	....	102⅜ Apr. '06	....	....
K. & H. C. & C. 1st s f g 5s	....	....	98 Jan. '13	98	98
Pocah. Con. Coll. 1st s f 5s	87½	88	87½ Feb. '13	87½	87½
St. L. Rky. Mt. & Pac. 1st 5s	76½	77½	76½ Feb. '13	76½	80
Tenn. Coal gen. 5s	101½	102	102½ 102½	102½	103
Term. Div. 1st consol. 6s	101½	103⅜	102½ Feb. '13	102½	103
Tenn. Div. 1st g 6s	101½	103½	101½ Dec. '12	....	....
Cah. C. M. Co. 1st g 6s	....	....	110 Jan. '09	....	....
Utah Fuel 1st g 5s	....	....	....	....	....
Victor Fuel 1st s f 5s	....	79½	79½ Feb. '13	79½	79½
Va. I. Coal & Coke 1st g 5s	97½	Sale	97½ 97½	96½	98

Delaware & Hudson Co.—Regular quarterly of 2¼% payable Mar. 20, to holders of record Feb. 25.

Reading Co.—Regular quarterly on 2d preferred of 1%, payable Apr. 10 to holders of record Mar. 25.

Burns Bros.—Coal sales of this company increased from 50,000 tons in 1885 to 1,950,000 tons in 1912; the average sales over the last five years were 1,800,000 tons. The company has paid interest on its bonds regularly, redeemed $500,000 of a total of $1,000,000, 5% bonds, and distributed $1,605,000 in dividends on its $1,500,000 common stock.

COAL AGE

Vol. 3 NEW YORK, MARCH 8, 1913 No. 10

"PRECEDENT" forms a comfortable wall for people to lean against. However, the fellow who wants to remain in a standing position needs only to keep his fingers on the railing of "ingenuity" that persistently winds about on the other side of the street.

We make no claim for originality of thought in the above. Sidney Smith hinted the same thing in an essay published in 1824, and, for all we know to the contrary, he may have but voiced the thought of someone who lived a century or two before. Close observation will show that some of our mining folk haven't discovered that there is anything of value above, below or across from the "wall of precedent," even though Smith has been dead "Lo these many years."

For the benefit of all who may be willing to class themselves with the last described, we wish to relate, in part, the experiences of a young fellow who followed the "ingenuity" route regardless of "precedent."

This man was superintendent of a group of mines that supplied coking coal to a blast-furnace plant. The capacity of his mines was such that under normal conditions the requirements of the furnaces were easily met, but during the months of December and January, when the holiday spirit took possession of his men, it was necessary to feed the furnaces largely from stock piles.

Occasionally strikes at the mines compelled the furnaces to draw from the stock piles at other times than Christmas, and during such years the holiday shortage had to be met by buying coke in the open market. Coke bought in this way and at such a time was always high in price and generally inferior in quality. This was especially true following a general strike covering all mines in a district, for in that event the only available source of supply must needs be at a great distance.

Now to return to the fellow who is to furnish the ingenuity lesson. One bright Thanksgiving morn he found himself facing an almost exhausted stock pile of coke and a group of miners longing for a good old-fashioned Christmas drunk. "Precedent" put the responsibility on the shoulders of his manager, since a general strike that affected all mines in the state early in the previous summer was responsible for the meager stock pile.

But the manager was not required to feel the responsibility this time. The superintendent decided that he would try to make his miners forget their annual holiday drunk until Christmas Day at least, and this is how he went about it: He posted a notice stating that all miners who worked every day during the month of December up to the 25th would be presented with a large live turkey on Christmas morning. Of course, he did not know how successful he would be, since "precedent," so far as he could learn, furnished no clue.

As a matter of record here is what happened: His December output exceeded that of any previous month during the year, nearly every man earned a turkey and the company earned the goodwill of the miners. Last, but not least, the meager stock pile remained intact during the holidays, notwithstanding the fact that no coke was purchased from outside companies.

The giving of bonuses or prizes has been successfully employed in many industries for years, but examples in the coal industry are rare. A little ingenuity would suggest numerous possibilities.

There is also a broader aspect to such ingenuity that should appeal to anyone who is ambitious to accomplish things which may be of benefit to the many. *Each innovation carried to a successful conclusion becomes in turn a precedent, which even the most timid may follow unhesitatingly.*

IDEAS AND SUGGESTIONS

Cheer Up

By J. E. Jones*

Centuries upon centuries ago mankind was taught that kind answers would turn away wrath, and a pleasing countenance was better than the possession of gold and silver. And down through the ages, wise men have endeavored to drive these lessons home. But with all of this teaching and our twentieth-century advancement, we are not exceptionally cheerful, nor are we adepts in giving kind answers at critical moments.

Good cheer is not out of place wherever people are associated. Especially is this true in connection with coal mining. The darkness of the mine, the absence of sunlight, the nature of the work and the generally austere bearing of those in authority are a few of the many things that tend to make the average mineworker despondent, cranky and suspicious. But, because of these unfavorable surroundings, the mining industry offers an excellent opportunity for the practice of lessons in "good cheer."

From general manager to trapper boy there is nothing more contagious than cheerfulness. In a brief period of time, it finds its way throughout the mine. Men seem to catch it and their work is lightened, the day made shorter and all go home to enjoy a good night's rest after a prosperous day's work. Even the mules and machinery are benefited, for the work has been accomplished in shorter time and with fewer mishaps when men keep their temper throughout the day.

Good cheer is as essential to the most successful management of a mine as is the good will of the men. To a great extent, these go hand in hand. Other things being equal, a cheerful mine manager will get better results than one who is gruff. Bosses who are able to maintain an earnest, cheerful manner when discussing the faults of men are infinitely more successful than those who are severe in correcting a fault, and leave a bad impression in the minds of workmen in their charge.

The best results are obtained when men perform their work with a hearty good will, and have a pride in the finished job. This sort of workmanship and a cranky boss are seldom found together. Men at best are but grownup children. They are affected nearly if not quite as much by their emotions and the emotions of others. It takes but little more time for a manager or boss to speak cheerfully for a minute or two to men as he travels through the mine. Men often carry to work burdens that a cheerful word will make lighter. It is a simple matter to inquire as to the welfare of a sick child, or speak approvingly of improvements noticed on the house or in the garden at the home of the workman, or ask about the baby and the mother.

Any manager with a little tact and ability to read human nature can, with sincerity and cheerfulness, make a big advancement in the building up of a strong organization. Since the work of the coal producer is at best somewhat unpleasant, the least that men in authority can do is to strive to let in a little of God's sunlight into their lives, and make living for them more worth while, and by so doing the world will be brighter and life happier; therefore, CHEER UP.

*Muleboss, Dering No. 2, Danville, Ill.

Handling Men

By Frank Selbe*

The ability to handle men seems to be one of the chief points in being a successful mine foreman. I have heard this preached since I was a trapper, and while it is undoubtedly true to a certain extent, still I do not believe it to be the most important point. I think, among the qualifications of a successful foreman, the first to be considered is his knowledge of mining operations and methods.

The term "handling men" has more than one meaning. First is the placing of men to obtain the best results from their labor, and to insure their own satisfaction. Next comes the problem of handling them in time of disputes, strikes or other labor troubles. This is a big question in itself and often time can be saved (and time is money) by the exercise of a little judgment and forethought.

A great deal of trouble is often caused over the most trifling matters. For instance, a miner finds some unusual impurities in the seam, something from which it is almost impossible to free the coal and he is then docked. He sends for the mine foreman to examine it and tell him what to do. The foreman sends word that he is well acquainted with conditions and there is nothing for him to do but clean the coal. It may be that the mine foreman has not been in this miner's place for a week, and the latter, feeling that an injustice is being done him, goes with his complaint to the company, with the result that trouble usually follows.

In another instance, one miner sees a fellow-workman bringing his boy, who is under age, according to the state laws, to the mine. He reports the case to the pit-boss, who informs him that: "I am carrying the time-book here and if I need any assistance, I will call on you." It would have been much better had the foreman used a bit of tact and replied: "I will look into the matter—am very glad you mentioned it."

It seems to me that the average mine foreman is too self-important. He quite often resembles Simon Legree—very knowing and important until the superintendent arrives on the scene, when he becomes as meek as a lamb. And not infrequently he is guilty of shifting the blame for mistakes on someone else. The best of men make mistakes and they should have no hesitancy in acknowledging them. It has been wisely said that: "The man who never made a mistake, never made anything."

*Elkridge, W. Va.

Generally, the mine foreman who finds the most fault is the one who ignorantly, but effectively, multiplies the evils, and he often convicts himself while trying to convict someone else. Of course, the foreman has some difficult problems to solve, but if he will use good sense and judgment he will obtain better results.

Frequently he has a man to contend with who is as bullheaded as himself. Such a one, having his own ideas of right and wrong (nearly always wrong), may destroy the peace and contentment of others who are perfectly satisfied. He also has some men who are never satisfied—men who are always on his trail, wanting to change places, extra pay for everything they do, and so on. There is also the man who is always trying to make trouble. He thinks he is the right party to lead the men to victory, when he is simply a black sheep, and the best thing for all concerned is to weed him out.

Modernizing Mine Management

By a Colorado Engineer

The dictionary defines a manager as "One who conducts business or other affairs skillfully and with frugality and economy; an economist." But, in coal mining, many factors complicate the duties of a successful manager. Competition in trade, the increased difficulty in the recovery of coal owing to the exhaustion of the seam, the increasing demand for greater safety and the exacting requirements of large consumers of coal, together with the demand for increased wages and reduction of hours on the part of the miner make it a practical impossibility for *one* man to successfully manage and harmonize these conflicting conditions. The demand is now that every personal unit in the organization be a manager *in fact*, to insure ultimate success.

To bring about this millennium requires an intense desire for the accomplishment of such a purpose, in the mind of the one high in authority, and an ability, on his part, to inspire confidence in his subordinates. Where a subordinate shows a tendency to be stubborn someone must be appointed to take his place, and the choice is preferably of one within the organization. Such change is necessary for proper discipline. The manager must study, standardize, instruct, condemn and reward, using always his best tact and judgment.

Much of the expense of operation, in coal mining, occurs at the working face. Where machines are used in mining the coal, there is great need to study carefully the conditions here, so as to expedite the work of cutting and loading the coal and harmonize the movements of the machine man and his helper, and those whose duty it is to blast and load the coal.

Much delay is often experienced when starting to cut in the morning and when moving the machine from room to room, in the unloading of tools, and setting of anchors or jacks and other details. A careful study is often necessary to determine the exact cause of such delay. The fault may not rest wholly on the man in charge of the machine. The mine electrician may have failed to make the necessary repairs reported the previous day, or the cause may be a faulty installation or equipment.

A careful study of all these conditions should result in ascertaining data by which it is possible to set a standard time for each operation, barring, of course, unforeseen accidents. The coöperation of every man on the job is necessary to do this. In this respect the workmen themselves become undermanagers. They study to conduct their business "with frugality and economy."

The work of the manager is thus, not only lightened, but made more efficient. Difficulty is sometimes met when the work is done on contract; especially if the conditions are such that the man is not interested in increasing his rate of cutting in order to expedite other work in the mine. If he is working at a certain rate per day, he must be assured that an increased rate of cutting will materially increase his wage.

It is, of course, impossible for wages to increase in the same ratio with the increased efficiency of workmen. Men are generally fair as a whole, if they are not as individuals. A workman who increases his efficiency twofold will seldom demand twice his former pay. In this regard experience teaches that a word of encouragement often works wonders that money cannot accomplish.

In seeking to better the management of a coal mine, every improvement in design of equipment, every successful attempt to increase the efficiency of workmen, is a step in the ultimate increase of efficiency.

A growing feature of the new management, in coal mining, is the desire shown to provide for those on whom the industry depends, giving to them comfortable places in which to live, providing suitable amusement and education for them and their families and encouraging thrift in the community of workers. By this means each worker is stimulated to do his best.

The Trapper's Swagger,

By J. R. Allardyce

(Written expressly for Coal Age.)

"When I'm a man," quoth the ancient kid
That sits by the third west door,
"I'll show some guys in this mine, what's what,"
And he spat through his teeth and swore.

"There's Yankem Jones—the son of a gun!—
I'd give that jay a rope."
He swallowed a chew and missed his sprags,
And killed mule Dick on the slope.

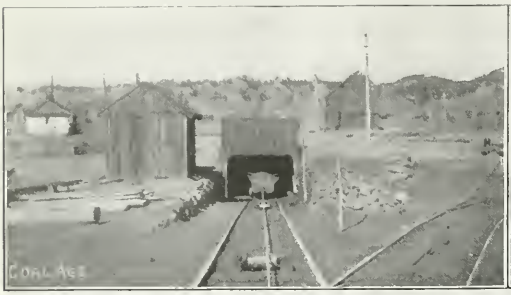
"And Balky Pete," says he, as he stuffed
Some "long-cut" into his cheek;
"He cracks his whip like a man, but—huh!—
He couldn't drive cows to the creek."

"And that Red Jack that swipes my oil,
And dopes my dinner tea;
He sleeps on the trip—the roundhead dub,
I'm in training for him," says he.

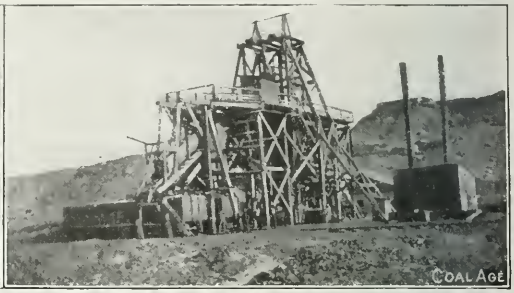
"And that old guy with the fringe on his chin—
Sam Sears—he thinks he's It;
He bosses me 'round like a blooming slave,
But now he has got to quit."

And he clenched his fist, and he felt his arm
Where the muscle ought to be;
And puffed himself up and smote his chest—
"Oh! I'll soon be a man," says he.

SNAP SHOTS IN COAL MINING



Mouth of Slope at Heaton Mine of Victor American Fuel Co., Heaton, N. M.



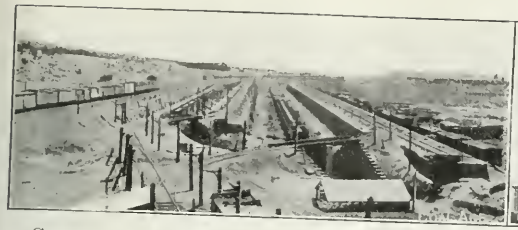
Bartlett Shaft at Mine of Victor American Fuel Co., Gibson, N. M.

Tipple and Power House of Elkins Coal & Coke Co., Bretz, W. Va.

No. 2 Mine of Dominion Coal Co., Cape Breton, N. S.

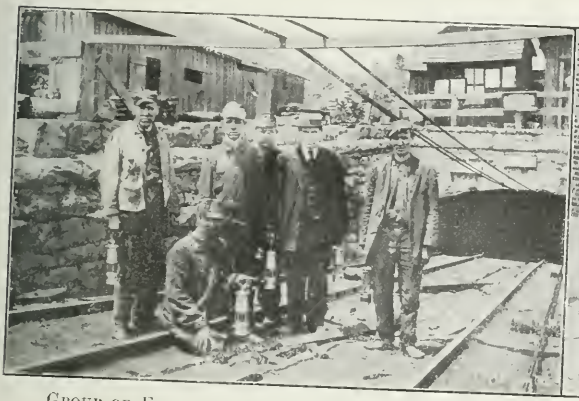
Honeybrook Strippings at McAdoo, Penn. Note Folds in the Coal

Another View of the Anthracite Strippings at McAdoo, Penn.



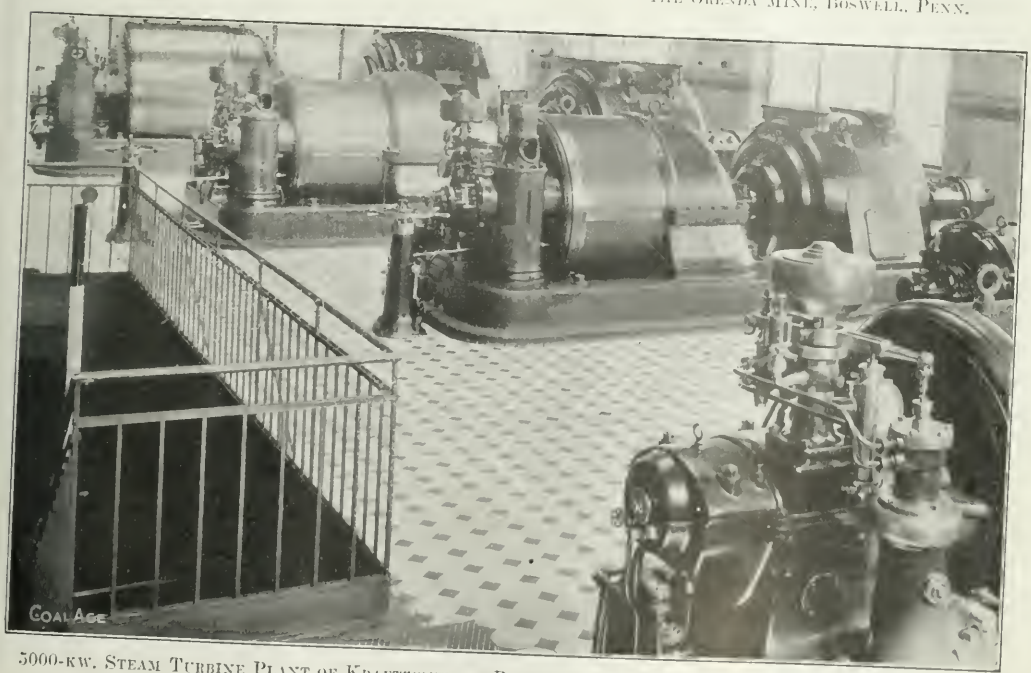
Coke Plant, Utah Fuel Co., Sunnyside, Utah. Photos Taken on an Idle Sunday

Shaft No. 1, Kentucky Midland Coal Co., Midland, Muhlenburg County, Ky.



Group of Firebosses, All of Whom Are Coal Age Readers. Orenda Mine, Boswell Penn.

Showing Substantial Brick Fan Housing at the Orenda Mine, Boswell, Penn.



5000-kw. Steam Turbine Plant of Kraftzentrale Rosenthal, at Rosenthal, near Berlin, Germany

Our Future in the Export Trade—III

By F. R. Wadleigh*

SYNOPSIS—The third and concluding article on this subject. This installment discusses the monetary value of different export coals of the world, and gives a careful analytical comparison. The question of transportation to the loading ports is also discussed in detail.

❖

As already noted in a previous issue, the average railroad haul of Welsh coal is about 20 miles; for this distance the maximum rate chargeable is 1.75c. per ton-mile; a rebate of about 35% is allowed on coal for export. For instance, the rate from mines to Cardiff is 33.3c. for export and 46.3c. for local use. It might also be stated here that both the French and German railroads give special rates on coal for export. The following table shows the market value of the different British coals as of July 1, 1912:

TABLE I COMPARATIVE VALUE OF VARIOUS ENGLISH COALS

South Wales (F.o.b. Cardiff)	
Best Admiralty large	$4 08@4 26
Admiralty seconds	3 65@3 90
Large ordinaries	3 53@3 65
Large best drys	4 02@4 14
Best smalls (bunkers)	2 43@2 56
Cargo smalls	2 13@2 25
Newcastle coals, (F o.b. Tyne)	
Blyth best steams	$3 10@3 17
Blyth ordinary steam	2 43@2 56
Blyth best smalls	2 13@2 19
Tyne prime steams	2 92
Tyne second	2 62@2 68
Tyne best smalls	2 31@2 37
Northumberland unscreened	2 31@2 43
Northumberland ordinary bunkers	2 31@2 43
Good Durham bunkers	2 49@2 68
Wear gas coal	3 29
Durham gas coal	3.20
Monmouthshire	
Best Black Vein	$3 65@3 77
No. 3 Rhondda, large	3.90@4 14
No. 3 Rhondda, smalls	2 92@3 04
No. 2 Rhondda, large	2 92@3 04
No. 2 Rhondda, smalls	2 07@2 19
Patent fuel (briquettes)	4.39@4 62
Special foundry coke	6 57@6 82
Furnace coke	4 62@4 87
Scotch Coals	
Scotch ell coals, f.o.b. Glasgow	2 56@2 70
Scotch steam coals, f.o.b Glasgow	2 56@2 68
Scotch splint coals, f.o.b. Glasgow	2 74@2 86
Fife steam coals, f.o.b Methil	2 92@3 04
Fife treble nuts, f.o.b. Methil	2 56@2 58

In making any comparison between the coals of the United States and Welsh product, we should first have a clear understanding as to the names and quality of the different grades in question, as well as the coal beds from which they are mined.

The United States fuels considered in this comparison are those known under the trade names of Pocahontas and New River. Both of these come from what is called by the state and U. S. Geological Surveys, the New River-Pocahontas area of West Virginia: both are found in the same geological measures, known as the Pottsville Series, the Pocahontas coal from the Lower Group and the New River from the Middle Group. The estimated total area underlaid by these coals is about 1,648,000 acres, or about 9,888,000,000 tons of available coal.

Pocahontas Coals

About 90 per cent. of the Pocahontas coal is mined from the No. 3 Pocahontas bed, which is generally considered to be the standard. The coal from the upper thin beds is, as a whole, not equal in quality to that from the No. 3 bed, with the exception of the Davy-Sewell bed, which is correlated with the Sewell bed of the New River field proper. There is also a small tonnage of coal from the No. 4 Pocahontas bed that is quite equal in quality to much of that from the No. 3, but the amount is so small as to be negligible in this comparison.

The Pocahontas No. 3 bed has been under development since 1883, since which time to the close of 1910, 101,986,000 tons of coal and 25,000,000 tons of coke have been produced. This coal is probably the best known, especially in foreign countries of all American coals, due largely to its quality and to the intelligent manner in which it was put on the market and advertised by Messrs. Castner & Curran, who for many years were the exclusive sales agents for this coal. The foresight and sagacity of F. J. Kimball, former president of the Norfolk & Western Ry., on which line all of the Pocahontas mines are located, also had much to do with the rapid development of the field.

Area and Thickness—The No. 3 Pocahontas underlies a large area above water level, approximately 300 square miles. The thickness of the bed will run from 4½ to 12 ft., the average for the entire field being about 6½ feet.

Analyses—The following analyses are taken from the various publications of the U. S. Geological Survey, the U. S. Bureau of Mines and the West Virginia State Geological Survey. We also give analysis of a picked sample, made by J. & H. S. Pattinson, Newcastle, England, as showing the purity of the clean coal:

No. 1—Average of 205 mine samples, from 64 mines, U. S. Geological Survey, 1909.

No. 1a—The best single analysis from the ones averaged as No. 1 above.

No. 1b—The worst single analysis from the ones averaged as No. 1 above.

No. 2—Average of five mine samples from three mines, U. S. Geological Survey Bulletin 362.

No. 3—Average of four samples, actual shipment, U. S. Geological Survey Bulletin 362.

No. 4—Average of samples from 15 mines, West Virginia State Survey, 1911, Bulletin 2.

No. 5—Average of samples from 38 mines, West Virginia State Survey, 1908, Vol. II (A).

No. 6—Average of 407,326 tons, shipped to the Panama Canal, 1909-10, Bureau of Mines, Bulletin 41.

No. 6a—Best average of 5021 tons, shipped to the Panama Canal, 1909-10, U. S. Geological Survey.

No. 6b—Worst average of 5530 tons, shipped to the Panama Canal, 1909-10, U. S. Geological Survey.

No. 7—Average of 181,000 tons, shipped to the Panama Canal, 1908-09, U. S. Geological Survey, Bulletin 428.

No. 8—Analysis of samples from 100 tons shipped to the U. S. Navy and made into briquettes, 1907, Bulletin 362.

No. 9—Selected sample. Analysis by J. & H. S. Pattinson, Newcastle, England.

Norfolk & Western Ry.—All Pocahontas coal for ocean shipment is hauled to tidewater at Hampton Roads over this road; the average distance from the mines is 376 miles and the freight rate $1.40 per gross ton, or 3.70 mills per ton-mile; the weight of a coal train hauled to the Lamberts Point terminal and piers with one locomotive is 4200 net tons. There are three piers at Lamberts Point for dumping coal into ships and the best record for one day's dumping was 26,851 tons. During year ending Mar. 31, 1912, 3,827,121 tons of coal were dumped at these piers. A contract has been let and

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work begun on a new steel pier, 1200 ft. long and 90 ft. high, with an estimated capacity of 1700 tons per hour.

New River Coals

There are three beds of coal in the New River field, Sewell, Fire Creek and Beckley, although there are never more than two of these of workable thickness in the same locality; the largest percentage of coal mined comes from the Sewell bed.

The heating value of the coal from each bed is practically the same and no distinction is made between them in shipping.

The field has been under development since 1873, and the coal has been used by the U. S. Navy since 1878; the output last year was 9,298,000 net tons.

TABLE II. TYPICAL ANALYSES OF THE DIFFERENT GRADES OF POCAHONTAS COALS

	1a	1*	1b.	2†	3†	4*	5*	6a**	6**	6b	7†	8	9
Moisture	0 60	0 68	0 51		1 21	0 23	3 30	2 63	2 06				1 59
Volatile	16 00	14 29	13 76	17 07	16 275	15 66	17 47	17 79	18 25	17 12		16 42	21 20
Fixed carbon	80.40	80 55	79 95	79 03	77.325	78 01	77 80	72 41	73 87	77 20		79 13	78 80
Ash	3 02	4 48	5.78	3 90	6.40	5 12	4.50	7 50	5 25	3 62	5 97	4 45	1 54
Carbon	87.50	86 05	84 41		84 68	84 76						87 01	86 51
Hydrogen	4 71	4 46	4 24		4 265	4 27						4 28	4 44
Oxygen	2 92	3 27	3.99		3 045	4 22						2 72	4 95
Nitrogen	1 20	1 14	1 14		1 01	0 94						1 00	0 56
Sulphur	0 65	0 62	0 44	0 56	0 53	0 69	0 62	0 75	0 64	0 66		0 54	0 61
B.t.u.**	15,350	15,008	14,735	15,288	14,893	15,027	15,095	14,667†	14,921†	15,200	14,898	15,226	15,411

* Air dried † Dry ** As received.

Area and Thickness—The New River beds underlie approximately 1600 square miles. Their thickness is as follows: Sewell, from 3½ to 6 ft.; average, 4½ ft. Fire Creek, from 3½ to 6 ft.; average, 4½ ft. Beckley, from 4½ to 11 ft.; average, 5½ ft.

Analyses—The following analyses of New River coals are taken from various bulletins of the U. S. Geological Survey and the U. S. Bureau of Mines, in addition to which are given analyses of coals shipped to the United States Navy in 1911 and 1912. We also give an analysis made by the Babcock & Wilcox Boiler Co., of a sample from a shipment of 100 tons, the gross sample weighing 500 lb. While of no commercial value, but to show the great purity and value of the clean coal, analysis of three different carefully selected samples, *two* made by a well known authority, John W. Hill, of New York, and one by J. & H. S. Pattison, Newcastle, England, are given.

No. 1—Average of 116 samples from 42 mines, U. S. Geological Survey, 1909.

No. 1a—The best of the above analyses.

No. 1b—The worst of the above analyses.

No. 2—Average of 16 samples from eight mines, U. S. Geological Survey, Bulletin 362, 1907.

No. 3—Average of 10 analyses from actual shipments, U. S. Geological Survey, Bulletins 362 and 23.

No. 4—Average of analyses of samples from 60 mines, West Virginia Geological Survey, Bulletin 2, 1911.

No. 5—Average of analyses of samples from 51 mines, West Virginia Geological Survey, Bulletin 2, 1911.

No. 6—Average of 115,000 tons shipped to Panama Canal, 1908-09, sold on a guarantee of 14,850 B.t.u. Reported by U. S. Geological Survey Bulletin 128.

No. 7—Average of 27 cargoes shipped to Panama Canal, sold on a guarantee of 14,850 B.t.u. Reported by U. S. Bureau of Mines.

No. 8—Average of 11 cargoes shipped U. S. Navy in 1911. Samples and analyses by U. S. inspector and chemists.

No. 9—Average of eight cargoes shipped U. S. Navy in 1912. Samples and analyses by U. S. inspector and chemists.

No. 10—Average of samples from 11,700-ton cargo of U. S. Navy Collier "Cyclops," July 27, 1912, five mines represented.

No. 11—Analysis of sample from shipment of 100 tons—Babcock & Wilcox Boiler Co.

No. 12—Selected sample average of five analyses—J. W. Hill.

No. 13—Selected sample average of four analyses—J. W. Hill.

No. 14—Selected sample average of six analyses—J. & H. S. Pattinson.

New River coal is hauled over the Chesapeake & Ohio Ry. to Newport News and over the Virginian Ry. to Sewalls Point.

Chesapeake & Ohio R.R.—The average distance from the mines to tidewater over this road is 418 miles and the freight rate is $1.40 per gross ton or 3.34 mills per ton-mile; the weight of coal trains hauled into the Newport News terminal by one locomotive is 4200 tons. There are four piers or docks at this terminal for loading coal into ships and 31,565 tons is the largest dumping in one day. The quickest loading record was made by the S.S. "Berwindmoor," and was 8612 tons in 10½ hours.

The contract has been let and work begun on a new steel pier, 1200 ft. long, 90 ft. high and 67 ft. wide, with berths for four of the largest steamships and a dumping capacity of 3000 tons per hour.

During the first eight months of 1912, 689,767 tons of coal were shipped to foreign countries from Newport News.

Virginian Ry.—The average distance from the mines to tidewater on this road is 410 miles; the freight rate $1.40 per gross ton or 3.41 mills per ton-mile, while the weight of coal trains hauled by one locomotive into their Sewalls Point terminal is 5000 tons. There is one steel pier for loading ships, 1015 ft. long, with 32 chutes on each side and a handling capacity of one 50-ton car every two minutes.

The largest dumping in one day at this pier was 29,558 tons, the actual working time being 18 hr. 30 min. The largest dumping in one hour was 1721 tons. The quickest loading record was made on the S.S. "Newton," and was 8127 tons in 5 hr. 15 minutes. During the eight months ending Aug. 31, 1912, 181,712 tons of coal were shipped to foreign ports from this terminal.

The Sewalls Point pier, probably the fastest coal dumping pier in the world, is 1015 ft. long, 76 ft. high and 65 ft. wide, with 30 ft. of water at low tide, berth room for four ships and a dumping capacity of one 50-ton car every two minutes.

A Comparison of Foreign and Local Export Fuels

As said elsewhere, it is difficult to make an accurate comparison, based on calorimeter tests between these coals, owing to the fact that many of the tests of British coals, as published, have been made with the Thomson

and Favre & Silbermann calorimeters and comparatively few with the bomb (Mahler) calorimeter, as used in the United States. The Thomson instrument gives uniformly lower results than does the Mahler type, while the Favre & Silbermann determinations are liable to error, owing to the delicacy of the instrument, and the results obtained are usually higher than those obtained from the Mahler.

However, the results, as given elsewhere, show very little difference between the coals under consideration; as regards theoretical heating value, the New River-Pocahontas coals yield slightly higher B.t.u. values.

Ash—The results of analysis show that the ash content of the two kinds of coal is about the same. The United States coals have sometimes shown a greater amount of refuse under boilers, because, where comparative tests have been made the grates were designed for burning the Welsh product and the stokers were accustomed to handling it.

Sulphur—Here the United States coals have a slight advantage, although the amount of sulphur in any of the coals is too small to be of importance.

Volatile Matter—The Welsh coals are uniformly lower in volatile than the local product, which lowers their heating value to some extent (see remarks under Table IV) and causing them to give off slightly less smoke, although this is largely a question of proper combustion conditions and firing.

Clinkers—The writer has been unable to find any actual tests of the ash-fusing point of Welsh coals; a series of tests of a standard New River-Pocahontas coal showed an average of over 2600° F. Actual experience in burning Welsh and New River-Pocahontas coals under boilers has shown, in specific cases, that the latter coals will not clinker any more readily than do Welsh coals, and that the percentage of clinker to total refuse is smaller.

Results Obtained from Actual Trials

When each coal is burned under suitable conditions, the evaporative results obtained from New River-Pocahontas fuels will be quite as high as those yielded by the Welsh coals. Under certain conditions, the former coals will show greater economy and make more steam per pound of coal per hour, owing to their superior coking qualities and higher percentage of volatile matter.

As stated elsewhere, the Welsh export coal is harder and is usually screened at least once, hence reaching the consumer with a larger percentage of lumps, while on the other hand, all of the New River-Pocahontas coals are run-of-mine or "wro't thro'" coals and are not screened at all. This is often the basis for complaints against the American coals, although it is really an advantage, as good run-of-mine, semibituminous coal will yield better results than lump coal; the stoker has less labor on account of the coking qualities and the swelling of the coal into a more or less cellular mass when burning, gives quicker combustion, prevents the coal from falling through grates and makes less smoke.

TABLE III TYPICAL ANALYSES OF DIFFERENT GRADES OF NEW RIVER COALS

	1*	1a*	1b	2†	3†	4*	5*	6†	7†	8*	9*	10†	11	12	13	14
Moisture	0 86	0 77	1 08			0 812	0 65			1 107	1 46		0 94			1 51
Volatile	19 61	17 24	19 63	19 625		17 27	21 94			20 50	20 36	20 62	22 16	20 399	20 32	21 90
Fixed carbon	76 05	79 42	74 13	76 812		77 588	73 62			73 37	73 89	74 80	75 85	75 99	75 87	78 10
Ash	3 46	2 57	5 16	3 564		4 33	3 79	4 84	5 395	4 96	4 35	4 58	1 99	1 35	1 75	1 74
Carbon	85 29	86 26	83 05		83 846	85 092										86 29
Hydrogen	4 87	4 93	4 94		4 707	4 546										4 60
Oxygen	3 99	4 22	4 53		3 415	3 974										3 54
Nitrogen	1 53	1 48	1 46		1 44	1 366										1 50
Sulphur	0 83	0 54	0 86	0 677	0 749	0 746	0 705		0 813	0 828	0 837	0 68		0 302	0 46	0 76
B t u	15,006	15,286	14,666	15,263	14,857	15,007	15,215	14,985	14,881	15,053	15,007	14,934	15,159	15,514	15,440	15,516

*Air dried † Dry.

Oxygen—The researches of Dr. David White have shown that the oxygen content of any coal has a distinct and constant relation to its heating value and that it may be considered as an impurity and as having nearly an equal anti-calorific value with the ash. In this respect the Welsh coals show slightly better, although the combined ash and oxygen will give about the same totals with each kind of coal.

Preparation—The United States coals are not, on the whole, as well prepared as the Welsh. More care is taken with the Welsh coals both in mining and cleaning and they are prepared to suit more nearly the needs of the buyer and consumer.

Large and Small Coal—The slack or small coal in the local run-of-mine product is pure and of higher value than that from the Welsh coals. This is conclusively shown by analyses of briquettes from each, those from the Welsh coal being made from the dock screenings of the large coal, while those from the New River-Pocahontas were made from the run-of-mine smalls.

The following analyses of briquettes will be of interest here:

	New River-Pocahontas					Welsh		
Moisture	1 40	1 06	2 70	1 50		0 92	1 30	1 50
Volatile	19 88	17 30	20 28	16 50	18 50	15 87		
Fixed carbon	73 22	76 13	72 74	73 00		75 52		
Ash	5 50	5 51	4 28	9 00	7 40	7 69	6 60	7 60
Sulphur	0 58	0 65	0 81	0 81			0 90	0 80
Hydrogen	4 32	4 76	4 94				3 90	3 80
Carbon	83 62	85 15	83 75				82 60	83 30
Nitrogen	0 89	1 09	1 45					
Oxygen	5 09	2 90	4 77				4 70	3 00
B t u	14,796	14,836	14,886	...	13,167	14,089	13,740	13,890

Weathering and Storage—The heat value loss under storage may be considered as negligible with both the coals under consideration. Recent exhaustive tests made by the United States Bureau of Mines have proved that, under actual storage conditions, under cover, in the open and under water, in both hot and cold climates, the loss in heating value of the New River-Pocahontas coals is less than 1 per cent. per year.

Firing—The amount of work done by the stoker or fireman, accustomed to handling the New River-Pocahontas coals, will be less, in a day's run, than that done by a Welsh-coal fireman, when burning equal quantities of each coal under similar conditions.

Wear and Corrosion of Heating Surface—The corrosion and wear of heating surfaces, grates and connections and the cleaning of tubes is about the same with both kinds of coal.

Variation in Quality—There will be found less variation in quality in the New River-Pocahontas coals than in the 26 Welsh coals on the British Admiralty list.

Stowage—The New River-Pocahontas coals, being all run-of-mine, will stow more closely and will yield more heat units per cubic foot of space occupied, the specific gravity of the two coals (Welsh and New River-Pocahontas) being practically the same, 1.27 to 1.31.

Spontaneous Combustion—While for obvious reasons, no comparative figures or tests are available, the fact that the U. S. Navy gets its main supplies now, and has done so for years, from the New River-Pocahontas mines and that these same coals are the only ones that the U. S. Government will accept for the Panama Canal work, where thousands of tons are kept in storage, in the open, under the most likely conditions for spontaneous combustion to take place, proves that these are, from actual experience, known to be comparatively free from fires due to spontaneous combustion. There is no bituminous coal that is not liable to fire, under certain conditions and the Welsh coals are not excepted from this liability.

Gas and Locomotive Coals

It must not be thought that New River-Pocahontas coals are the only local ones that can compete in the foreign trade. There are large markets in Europe and South America for coals used in the manufacture of illuminating gas and at least two large gas works in South America have contracted for a year's supply from this country. Our gas coals are quite equal in every way to those from Great Britain and there is no reason why we should not share in this business.

The following laboratory results are the average obtained from eleven mine samples of best Durham (England) gas coal, compared with results obtained from a shipment of 50 tons of West Virginia gas coal in actual practice:

	Durham	West Virginia
Fixed carbon	62 62	61 11
Volatile	30 17	33 16
Moisture	1 26	
Sulphur	1 19	1 18
Ash	4 76	5 73
Coke yield	67 93	74 91
Gas per ton of coal	11,115	10,842
Candlepower	16 65	17 42

In my opinion, there will also be a large market in South America and the West Indies, and possibly in some of the Mediterranean countries, for the medium high-volatile coals of the United States, that are suitable for use as locomotive fuel. There are no better locomotive coals in the world than some of the medium high volatiles (30 to 35 per cent.) mined in West Virginia and Pennsylvania; they will yield the highest evaporation per square foot of heating surface per hour, or, in other words, make the most steam per minute and when properly handled and under suitable conditions will make little smoke; they are also hard and lumpy and will stand transportation well.

As long ago as 1902, a cargo of such West Virginia coal was shipped to Chile and gave excellent results on the State Railways. These same railways are now using large amounts of Australian (116,200 tons) and Chilean (103,000 tons) coals, both of which are high volatile and decidedly inferior in every way to the United States coals mentioned above; they are testing Japanese coal this year, also high volatile. We should secure practically all of this South American railway trade.

Typical analyses of United States locomotive fuels are given below:

Moisture	1 60	1 47	1 47	0 87	1 28	1 54
Fixed carbon	58 92	57 59	62 95	62 19	59 03	58 367
Volatile matter	32 12	34 83	31 87	32 36	33 77	34 985
Ash	7 36	6 11	1 01	4 58	5 92	4 499
Sulphur	0 92	0 89	0 91	0 68	0 68	0 887
B t u	14,153	14,154	14,821	14,776	14 333	

‡ These analyses are taken from the U. S. Geological Survey Bulletins, 382-348 and represent actual shipments.

Smithing and Coking Coals

There is also quite a large market for smithing coals in South America which we have never made any effort to enter. The coals now used for this purpose come mostly from England (Cardiff and Swansea), the best of which come from the Rhondda No. 3 seam in Wales (analysis given elsewhere). While these are very pure and have been famous for years, they are not in any way superior to the highest grade smithing coals of the United States, such as Piedmont, New River, Valley Forge, Blossburg and Pocahontas. I witnessed a test of ordinary Pocahontas slack from a cargo of steam coal, in a railway shop in Chile, against Swansea smithing coal and the former gave results that were entirely satisfactory, at a lower price for the coal.

The market for coke in South America is also quite extensive; nearly all coke used is imported from England and Germany and Australia. No late consumption figures are obtainable, but it is a business well worth looking into. In 1909 coke was exported from South Wales as follows, in long tons: Chile and Peru, 6258; Argentine, 13,513; Uruguay, 12,543; Brazil, 12,618; Cuba, 2693. The total British exports of coke in 1911 were 1,064,000 long tons.

Exports from the United States during same period were 1,023,839 short tons, most of which went to Mexico and Cuba. Germany also sent 171,000 tons of coke to South America and Mexico during 1911.

Our best Eastern cokes are as good as either the Welsh Durham or German and can be put on ships at a lower price. Present quotations on best Durham foundry coke are $4.76 f.o.b. Tyne ports, while ordinary Cardiff foundry coke is quoted at $5.24@5.20 f.o.b. and Special foundry $7.44@7.67.

Analyses of United States and British cokes are given below:

	Durham Foundry Cokes		Welsh	Foundry Cokes	
Fixed carbon	90 30	91 06	93 79	93 234	92 69	90 20
Volatile						0 21
Ash	8 40	7 87	5 17	5 97	5 63	7 75
Sulphur	0 85	0 91	0 66	0 774	1 09	0 51
Moisture	0 45	0 16	0 08		0 59	1 84
Phosphorus			0 003	0 022		0 0041

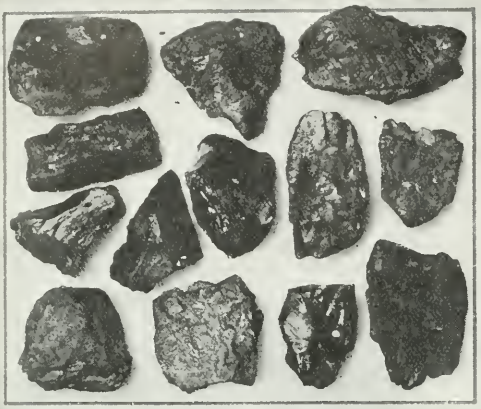
	Pineville, Ky	Pocahontas	New River	Toms Creek, Va	Elkhorn	Best Connellsville
Fixed carbon	91 66	92 691	93 04	91 85	92 74	91 00
Volatile	0 410	0 311	1 34	1 26	1 033	1 70
Ash	3 78	5 822	5 24	6 73	5 63	7 30
Sulphur	0 59	0 738	0 69	0 55	0 451	0 47
Moisture	1 14	0 345	0 39	0 16	0 142	
Phosphorus	0 007	0 006	0 007		0 003	0 012

The above analyses are from the following authorities: U. S. Geological Survey, Bulletins 261, 348 and 290; "Coke," by John Fulton; Greenwell's "British Coals and Cokes."

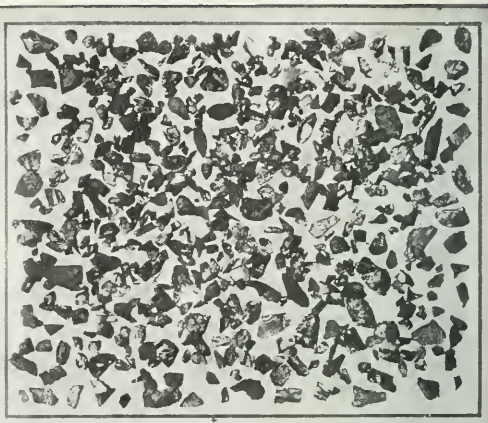
The comparisons given above are based, partly on the heating values of the coals considered, from the best available information, and partly on an experience running through some fifteen years of actual contact with the handling of New River-Pocahontas fuels in foreign markets.

The only solution of the export question for the United States shippers lies in the creation of a consolidated selling agency to handle the sales of all Eastern coal to foreign countries. Such an agency should have not only a single responsible head to direct the whole business, but also a first-class technical department. This department should have charge of the inspection and preparation of the coal, as well as its handling.

Suggested Anthracite Steam Sizes

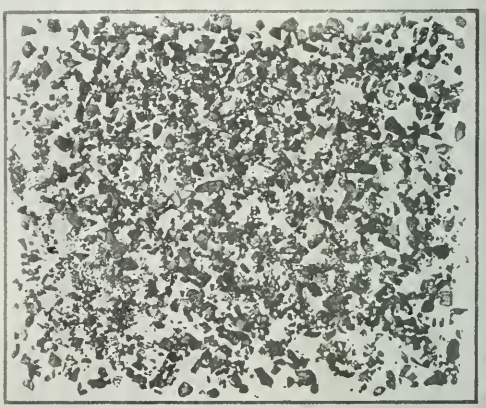


PEA



No 3 - BUCKWHEAT OR BARLEY

No 1 - BUCKWHEAT



No 4 - BUCKWHEAT OR CULM

No 2 - BUCKWHEAT OR RICE

POWER

STANDARDS FOR ANTHRACITE STEAM SIZES, RECOMMENDED BY THE AMERICAN SOCIETY OF MECHANICAL ENGINEERS IN THE SOCIETY'S *Journal*, NOVEMBER, 1912:

Steam Grades	Circular Screen or Opening Through or Over Which Coal Will Pass, Inches: Through	Over
Pea	1	⅝
No. 1 buckwheat	⅝	½
No. 2 buckwheat	½	⅜
No. 3 buckwheat	⅜	¼
No. 4 buckwheat or culm	¼	...

Power states that the sizes specified by the New York City Department of Water Supply, Gas and Electricity are practically the same as above except for pea coal, which is specified as coal which will pass through ¾-in. and over ½-in. openings.

Economical Steam Mine Hoists

Special Correspondence

SYNOPSIS—For shafts over 1200 to 1500 ft. deep the first-motion Corliss type of hoist appears to be the most economical, but for shallower depths even the simple slide-valve engine has the advantage. For such locations a valve with a cutoff which is varied automatically has been developed showing satisfactory results.

Operating economy is a subject of rapidly growing interest to all coal-mine owners and managers. A few years ago, many owners did not seem to appreciate that the use of engines and machinery, high in consumption of steam, were profit wasters. Then, too, it was customary to burn run-of-mine or lump coal under the boilers, grades which found a ready market.

At the present time, practically every grade of coal hoisted from the mine has a market value, and managers are realizing that the installation of power equipment of high fuel economy is desirable, if maximum profits are to be obtained.

High Economy Hoists

In the iron and copper fields of northern Michigan and in the precious-metal mines of the West, hoists of high economy have long been favorites. In the Lake Superior country, first-motion hoists with Corliss engines and many refinements, are necessary in order to produce the heavy tonnages from the great depths there encountered.

In ordinary coal-mining work, the depths of the shafts are not sufficient to permit the installation of first-motion Corliss plants, but in mines of over 1200 or 1500 ft. depth, such hoists could be employed with great operating economy. The ordinary Corliss hoisting plants will consume about one-third as much coal in a given space of time as the plain slide-valve engines usually employed.

The photograph, Fig. 1, shows a typical Lake Superior country first-motion hoist. It is equipped with steam reverse and steam brakes and an automatic throttle-closing mechanism, which cuts off the steam from the main throttle at a fixed point in the hoist, so that if the engineer should forget to throw his lever at the proper time, the steam will be shut off automatically and it will be impossible for the skip or cage to come to the landing under steam pressure.

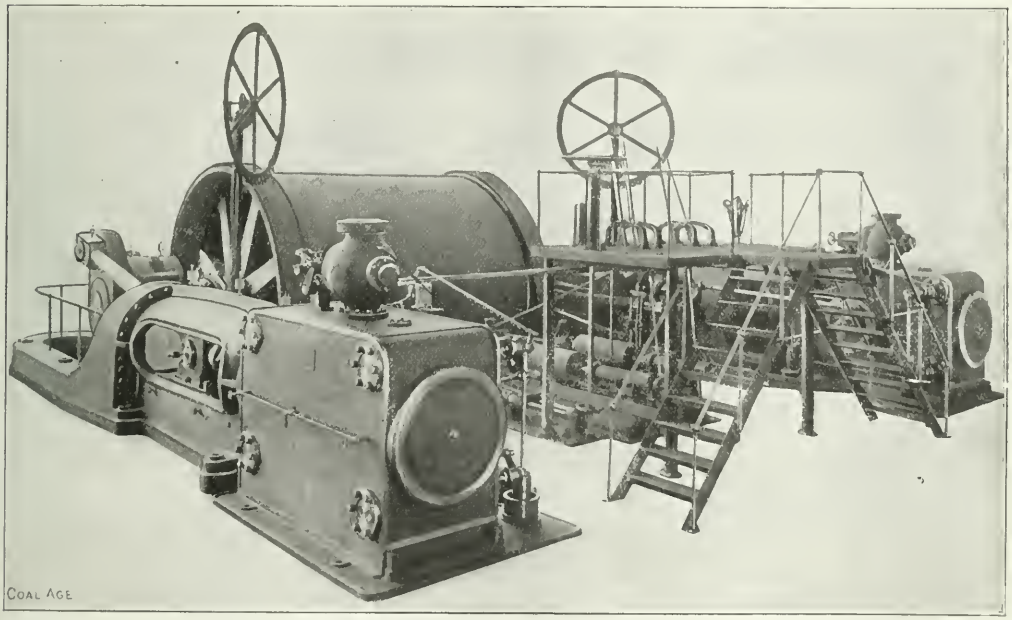


Fig. 1. A 28-60-in. First-motion Corliss Hoist

A further safety device is the automatic brake, which goes into action in a similar manner, in case the brake levers should not be thrown, in time to stop the hoist at the landing.

For mines less than 1000 or 1200 ft. in depth, which are the rule in coal mines in this country, it is out of the question to use first-motion Corliss hoists, as already mentioned, on account of the limitations in speed of the Corliss valve-gear, requiring engines unduly large for the service rendered. In shafts only a few hundred feet in depth, after the load is accelerated, but few revolutions of the engine will be made with the automatic cutoff in action, so that a direct-acting Corliss plant would be needlessly high in first cost, and actually more extravagant in fuel than a slide-valve engine.

Corliss geared hoists have also been tried for shallow mines, but as in the case of first-motion hoists, engines disproportionately large had to be supplied, to keep the number of revolutions as low as possible.

Slide-valve Hoist with Automatic Cutoff

After much study, the Sullivan Machinery Co. has developed an automatic slide-valve type of hoist which has now been in satisfactory use for several years.

In hoisting engines, hand adjustment of the point of cutoff is out of the question. It would require an engineer's constant attention, to give his engine steam for the entire stroke when starting the load, to set the valves at the proper point of cutoff when the load is under full motion, and to lengthen the cutoff again, at the end of the trip. Neither would it be possible for the engineer to set the cutoff at its most economical point each time, owing to variations in steam pressure and load.

The engine of this hoist is of the plain double slide-valve pattern, the valve-gear placing no limit on the speed at which it can be run. The mechanism controlling the automatic cutoff is so arranged that no extra thought or action is required on the part of the engineer.

When the steam-admission lever is pulled, the first two or three inches of its movement opens the main throttles, admitting steam during the entire stroke to start the load from the bottom. As the lever is pulled back, it admits steam to an auxiliary valve mechanism and cylinder. The piston of this cylinder actuates a crank and shaft, which in turn moves a vertical rack at the rear end of each cylinder. These racks engage pinions, one at the outer end of each cutoff-valve stem. The admission of steam to the auxiliary cylinder, therefore, automatically places the main valves in the position of the shortest cutoff. At the end of the trip, the reversal of the lever, to close the main throttles, admits steam to the opposite side of the piston on the auxiliary cylinder, and the cutoff is restored to its first position.

As stated above, no attention to the cutoff mechanism is needed, after the eccentrics have been set, to secure the most economical operation possible with the service factors of steam and load pressure which are prevalent. The slide valves are operated by separate eccentrics, with the usual link motion, a third eccentric being employed for the cutoff. The range of the cutoff is from three-quarters to one-quarter at the latest setting, and from four-tenths to one-tenth at the earliest.

The hoists embody the most modern practice in all details. The engines are reversible, by a standard hand-operated link motion. The drum is keyed to the shaft. The brakes are thrown by steam, with a handwheel for use in emergency or when the plant is not under steam. The gear is of semi-steel, and the pinion is made of cast steel, with cut teeth of the short involute pattern, rendering the action of the hoist smooth and quiet.

While these hoists have been used for the most part in the iron mines of the Lake Superior district, in which they have given excellent service, there are many conditions met with in coal mining wherein they would take care of the required output satisfactorily and result in a tremendous saving in fuel over the plain slide-valve engines in such general use at the present time.

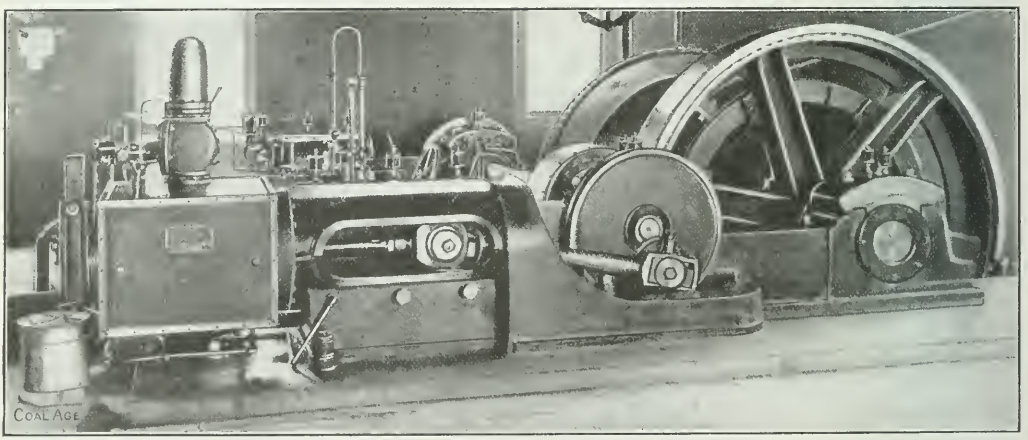


Fig. 2. A Typical, Geared, Automatic Slide-valve Hoist

Difficulties in Indian Mining

In an address before the National Association of Colliery Managers (Yorkshire branch), England, J. R. R. Wilson, a British mine inspector, told the following tale:

In India instead of using canaries or mice as indicators of the presence of carbon monoxide in fighting mine fires they use chickens quite frequently. A gang of men in charge of a Eurasian was building a stopping to close in a mine fire. As a precaution a chicken was placed inby, and the man in charge went frequently to ascertain if it was dead or alive.

The men knew very well that if the chicken died they could be sent out of the mine and moreover would receive their wages in full. Taking advantage of the boss' tendency to doze, a man would slip away from the rest, and after quietly wringing the chicken's neck would return to work. After awhile, they would contrive to make a noise which would waken the boss, who would immediately jump up, go and examine the chicken, only to find it dead. The men, of course, were sent out of the mine without delay.

The Indian's method of work is peculiar. On this subject Mr. Wilson said:

The whole family goes into the mine, father, mother and children, leaving the hut locked up. The males dig the coal and the women carry it, often long distances and 80 lb. to a load. The first mine I visited was a shaft and when the cage came up a woman with a black baby in her arms stepped out of the cage.

Electric Power in Collieries

Special Correspondence

SYNOPSIS—Many operators and mine managers look with more or less justifiable suspicion upon the employment of electricity as a motive power in mines. This article calls attention to some of the common difficulties which occur in the operation of motors underground.

There is no doubt that electric power in collieries has come to stay, and that its introduction has proved a distinct advantage in the processes entailed in the actual mining and transporting of the coal to the surface. It is, however, quite a matter of ordinary experience that a great many mine operatives and even managers have a certain amount of distrust of electric power which is not altogether without foundation in actual experience.

The large number of electrical plants which are working satisfactorily and with good results in economy rather tends to show that where trouble has occurred it may have been more or less preventable. Hence there is justification in bringing forward one or two notes of a minor character concerning incidents which have happened in connection with electro-motive power in mines in order to expose the causes which lead to such difficulties and also to indicate to a certain extent the way in which they might have been avoided.

Little Troubles Which Grow

A great deal of the trouble which occurs in collieries is due to the fact that apparatus is frequently placed in an awkward and ill-lighted position and is moreover not always given the proper amount of attention. The result is that troubles which at first may be insignificant and easily preventable, if allowed to accumulate, develop into quite serious matters.

A very typical case of this nature is to be found in connection with the breakdown of an alternating-current motor which was employed to drive a dip pump. This machine had been in operation for some time, but little attention being bestowed upon it, and, owing to the intrusion of grit into one of the bearings, this bearing ultimately seized. Unfortunately, however, the man in charge of the plant failed to stop the motor, perhaps hardly realizing that anything serious was wrong.

One of two things was, of course bound to occur. Either the seizing would be serious enough to stop the motor and hence by a virtual short-circuit blow the fuse, or the bearing itself would have to give way. The latter actually occurred. The brass bush which seized on the shaft was found to be running round with it, and the amount of heat generated was naturally considerable.

In order to effect a repair the brass had to be knocked off the shaft by means of sets and thoroughly scraped. The shaft was then replaced and the machine was running again in two hours after having been stopped. Taking into account the serious nature of the seizing, this may be reckoned a very quick job, but it was a matter which should not have occurred at all with proper attention.

A great deal of trouble with motor drives in collieries occurs through failure of insulation due to the damp locations in which they are called upon to work. The humid and sometimes hot atmosphere of a mine is extremely trying to an electrical installation and the remarkable fact is not that breakdowns occur, but that they are not far more common. Their infrequency points to the excellence of the work which is now being turned out by motor manufacturers.

It will often be found, also, that the cause of trouble with an electric drive is traceable not to the motor itself but to the apparatus controlling it. Here, again, although occasionally the fault may lie with the manufacturer, it is frequently caused through insufficient attention to the needs of the equipment.

It was found in connection with the motor driving a main and tail haulage that it started up very sluggishly and was therefore difficult to control. The trouble gradually became so bad that at last it was quite often the case that the rope was broken. Eventually a thorough overhaul and investigation was made not only of the motor itself, but also of the controlling apparatus.

It was then discovered that the liquid starter which was being used had not been cleaned out for months, but as the water evaporated a fresh supply had simply been added. As these replenishments had been obtained from the mine itself, it can be readily understood that when the tank was emptied a considerable quantity of mud and other impurities was removed.

After clean water had been provided and the requisite amount of salt added, it was found that the machine which had been giving so much trouble worked in a perfectly satisfactory manner. In this instance the mine management learned a valuable lesson on the importance of a thorough periodic overhaul.

The Maker Must Consider the Exacting Conditions

As was mentioned above, it sometimes occurs that the manufacturer has not thoroughly grasped the peculiar conditions attendant on mine operation. The result is that apparatus which may perform its work satisfactorily above ground, fails in mining service. This often applies to the auxiliaries.

The temperature of a mine is frequently in excess of that common in a factory and in addition to this there is a large amount of moisture contained in the atmosphere. These causes sometimes lead to breakdown.

In one installation, for example, the no-voltage coils on some oil switches repeatedly burned out. Sometimes the failure occurred twice in one week. The instruments could not be used without these coils, unless the switch was fastened in, and as this was a dangerous proceeding, a considerable number of stoppages took place.

After various methods to obviate the difficulty had been tried without success, it was decided that the root of the matter lay in the fact, that, considering the temperature and humidity of the air, the coils were of too small a cross-section for the current density they carried, and as a result they were rewound with a slightly larger wire, provided with a better class of insulation. After this had been done the trouble entirely ceased.

This is a very useful instance of the extra care and attention which has to be paid by manufacturers of electrical mining equipment in order to safeguard against the extremely severe conditions of operation which prevail.

Railroad Coaling Plants in England

British Correspondence

Description of one of the newest railroad coaling stations in Great Britain. Provision is made for cleaning the smoke-box and tubes, dropping the fire, filling tank and coaling the locomotive, all of which operations are accomplished in 24 min., as compared with 1¼ to 1¾ hr. by the method previously in use. The plant operates at a high speed and is designed to reduce breakage and labor costs to a minimum.

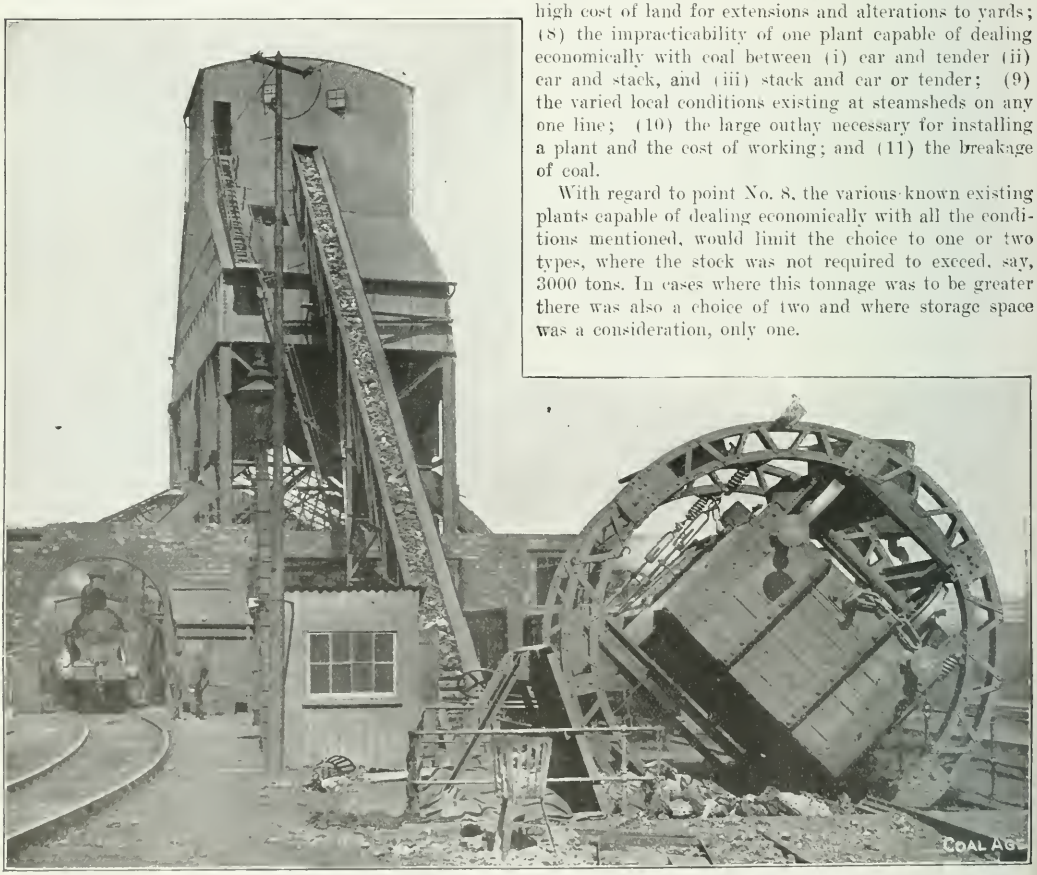
An interesting description of the mechanical coal handling plant recently installed by the London & North-Western Ry. Co. is contained in a paper read before the British Institution of Civil Engineers at the end of November by C. J. Bowen Cooke, Chief Mechanical Engineer of the company. This plant removes the coal automatically from the car, conveys it to the overhead bunkers, measures it, and places it on the tender without hand shoveling of any description. This is the first of its kind in the country, it is the joint design of Mr. Cooke and the builders of the machines.

The increasing consumption of coal at the Crewe depot, and other causes, made the cost of transferring it from the cars, amount to 7.38c. per ton. This high price, and the fact that the tonnage dealt with is the largest on the London & North-Western system, were two of the principal factors leading to the adoption of a mechanical coaling plant.

Considerations Affecting Design

In designing the new plant it was necessary to consider the following points: (1) The cheap rate at which coal was now dealt with by hand; (2) the impossibility of obtaining reliable statistics of a plant suitable for British requirements; (3) the large size of coal mined in England; (4) the class and size of coal cars in use; (5) the restricted area available in most railroad yards; (6) the regular and adequate supply of coal; (7) the high cost of land for extensions and alterations to yards; (8) the impracticability of one plant capable of dealing economically with coal between (i) car and tender (ii) car and stack, and (iii) stack and car or tender; (9) the varied local conditions existing at steamsheds on any one line; (10) the large outlay necessary for installing a plant and the cost of working; and (11) the breakage of coal.

With regard to point No. 8, the various known existing plants capable of dealing economically with all the conditions mentioned, would limit the choice to one or two types, where the stock was not required to exceed, say, 3000 tons. In cases where this tonnage was to be greater there was also a choice of two and where storage space was a consideration, only one.



View of Railroad Coaling Plant, at Crewe, England, Showing Car in Process of Dumping

In case (i) the two types were: (a) one adopted by certain railways abroad, in which the handling of stock and current coal by gravity, bucket, or conveyor was combined; and (b) some form of power driven crane and grab bucket.

With plants of type (a) the stock rarely exceeded 3000 tons and was stored in bunkers, either underground immediately below the coaling stage, or above ground and forming part of the coaling stage. In the latter case the coal was handled no less than six times between the colliery and locomotive tender, with consequent breakage at each stage. It had been argued that, owing to the deterioration of coal when left in stock out of doors for several years, it was more economical to handle it in this manner; but actual experiments had shown that a hard Yorkshire coal, after being in stock out of doors for eleven years, had deteriorated only 2.5 per cent., which is equivalent to a loss in value of 9.6c. per ton, or in the case of a 30,000-ton stack $262 per annum.

With a soft Blaenavon coal the deterioration after seven years was, 2 per cent. which is equivalent to a loss in value of 7.2c. per ton or in the case of a 30,000 ton stack, $309 per annum. Adding even $309 to the $750 for the taking up and putting down, the resultant figure—$1059 per annum—did not leave much margin for profit on a mechanical plant, after allowing for all capital charges and for the cost of working the plant, even if one of such capacity could be designed. Further at nearly all depots in England where the annual consumption was sufficient to warrant the installation of mechanical handling, the stock coal greatly exceeded 3000 tons; so that this type of plant appeared to be undesirable.

Regarding type (b) the crane might be of the revolving derrick class travelling on rails or the bucket might be supported from a traveller running on the overhead guide of a crane of goliath type. The grab-bucket, however, was limited in size by the receptacle from which it picked its load; when, therefore, it was compelled to work out of railway cars such as those used in England it became anything but the most economical form of appliance.

In case (ii) where the stock exceeded 30,000 tons, choice could be made between the bow string girder type of conveyor and the crane and grab-bucket. Where the former arrangement was installed it was apparently used only for handling coal much smaller than that generally mined in Great Britain, and therefore, in Mr. Cooke's opinion, it was not suitable for British conditions. In case (iii) the crane and grab-bucket type appeared to be the only one available, and further comment was unnecessary.

Type Finally Adopted

It appeared, therefore, that so far as Great Britain was concerned, the existing types of apparatus, capable of putting coal from cars to stock, stock to cars or tender, and cars to tender, were not suitable, owing to the peculiar conditions. The problem of coaling engines direct from cars would therefore alone be considered.

With regard to point No. 10 consideration of seven different types of plant showed that a suitable one could not be erected for less than $25,000 to $30,000 capital expenditure. Further, that where electric current was available at about 2c. per unit, the total cost per ton of coal when handling 110,000 tons per annum would be about 1c. per ton including interest on capital, depreciation, maintenance, and working charges. Such an expenditure, with such a result might lead locomotive engineers to the conclusion that, in their case, the experiment was not worth trying, owing to the smaller tonnage dealt with.

The consideration of certain inducements might, however, be studied before condemning such a proposition. For instance, (1), a mechanical plant, whilst occupying less ground than an old fashioned coal stage, could deal with nearly double the quantity of coal per annum; (2) there was an economical advantage in coaling as many engines as possible at a point adjacent to the collieries (where coal was cheapest) and in the shortest time possible; (3) the rapidity of coaling might enable a railway company to dispense with an engine or two, or even to refrain from building a similar number, with consequent economy of capital; (4) the release of cars would probably take place in less than half the time required at present, with consequent increase in earning capacity, and a possible reduction in the cost of shunting in the yards.

The large amount of slack created by the present manual handling was perhaps not generally realized, and the following statement might come somewhat as a surprise. After a tender had been loaded in the ordinary manner, and the coal broken by the fireman to a suitable size, the proportion of slack ranged from 13 per cent. in the case of Welsh coal to 2.3 per cent. in the case of North Staffordshire coal, although particular care had been taken to start the experiment with cars from which all slack had been removed by hand. When the slack which was in the car when it arrived at the coal stage was added to this—in this case 10.2 per cent. in soft coal and 2.9 per cent. in hard coal—the total was sufficient to make one pause to consider how this waste might be avoided. In this test "slack" meant all the small coal which was passed by a screen with ½-in. mesh.

Description of the Plant

The new plant was installed at the Crewe, north steamshed where about 130 engines were permanently stabled, and where the quantity of coal transferred from truck to locomotive every 21 hr. was about 150 tons or 110,000 tons per annum.

As the coal cars belonging to the railway company had neither side nor end doors, a "tippler" capable of dealing with cars of up to ten tons capacity, became the initial part of the apparatus. It was driven by a 660 volt, direct current, electric motor of 5 h.p. and was capable of emptying a car in about five minutes inclusive of the time taken to cramp down and release the wagon.

The hopper—of mild steel plates and angles—held about 20 tons and was carried by cross girders in a brick-lined pit. The coal was fed from this hopper by a jigging-tray, through an adjustable door, and into a two-roll breaker, where the large lumps were reduced to 8 in. This breaker, was belt-driven by an independent direct-current electric-motor of 10 h.p. which also operated the jigging-tray. The coal passed, with the large lumps broken, through the breaker to the conveyor trays, which carried it to the overhead storage. At the back of the jigging-tray was fitted a chute which delivered any powdered coal that tended to work out between the bottom of the hopper and the jigging-tray.

The conveyor was of the "tipping-tray" type, running at a speed of 70 ft. per minute and capable of lifting about 60 tons an hour. The driving gear consisted of a 660-volt, direct-current electric motor of 9 hp. driving through a belt, a train of machine-cut gear-wheels the effect of which was to give a very quiet drive. The coal was delivered over the end of the conveyor-track but, in order to prevent any breakage at this point, a special form of balance-plate retained it on the trays until the return journey, when it had a fall of only about one foot to the inclined chute which delivered it to the requisite division of the bunker.

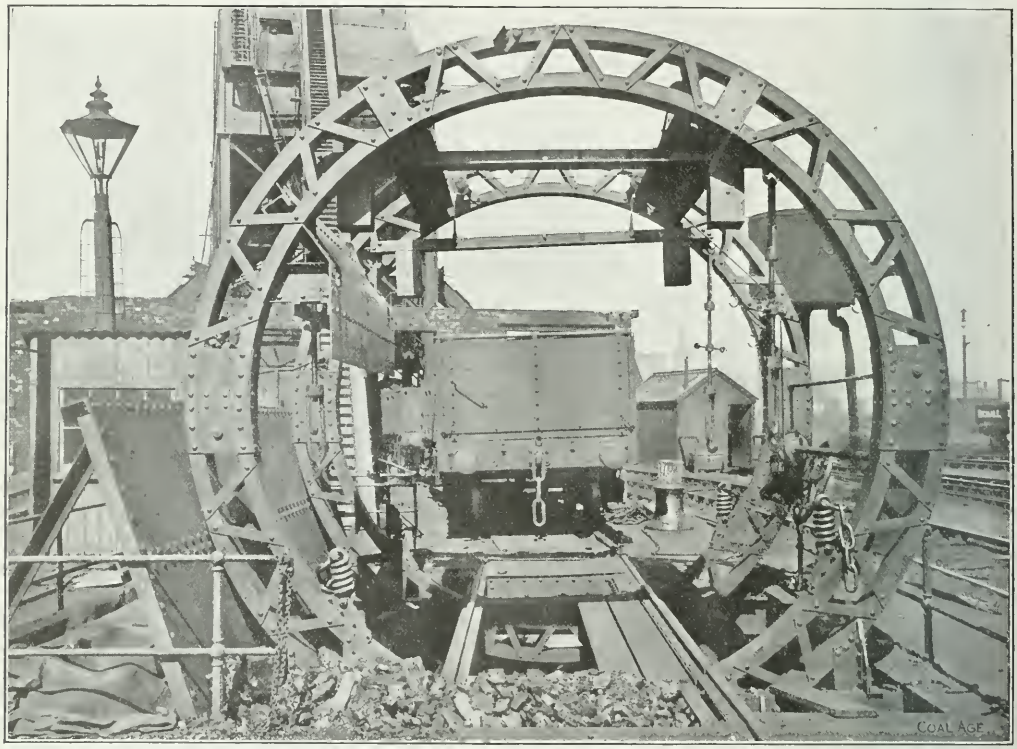
Owing to a large number of the main-line engines being loaded with two classes of coal—namely, Welsh and "hard"—it was necessary to provide separate bins for each class. The bunker was therefore divided into two parts, so as to store 100 tons of Welsh and 300 tons of "hard", with the floors, of course, built to suit. There was an outlet on each side of each division of the bunker, four in all, so that the tenders could be coaled on both sides at the same time.

Result Obtained

In conjunction with the coaling plant, an ash-conveyor had been installed close to the coal bunkers. There was also a compressed air, tube-cleaning apparatus consisting of a special form of pipe that could be held against the smoke-box end of the tube, and through which a jet of air at 100 lb. per sq.in. pressure, could be blown down.

The average daily quantity of coal placed on tenders is now about 450 tons and the new plant performs this task with a staff of three men by day and one by night, the conveyor being at work approximately ten hours a day. At present between 140 and 150 engines are coaled per 24 hours, and the coal should be placed on the tenders at the rate of two tons per minute, though the rate at which engines pass through the coaling plant is governed by factors other than that at which coal could actually be put on the tenders.

Under the new condition of things, an engine coming off the turntable proceeds in the following way, and is detained for the time stated for each process: Cleaning smoke-box of ashes, 4 min.; filling tank at water-column, 3½ min.; cleaning tubes, 4½ min.; coaling engine, 4 min.; and dropping fire, 8 min.; or a total of 24 min. These are the actual times taken by the several operations, and as they are only a few feet apart, little additional time was occupied in moving from one to the other. Under the old conditions the time taken was 1¼ to 1¾ hours.



Railroad Coal-car Dumping Arrangement, Showing Anti-breakage Device

❖

England's new coal-mines bill states that all newly opened coal mines shall have two main intake airways, affording means of ingress and egress to the mine, one of which shall not be used for haulage purposes. Mines employing less than 100 men, are exempt from this provision.

Diamond Crossovers for Shaft Bottoms

By H. D. Easton

SYNOPSIS—The article describes a neat graphical method of designing a diamond crossover to fit given conditions at the foot of the shaft.

Track arrangements at shaft bottoms must be in first-class condition if caging is to be done expeditiously and the maximum output of coal is to be obtained. In cases where the caging is done from one side of the shaft only, the most rapid handling of cars is made possible. The loads bump the empty cars off the cages and allow them to run by gravity into a kick-back and thence into the empty hole. This permits the tracks on the caging side to have a gentle down grade to the shaft, and allows the loaded car to bump the empty car off from the cage almost at the instant it lands. Such an arrangement requires few bottom men.

There are many mines in which the caging is done from both sides of the shaft where it would be an inexpensive improvement to alter the arrangements so as to take advantage of natural grades and do all the caging from one side. This is true of many mines operating in pitching coals. In other cases, especially in flat beds of coal, it would be necessary to install an automatic empty car lift to run the empties into a kick-back. This would prove advantageous in cases where mines have reached the maximum capacity of caging from both sides.

The Diamond Crossover

In mines where all of the caging is done from one side of the shaft, a diamond crossover is needed on the caging side. When the caging is done from both sides of the shaft, two of these crossovers are necessary. It is rather common to find these diamond crossovers constructed in the crudest manner possible. Often they are built by a blacksmith, who has no design to follow, but is left to his own resources. Much time is lost in caging over such tracks and the shaft bottom is always littered with coal spilled from the well-topped cars because of the abrupt turns and sudden jars. Besides this, wrecks and derails are especially expensive at the shaft bottom since they always impose a forced idleness upon the top men.

How to Design a Satisfactory Diamond Crossover

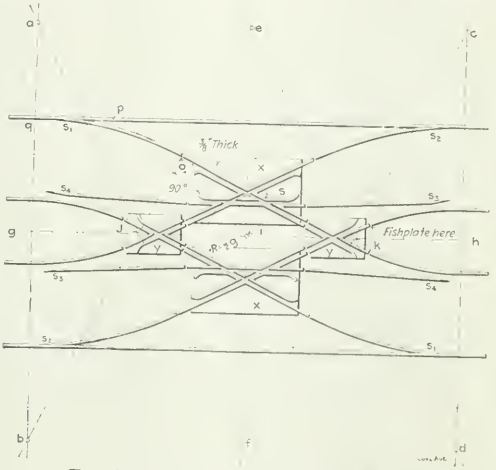
The distance between the track centers is determined by the size of the shaft compartments. The track gage is known, and the weight and size of rail used. The clearance is taken to accommodate the wheels used. In addition to the above data, it will be necessary to know one of two things before proceeding with the design. First, the frog angle must be known. To most people, however, the frog angle means little, and its use would require several trials in order to find the best angle to be used. If the angle selected is too great, the crossover will be too short and abrupt; while, if too small, the crossover will be too long and occupy too much of the shaft-bottom space besides causing the cagers to travel a long way to get a loaded car, since the trips cannot be kept up close to the shaft. Second, instead of determining the frog angle, it is a very easy matter to determine how much length can be allotted to the crossover and then to design the best one for the given length.

Our proposition, then, is to design the best diamond crossover with the following data given:

1. Track gage.
2. Size of rail to be used.
3. Distance between track centers.
4. Clearance.
5. Length of shaft bottom to be given up to the diamond crossover, bearing in mind that the longer it is the greater the ease of pushing loaded cars over it.

Procedure

The sketch shows a purely graphic method of designing a diamond crossover with the above data. Draw the tracks accurately to scale at the given distance apart. Erect the perpendiculars *ab* and *cd* so that the distance



The Layout of a Diamond Crossover

ac equals the allotted length for the crossover. Erect the perpendicular *ef* midway between *ab* and *cd*, also draw *gh* midway between the center lines of the two tracks. Establish points *j* and *k* so that $ji = ik = \frac{1}{4}\ ac$. With *i* as center and a radius of ½ track gage, draw a circle.

Now place a 90-deg. triangle at *o*, so that one side will be tangent to the circle at *s*, with the other side cutting through the point *j*; shift about until a position is found, such that the distance $op = pq$. This can best be done by using a second triangle, or a straight-edge, against the first one so as to produce the line *so* to *p* and comparing the distances *op* with *pq* by means of a pair of dividers. With the triangle in the right position, draw the line *oj* and extend it to *c* and to *b*.

Now, locate point *f*; $ie = if$. Draw *fja*, *fkc* and *ekd*, thus locating the four points *a*, *b*, *c* and *d*. With these four points, *a*, *b*, *c* and *d*, as centers, use a beam compass and draw the curved portions of the diamond crossover and then fill in the remainder, as shown, using any desired clearance.

*Professor of mining engineering, Kentucky State University, Lexington, Ky.

A special drawing of the steel plate *X*, with its pieces of track, can now be given to the blacksmith with instructions to make two of these; similarly for plate *Y*, two of which will be needed. All pieces of track and guards should be riveted solidly to the plates so there will be little danger of the track being torn up by a run-a-way or wreck. These plates can be spiked solidly to the ties.

If the shop has the machinery available, the points S_1, S_2, S_3 and S_4 can be planed to fit accurately to the sides of the rails. There will be two of each of these. Each pair of points can then be connected to a rod and the switch thrown as on a railroad, allowing the play to come at the fishplates. In the absence of a planer, to fit the points to the side of the rail, the usual mine points can be substituted for the planed ones.

Being made in sections, as shown by the plates *X* and *Y*, this diamond crossover can be taken into the mine without difficulty, readily assembled and, in case a wreck tears a portion of it up, it can easily be taken to the shop for repair.

Some Foreign Coke Oven Improvements

By Alfred Gobiet*

SYNOPSIS—Description of some unique departures in established coke-oven practice. These consist of two unusual door-lifters and two new methods of quenching coke. The last installations are more elaborate than would ordinarily be considered good practice in this country, but they are not without their advantages.

The following are two methods of lifting and moving aside coke-oven doors, the first being that of H. Grono, Oberhausen, Germany:

The winch frame *A*, Fig. 1, balanced by the counterweight *B*, carries a roll-guided, horizontal slide rack *C* moved by a pinion *D* geared to a crank. The rack is connected with the lever *E* by the shaft *F*, and *E* in turn

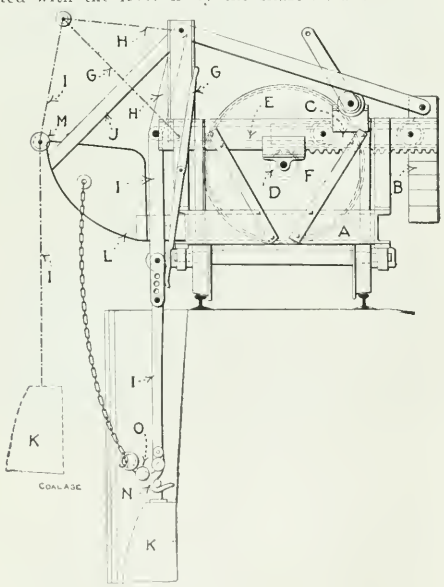


Fig. 1. Grono Door Lifter

with the lever *H*, so as to form a toggle joint. The coke-oven door *K* is suspended by means of strong, adjustable, jointed rods *I*. The movement of the rack in the direction of the arrow brings the door into the position indicated by the dotted lines, raising it obliquely 20 to 24 in. high, out of its socket, so that it can readily be moved sidewise.

Fastened to the rope windlass by the braces *J* are the guide shields *L*, the curved edges of which serve as tracks for the rolls *M*, from which the door is hung. The rod *I* is connected with the door *K* by a hook *N*, with a balance weight *O*. As the apparatus, with the door swinging from it is moved aside, the lever *G* may be used to push forward the rod *I* and keep the suspended door from striking against the front of the ovens. For use with doors that have to be lifted straight up before removal from

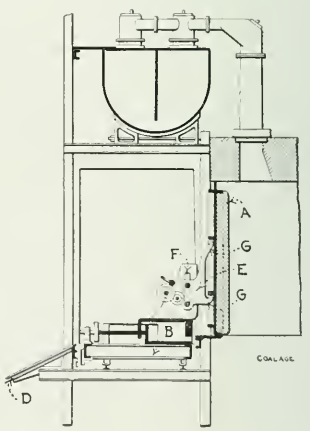


Fig. 2. Coke-oven Door Lifter

the oven, the shields *L* may be shaped as vertical guides.

The H. Koppers door lifter, Fig. 2, is a car *B* moved in front of the oven and carrying a mechanism for raising the door *X*. A bracket with a horizontal cross movement by the screw *C* supports the lifter proper *E*, which slides on a vertical guide *F*. It is elevated by the aid of a rack, and other gearing, and can be held in any desired position. Two fingers *G* of this lifter enter corresponding hollows of the oven-door frame which may thus be raised, drawn back by means of the horizontal slide, and rolled aside by moving the car. In the construction shown in the figure, there is a bridge on the same car which, when the door is moved aside, forms a connection

*Engineer, the Witkowitzer Mines, Ostrau, Moravia, Austria.

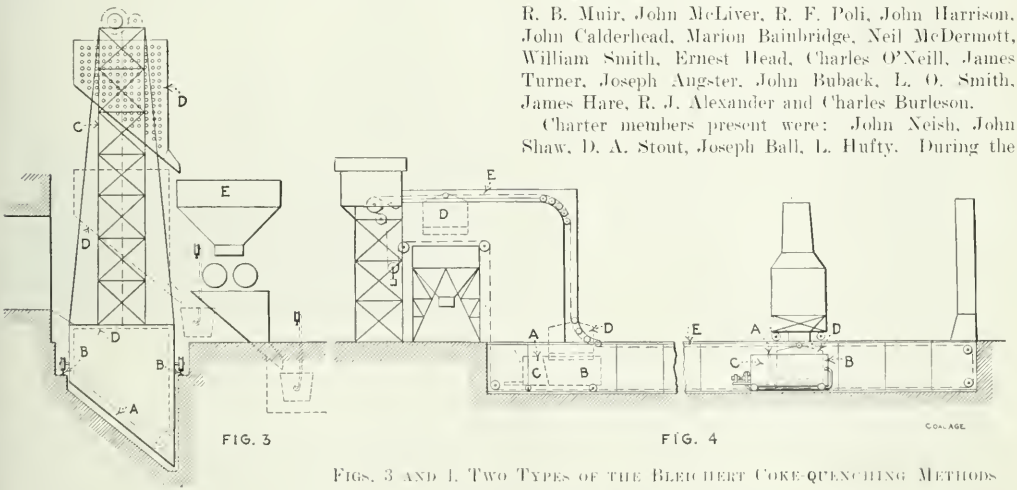
Note—Abstract of paper appearing in "Montanistische Rundschau" (Vienna), Oct. 1, 1912.

between the oven floor and the inclined coke dump *D*. Moreover, the car carries two side shields which prevent an untimely dumping of the coke that is drawn out.

Bleichert Coke Quenching Apparatus

The following quenching apparatus are patented by Adolf Bleichert & Co., of Leipzig and Vienna. The type illustrated in Fig. 3 consists of a water tank *A* of the peculiar shape shown, which runs on rails *B* in front of the oven battery; a perforated bucket *D* is let down into this tank. After the coke has been quenched, the bucket is lifted out of the water by a hoist on the frame *C*, and is thus drained. The bucket may then be placed on a car and transported to the storage yard, or the tank and bucket together may be rolled to a hopper *E* and there the coke dumped out, as shown by full lines in the drawing. Instead, the bucket may be raised to the dotted position and dumped into cableway buckets.

At the Tegal gas works, near Berlin, is installed a Bleichert quenching system on this general principle. There the coke is drawn into the bucket standing over the tank and during the operation the tank is slowly elevated so that the water gradually rises in the bucket. Afterward the tank is let down again and the bucket moved aside for emptying.



Figs. 3 and 4. Two Types of the Bleichert Coke-quenching Methods

Another patented Bleichert quenching system is shown in Fig. 4. Here the water tank, and in it the bucket, are rolled on rails in front of the ovens, and after the quenching are run to a particular place at a distance, where the bucket is lifted out of the water and its contents disposed of. The tank *A* is partitioned, so that it contains the reservoir *C* and the compartment *B*, which receives the perforated bucket *D*. These two compartments are connected by piping with a pump. The bucket is fastened to an endless cable chain *E* by which both it and the tank are moved.

The quenching process is as follows: The tank is moved in front of the oven and after the charge has been drawn into the bucket *D*, the pump is set in operation to force the water from the reservoir *C* into the bucket compartment *B*. At the same time the endless rope is started, and during transportation the coke becomes sufficiently quenched.

At a certain point beyond the oven battery the cable bends upward and elevates the bucket *D* out of the tank and carries it to a bunker or storage yard. At the bend, guide rails are provided for it. When the bucket has been dumped the movement of the cable is reversed, the bucket restored to the tank at the bend, where it is rolled to the oven to be drawn next.

The Huerfano Chapter of the Rocky Mountain Coal Mining Institute

The election of permanent officers for the chapter took place in the County Court House and resulted as follows: President, Joseph Ball; vice-president, D. A. Stout; secretary-treasurer, L. Hufty; executive committee, John McDowell, Martin Brennan, James Turner, James Tyson, R. Poli.

The ones who joined as new members are: M. Brennan, John McDowell, James McDowell, T. J. Stone, R. B. Muir, John McLiver, R. F. Poli, John Harrison, John Calderhead, Marion Bainbridge, Neil McDermott, William Smith, Ernest Head, Charles O'Neill, James Turner, Joseph Angster, John Buback, L. O. Smith, James Hare, R. J. Alexander and Charles Burleson.

Charter members present were: John Neish, John Shaw, D. A. Stout, Joseph Ball, L. Hufty. During the meeting, Mr. Stout gave a very interesting talk. Regular meetings will be held the third Sundays of each month at 2 p.m.

Briquette Binders

The best binder for briquetting depends upon the locality, the character of the coal, and the purpose for which the briquettes are intended. If the mines are near an oil field, the cheapest and best binder is asphalt; the best results are obtained with about 4 per cent., which costs 50 or 60c. per ton of briquettes. Five or six per cent. of water-gas pitch is a good binder and costs about the same as asphalt; 6.5 to 8 per cent. of coal-tar pitch is probably one of the most widely available binders and the cost is from 65 to 90c. per ton. Wood-distilled tars and asphalts form good binders but, with the exception of a few localities, they are too high in cost to be generally used. Producer-gas tar gives the best of results and calls for a low percentage of binder.

Belgian Methods of Coal Working

Special Correspondence

Owing to the difficulties under which the Belgian coal industry is operated, the margin between the cost of production and the selling price is much smaller than in other European mining countries where circumstances are more favorable.

The method of working generally used is that of continuous headings, which are pushed forward from the shaft toward the limit of the field. The room-and-pillar system has occasionally been adopted in some thick beds in the districts of the Center and of Liége, while steeply inclined seams are worked in reverse steps, and the flatter measures either by rising or forward stalls.*

Primitive Methods of Mining

Coal cutting is nearly always performed by hand and it is preceded by cutting, in the unproductive parts of the seam. Blasting in coal is restricted to mines containing little or no firedamp and is specially used in the hard seams of coal near Charleroi. The consumption of explosives for the getting of coal in these latter seams varies from 40 to 96 lb. per 100 tons extracted, but in other mines where the use of explosives is allowed their average consumption does not exceed 28 lb. per 100 tons.

Compressed air is applied to drilling machines and small fans. Haulage is mostly done by horses; mechanical traction is restricted to the main roads, and is less developed than in the other coal fields where the output is greater and more concentrated. Locomotives are preferred in Belgium to the endless rope or chain systems. In the colliery of Amercoeur at Jumet, the underground haulage is effected by accumulator locomotives, but of late in a number of collieries preference has been given to benzine-propelled locomotives.

The underground applications of electricity for drilling, lighting, and especially pumping, hoisting and haulage, are already numerous, but have hitherto been confined to downcast shafts and intake airways except in nonfiery mines. In most cases continuous current at a moderate voltage has been employed, but three-phase current is used in some important installations.

At present more than 50 per cent. of the companies have no underground power, except for the dumping of cars. But since the application of the new law limiting the hours of work in coal mines, the adoption of mechanical appliances has been considered by a number of companies as a matter of necessity.

Thin and Contorted Beds Make Coal Costly and Methods Primitive

Three circumstances have a preponderating influence on the cost of production of the Belgium mines—the thinness and contortion of the seams, the occurrence of firedamp, and the depth of the workings. The seams are split and folded everywhere. These folds and wrinkles are most numerous in the southern portions of the coal-bearing area, but while they are still well marked in the center, they become less noticeable toward the north, in the lower part of the country.

The average thickness of the workable seams is only 27 in. with 10½ in. as low limit; in several collieries of the Hainaut province the average available thickness of all the seams is from 16 to 20 in. These conditions present obstacles to the use of coal-cutting machines, which in that part of the Belgian coal field known as the "Couchant de Mons" (Borinage district) will be impracticable on account of the folded character of the beds.

*Narrow rooms usually with large pillars and frequent crosscuts dividing the ribs into large rectangular pillars.—Editor

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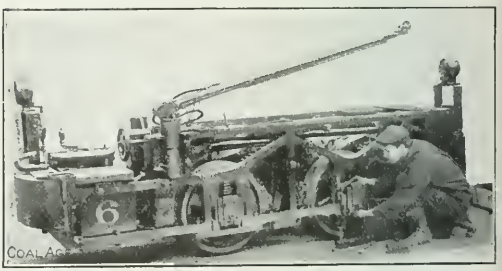
A New Type of Locomotive

The accompanying illustration shows a type of mine locomotive which has recently been placed on the market by the Baldwin Locomotive Works and the Westinghouse Electric & Manufacturing Co., which it is claimed will operate satisfactorily under the worst conditions with minimum attention and maintenance expense.

The motors, brake rigging, brake shoes and sand boxes are easily accessible. The upper parts of the motor and armature-bearing housings can be removed without disturbing the suspension, so that each part of the motor is exposed for inspection. The only work necessary to remove the grid resistors is to take off the locomotive covers and loosen the bolts and terminals that hold the resistor frames in place.



Removing a Journal Box on an Outside-frame Locomotive

The Vauclain removable jib is introduced on locomotives with outside frames. To remove a journal box with this jib it is only necessary to drop the binder and take the weight off the box, which may then be slipped out from the side. On locomotives with inside frames the journal-box cellars are arranged to be easily dropped out for repacking. The frames of the motors are made of cast steel, and are split diagonally. The axle bearings and suspension nose are on the lower half, so that the upper half, the armature and bearing housings can be removed without disturbing the suspension or axle brackets.

The armature core is mounted on a spider to which it is keyed, making it possible to remove the shaft without disturbing the windings, and also reinforcing the shaft against bending. Large openings are provided in the spider and through the core to give sufficient ventilation.

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When designing an underground stable the character of the floor to be decided upon requires special consideration. So long as the mules are shod, it does not make any difference to the foot itself what the shoe rests upon. The material used for flooring should be such as will keep the stalls and mules clean, with the least amount of work. Cement, properly corrugated, gives the best results in stable construction. Drainage should be so arranged that the slant and the direct sewer conection will remove all fluids.

EDITORIALS

A Bad Name

The mining industry has a malodorous name. Everywhere we go we are informed that the mines are the largest graves in the country, that nothing is being done to remedy the evil, for nobody cares about the countless sacrifices but the general public.

Really the populace is to be thanked for its keen continued interest in our deliquencies. It would be well, however, if it did not inquire into *our* conduct alone. Congress is willing to spend thirty times as much for agriculture as for mining, but it is not desirous of discovering how many agriculturists yearly succumb to the perils of farming. An investigation pursued with diligence would probably show that the number of fatalities among farmers exceeds, as in Germany, the accidental deaths of any other class of operatives.

Since 1909, no investigations have been made regarding the deaths of railroad trainmen. The Interstate Commerce Commission no longer gives publicity to such losses, but during the last year in which the record was kept, the death rate among trainmen was 4.87 per thousand.

These men were killed mainly one by one. There were no sudden reapings of men by tens and hundreds, which in years of gloom swell the death rate in mines. The record represents a far greater number of separate accidents than would be indicated by a similar figure in coal mining. Nevertheless, though this proportion has been exceeded in France and Canada, it has only once been reached in the mining records of the United States. That was during the year 1907, which is generally conceded to have been abnormal.

There are many industries more dangerous than mining, and it would be well if all were investigated. We do not advocate ceasing the good work of inquiring into the fatalities of mining. By all means let the investigation proceed as a continued prod to the industry to do better and to prove to the world that progress is being made.

The loss of life is not great, though larger than it should be. The City of New York often records as many deaths from all causes in ten days as are collected by the Bureau of Mines in a whole year. Of course, the population of the city is about seven times as great as that of the mines, and it is not just to compare accidental deaths with mortalities of all kinds.

But we need a base, a norm to control the public mind. It is easy to condemn and to rant whether the losses be few or many. The man on the street will shudder as readily when told that 1000 men died in the mines last year, as he would if you increased the number to 10,000. He has no basis for judgment and readily believes the purchased press.

For the press is venal. It may be free from the constraint and control of the multi-millionaire, but it is usually slavish before the man who pays pennies and dimes for its circulation. This press should be given a chance to learn related facts from other bodies beside the Bureau of Mines; should be presented with an opportunity for fulminations against other persons than those who chance to be producing coal and should be afforded an opportunity to do justice to an industry which deserves to stand well in the judgment of the public.

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The Efficiencies of Large and Small Turbines

Ever since the conversion of the steam turbine from a scientific toy to a commercial prime mover, there has been a steady increase in the size and power of these machines. Simultaneously also they have been developed both in capacity and efficiency.

There is a marked difference in the performance of large and small turbines as they exist commercially today. The average overall efficiency of a 1000-kw. unit is in the vicinity of 57 per cent., while that of a 10,000-kw. machine may easily reach 70 per cent.

There are two principal reasons why the small machine is less efficient than the larger one. The first of these is simple and readily understood. In low-capacity turbines, a far greater percentage of the entire cost is taken up by those parts (governor, oiling system, pipes, etc.), which do not directly contribute to the internal efficiency of the unit. In a 500-kw. machine, the cost of these parts may easily reach 15 per cent. of the total, while in one of 10,000-kw. capacity, this item is only about 30 per cent. From this it may be readily appreciated that small turbines of high efficiency cannot be commercially produced unless exceptional prices are obtainable.

The second reason is more obscure, and is strictly technical. Each pound of steam contains a certain definite amount of potential energy, which, through expansion, is converted into kinetic energy, in which form it may be absorbed by the moving blading. The wide range or difference in pressure between intake and exhaust on a modern turbine, renders available a considrable amount of heat for each pound of steam, and the machine's efficiency depends upon how and in what manner this heat is distributed.

To obtain a maximum absorption of the heat energy made available by a given pressure drop, the velocity of the steam must bear a certain ratio to that of the blades. This ratio, however, varies according to the type of blading employed.

With a given speed of rotation, number of stages, and total pressure range, the radius of application or mean diameter of blading must remain constant, and the output of the machine is dependent directly upon the length of the blades. The more stages there are employed, the greater, within limits dependent upon the type of the turbine and the speed, will be the overall efficiency.

As to reliability, which is an extremely important factor in mining service, there can be but little question

but that the steam turbine is the equal, if not the superior, of any prime mover now in use. It has the further advantage that wear is confined to but a few surfaces, practically all of which may be subjected to forced lubrication, so that the maintenance charges on even the largest of units may, and under ordinary circumstances should be, so small as to be almost entirely negligible.

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The Committee on Gas Wells

We hope the mining inspectors of the United States will be well represented on the committee on gas wells and oil wells passing through coal. Unless the mine departments of the states do their part, there will be an imperfectly balanced council, for the gas and oil industries both have their representatives, and the coal men have no more than either of these interests.

Someone jokingly remarked at the conference that the separating of two industries, so unified in their purposes as those pertaining to gas and oil, would justify the coal men in demanding a representation both for their point of view and for that of the producers of lignite. However, if the inspectors do their part, the unfairness in representation will be met.

The Pennsylvania inspectors were represented by one man only and he came late for the third part of the conference. It seemed to bode no coöperation on the part of the inspectional service of that state where the Bureau of Mines finds its home. The sentiment of the mining public, we believe, hardly justifies that abstention.

Unfortunately, the whole question has sprung upon us before the problem of roof action has been thrashed out to a universally satisfactory conclusion. We still have many adhering to a belief in shear as an explanation of all difficulties. The Belgian bureau seems to favor this hypothesis, others believe that the roof bends but oppose the idea that the strata act as a unit, and, of course, there are others whose ideas are contradicted by every evidence, but their theories are not worthy of serious consideration. That being the case, the various departments of mining in the states should be willing to meet in conference and contribute to the consideration of the subject.

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Red Tape in the Geological Survey

The government printing office in Washington assumes prerogatives that are, at times, exasperating in the extreme. For instance, when one orders a series of topographic maps, he is apt to receive a notice with them to the effect that a certain sheet is out of stock, for which another one has been substituted. What firm of publishers would reply to a request for a certain issue of their magazine by sending the number immediately preceding or following the one asked for? Engineers generally know what they want and resent this apparently indifferent attention to their requests.

The procrastination (common to all government departments) in filling these orders is also prolific cause of annoyance. It is difficult to understand, for instance, why it should take eight days to get certain topographic and geologic sheets ordered from New York City. Few engineers have either the means or the facilities for filing anything like a complete set of the Geological Survey publications now in print, and it frequently happens that one of these may be required on short notice. Unless one has connections in Washington to whom he can wire he is sure to be disappointed, for the government would not trust the greatest engineer in the country for a 10c. map.

The high excellence of the government publications, and particularly its maps, are too well known to require comment. But it is to be deplored that the distribution of these cannot be effected in a more businesslike manner. If certain maps are out of stock, the question naturally presents itself as to when they will be in again, or reprints be made. Questions as to when certain reports will be issued are ignored, and there are numerous ways in which the survey could enlarge the scope of its usefulness had it the facilities for getting in closer touch with the public. Surely it would not strain the resources of the department to install a force of correspondents, well posted on the Survey's publications and competent to act promptly and effectively on all communications received.

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Sand Filling

The new bulletin of N. H. Darton on the "Sand Available for Filling Mine Workings" is painstaking and complete. In fact, Mr. Darton is a most unwearied investigator. The monograph frankly acknowledges the main difficulties in the sand-filling problem, the fineness of the silts and the possibility of their running like a quicksand, if not restrained by pillars. This difficulty we pointed out in an editorial, of identical name with the present, published Nov. 25, 1911.

We then urged, and still continue to insist, that experiments on cementation should be made, and though we know Mr. Darton has been extremely busy along other valuable lines of investigation, we think it would have been well had the Bureau of Mines taken up the problem from the first.

The bureau is acting in an open way with the public. The parting and thus the most prominent words in the bulletin draw attention to the inadequacy of the available supply of sand to fill the workings. "The quantity necessary to replace all the coal which can be shipped in the future, under present conditions, is about 10,000,000 tons, or sufficient to cover to a depth of 25 ft. the whole area of the coal basin, 176 square miles. This is more than twice as much material as is contained in the buried valley of the Susquehanna River, but is about the same quantity as the contents of that valley, together with all the till and terrace deposits."

Excluding areas, now occupied by towns, and which can hardly be removed for the obtaining of the sand, it will be seen that the supply is inadequate. Still there is sufficient to do a greater part of the flushing needed, and to support and control completely those parts of the workings under permanent buildings. With such a large body of sand placed almost providentially to hand, and with the crying need for some release from the severity of the present situation, it seems that some effort should be made to guarantee a continued life to the otherwise permanent beauties of the city of Scranton.

Nevertheless, prudence compels us to declare that the removal of much of the sand in the Wyoming buried valley would involve engineering difficulties as great or greater than it would solve.

SOCIOLOGICAL DEPARTMENT

Pure Milk for a Colliery Village

Special Correspondence

SYNOPSIS—The Heilwood Co., composed of persons forming the corporation which operates the Penn-Mary coal mines, has started a model dairy farm. The company hopes to make money on the project, but is still more anxious to assure a good milk supply for the miners, thus preventing such diseases as might result from contaminated milk. The daily expense is $16, the income $14.80; so in due time both health and profit may be attained.

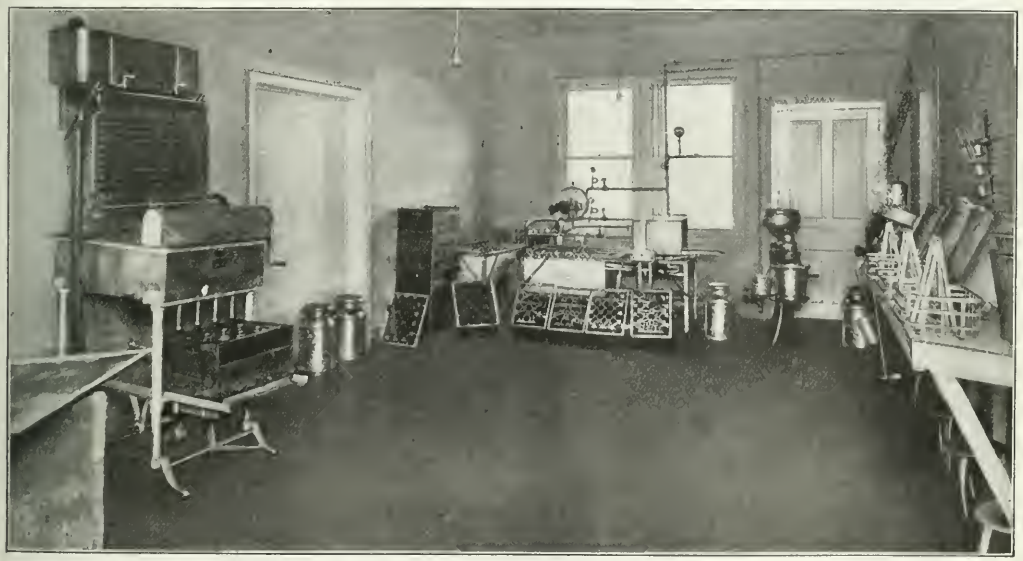
The Heilwood Co. is a corporation running a store at Heilwood, Penn. It is believed to be controlled by the stockholders of the Penn-Mary Coal Co., a subsidiary of the Maryland Steel Co., which has its offices and houses in that village. The store company does not, however, make any collections on the coal company's rolls and the miners buy where they will. As prices are reasonable and the line of goods of a high order, the Penn-Mary employees do not avail themselves of their opportunity to purchase elsewhere, and being men of a good class, they are appreciative of the innovations in merchandising which the Heilwood Co. has developed for their advantage.

I make this statement regarding the personnel because the experiment has been tried elsewhere without success, at the suggestion of a well known Philadelphia philanthropist, owning stock in another coal company. The project, in that instance, has been conducted, I understand, at a considerable loss because the miners prefer to buy their milk from other and less desirable sources.

A $15,000 Plant

The Heilwood Co. has signed a 20-year lease with the Penn-Mary Coal Co. for some 400 acres of farm land. It has erected the modern dairy plant shown on the front cover and is now prepared to supply milk to all the miners. The plant, when entirely complete, will cost about $15,000.

The cowbarn measures 40x130 ft., and is finished with floors and feeding troughs of concrete. Drinking water can be turned into these troughs when needed. The stalls are built of steel pipe, as are also the stanchions by which the cattle are secured. Each stanchion consists of two pipes about 5 ft. long, set just far enough apart to hold the head of a cow. These pipes approach each other at either end and are arranged with swivels above and below. The cow's head can slide up and down in the stanchion and the animal can turn her head through a large angle without restraint and yet is absolutely secured by the framework. She can lie down or rise at will. In fact, the method of securing the animal's head is sanitary, safe and humanitarian, and probably would be equally available for use in mule stables.



Interior of the Milk Room at the Dairy of the Heilwood Company

Holstein-Friesian Stock

In the foreground of the picture illustrating the cowbarn are the box stalls for the calves and bull. In the

rear are single stalls for the grown cattle. There are 32 milch cows at present; 19 of which are giving milk and there is room in all for 50 cows. All but one of the present herd are of Holstein-Friesian stock, and it is altogether probable that after the weeding-out process has been completed and the herd is well balanced, the milk production will gradually increase.

The second floor of the barn is divided into two compartments; one for hay and the other for a feed room. On the one side of the main building are twin silos, two large towers which can be seen in the picture of the exterior of the building. Each holds 150 tons of ensilage. They are connected by an entryway to the barn proper. Between the main barn and milk house, to the left of the silos, a passage 8x14 contains a room in which milkers change clothes and another with a milk scale and a lavatory.

The Cow Hospital

The smaller barn is an emergency building. It contains six box stalls for sick cattle. It is almost entirely empty at present, having only one cow in it, and that is only in the hospital because she is about to become fresh. There are diseases among cows like cow-pox, which are exceedingly infectious, but which cannot be transmitted to human beings except by inoculation. It is necessary to have an emergency building for such cases, if any should occur. The cows having tuberculosis will, of course, be killed. In this same building are the boiler room and coal bins. The entire plant is lighted by electricity.

Sanitary Milk at Eight Cents a Quart

The production of certified milk is a comparatively small industry and it is still only in its infancy, for it is certain that before long such milk will be the only kind sold in the larger cities. The retail price of certified milk in Philadelphia and Pittsburgh is 15c. per quart, while commercial milk sells at 8c. The Heilwood Co. is marketing its product at the lower figure, so it will be seen that only a narrow margin is left for profit.

Absolute cleanliness at every stage marks the production of the Heilwood milk. First of all the cows must be free from disease. They are tuberculin-tested and passed as perfectly healthy animals by official veterinarians, recommended by the dairy division of the Department of Agriculture, at Harrisburg, Penn. Any cow found to be diseased is immediately isolated and if the malady is found to be in an advanced stage, the animal is killed at once.

Barns must be sanitary in construction, well ventilated and clean. Cleanliness in this connection means the daily removal of any contaminating filth. It also involves the employment of expensive and responsible labor. Pure running water must be accessible at all times and only persons of good health and clean habits should be allowed to work in the milk room. All milkers are required to wear clean white duck suits when milking.

How the Milk Is Kept Free from Pollution of Cow and Air

When a cow freshens, all the long hairs are clipped from the udder, inside of the hind legs and part of the tail. Before milking, the udders are washed clean with warm water and all milking is done into sanitary pails, having two layers of strainer cloth over the top. Each cow's milk is weighed as soon as it is drawn and is emptied into a large funnel, which conveys it through the wall to the cooling tank. In this funnel is a large mass of absorbent cotton, through which the milk filters into the cooler.

Through the pipes in this tank passes a continuous stream of fresh water at a temperature of 45 deg. F. This eliminates the animal heat from the milk and prevents the multiplication of bacteria, some of which would be harmful to life. As the milk cools it is allowed to drip slowly through two or more layers of gauze or strainer cloth and goes into the bottling machine through a wire cloth strainer and is fed into sterilized bottles. It is then put in a cooling room, kept at an even temperature by the ammonia system of refrigeration, and delivered to the consumer in a condition such that it will be maintained sweet and pure for twice the length of time that common milk can be kept.

High Percentage of Butter Fats

Tests prove that the milk averages 4.4 per cent. of butter fats, which shows that it is of a very fair quality. In the village of Montclair, N. J., just outside New York, where a most diligent campaign for good milk has been conducted for many years, only one firm out of the dozen doing business in 1911 had as good a record for richness of milk as the Heilwood Co.' Certified milk is required to have over 3.5 per cent. of butter fats.'

It must be free from any disease germs and should contain only the harmless bacteria found in all milk. All these germs multiply very rapidly when the animal heat is retained in the milk, and when it is exposed in open vessels. It is owing to their presence that milk sours quickly. It is known that commercial milk contains ten times as many germs as are found in the certified product.

All pails and utensils used in the handling of the milk are sterilized daily in live steam, even to the milking stools. Ventilation is secured by the King system. Each cow stands on a cork-brick floor covered with sawdust. Once a day, all the cows are curried and brushed, litter and bedding being removed every morning. Eventually the floor will be covered daily with a sprinkling of land plaster or cheap lime as a deodorizer and disinfectant. This will be removed with the litter.

Milk for Babies and Invalids

The Heilwood Co. is selling milk especially for babies. This milk is supplied by cows which are fed on simple food, excluding oil cake and like heating foods. Two cows, whose milk runs low in butter fats, have been selected, and their milk is marketed especially for babies and invalids. For this a charge of 10c. per quart is made. The babies which have been fed on this milk have shown remarkable improvement.

It is the purpose of the company to keep a detailed account of the cost of running the dairy, though the large amount of work involved hitherto in starting the plant has caused all attention to be directed to building, sanitation and marketing. In the coming year, the company expects to run truck and stock farms. The cost of living is increased throughout the country by the fact that many coal companies hold idle large acreages of land, which they could make generously productive, but

which they either keep idle or rent at rates which barely pay the taxes, to tenants who try to extract the last vestige of nitrogen from the soil without regard to the future. The action of the Heilwood Co. is therefore to be welcomed.

The manager of the store company is J. M. Thompson, who is also in charge of the farm. E. E. Blackburn, a graduate of State College (1912) is in immediate charge of the dairy project. Two men deliver the milk through the town of about 3000 inhabitants, and one man does the rough chores around the plant.

The Nova Scotia Steel and Coal Co.'s Car

SPECIAL CORRESPONDENCE

The death rate in Canada has not been enlarged by any great fatality in the Nova Scotia mines, but this has not prevented the Nova Scotia Steel & Coal Co. and other nearby corporations from providing a complete system of protection for their mines. In fact, no other company in Canada except its neighbor, the Dominion Coal Co., is so well fitted for fighting mine fires and for rescue work after an explosion, as is this Nova Scotia company.

The Rescue Car

It formerly kept its apparatus in a room in the general office building, but the equipment is now transferred to a railroad car, which is always ready to go to any col-

FIG. 1. THE MIDDLE SECTION OF THE NOVA SCOTIA STEEL & COAL CO.'S RESCUE CAR

lieries in the province with which railroad connections can be made. The car is a remodeled passenger coach divided into three sections. Two of these are illustrated in this article; the third, at one end of the car, is for the use of the rescue corps during travel. It is fitted with seven seats and a lavatory.

The middle section is shown in Fig. 1. On the left, in the foreground, is a long closet with two doors for the accommodation of Draeger apparatus and clothing for the rescuers. On the floor at the rear left is an oxygen pump and still further back a switch board and table for charging the hand electric lamps. Above the closet, the plans of the mines and of the various water systems are kept ready for use.

Above the rear door leading to the third section are a row of electric lamps and three oil safety lamps for gas observation. In the rear on the right is the surgical case with the pulmotor at its foot. Several Draeger helmets are hung on the right wall of the car with oxygen tanks adjacent. Below this are the regenerating apparatus which are carried on the backs of the rescuers. In the foreground on the same side is a desk with a telephone.

Surface Fire-fighting Equipment

The second illustration shows the section equipped for fire fighting. The large doors on the right and left are hinged at their lower edges so that when let down they furnish a suitable runway for the hose reel in the rear. It will be noted that these doors are slatted horizon-

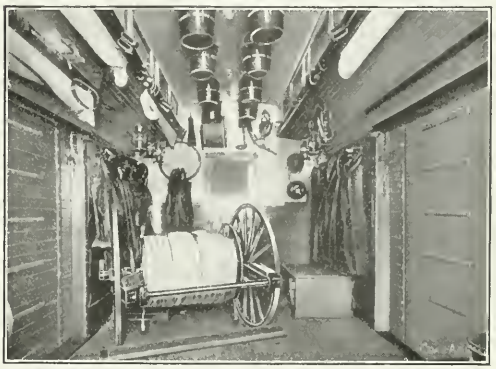


FIG. 2. THE END OF FIRE-FIGHTING SECTION OF THE NOVA SCOTIA CAR

tally so as to make it possible to travel up them when they are on a steep slant. At the same time the slats are so short that the hose cart clears the ends of the strips.

The walls wherever available carry firemen's coats, boots and fire helmets. The roof is hung with stretchers, lanterns, wire, rope and fire buckets. On the floor to the right are a tool box and a "three-hole" oil stove, the latter not being visible in the photograph.

The Equipment

In all there are 15 sets of Draeger-helmet rescue apparatus, and one of the Ever-Ready mouthpiece type, 24 oxygen cylinders, 2 oxygen-refill pumps, 1 pulmotor, 2 dozen electric safety lamps, 1 electric charging device for the electric-lamp batteries, 1 Draeger oxygen reviving box, 6 ordinary respirators, 1 set of portable telephones and some canaries. Of the 24 oxygen cylinders only seven are carried in the car, the others being stored as an emergency supply. These cylinders contain 100 cu.ft. of oxygen at a pressure of 125 atmospheres.

A smoke house has been constructed in a central location. It is so built that the head trainer can observe the men from outside as they perform their evolutions. At present there are about 40 men, including the officials of the collieries, who are trained in the use of rescue apparatus. In addition to this number, 24 of the officials hold certificates of proficiency in first aid.

There are ambulances, stretchers and blankets at each colliery, and in the rescue car there is a first-class ambulance for the conveyance of injured men from the car to the hospital or to their homes.

DISCUSSION BY READERS

Timbering at the Working Face

Letter No. 1—This subject is of the greatest importance with respect to the safety of the miner, the conservation of the coal, cost of production and economy of time and labor; although the timbering of the working face is primarily for the protection of the workman. For the most part, post timbering is employed. The province of a mine post is twofold: First, to give support to loose pieces of overhanging slate or rock; and second, to give suitable warning of any movement of the roof and the danger that is imminent. In post timbering, the time and place of setting posts are items of more importance than the number of timbers set. There must be no delay in setting a post under a loose piece of roof slate; or, better still, the loose piece should be pulled down at once. The manner of setting posts or style of timbering adopted will depend on many conditions, such as the character of roof and floor, thickness and character of coal, size of opening and length of time the place must be kept open.

A strong slate or shale roof will generally have a good bending factor. In my opinion, such roof requires a systematic method of timbering, which should be rigidly maintained. The posts should be set a constant distance apart every way. This will enable a large percentage of the posts to be recovered when the room is finished and the pillars are being drawn back. In all cases, it is important to keep the timbering within as short a distance of the working face as practicable.

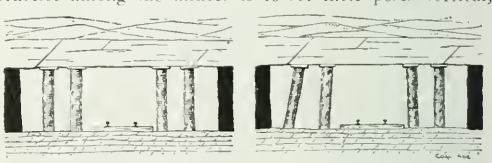
Since a good, strong slate or shale is generally considered the safest kind of roof, in coal mining, its proper support is too frequently neglected by the miner, and this neglect is not regarded as serious by most mine foremen. An experience of 20 years in the superintendence of mines has convinced me that this is one of our greatest dangers in coal mining; and the reports of mine accidents, both fatal and nonfatal, in all states, bear out this conclusion. Many times I have seen a space 20x30 ft. left wholly unsupported, under a strong roof slate, while miners still continue to advance the face of the coal. Frequently, such neglect will result in a fall of roof sufficient to close the place before it has been driven 30 yd., causing both a loss of coal to the company and loss of time and labor to the miner.

A soft, friable roof, or a drawslate that disintegrates by exposure to the air or by reason of the increasing roof pressure, or a roof containing slips or faults, or one of a fireclay nature is always more or less dangerous. An example of such roof is found in the Pittsburgh seam. This seam, in West Virginia, is soft and friable; and, in the mines of the lower Kanawha region, must have careful attention to insure safety and economy in mining. I think this fact is clearly shown by the state inspectors' reports of these mines.

Mine roof of the character just mentioned requires a practical system of timbering adapted to the special conditions of the roof and coal and the pressure exerted by the overburden. In the mines of the Kanawha region, there are few if any foreign miners employed. The mine officials are careful; a good system of inspection is maintained; and any failure to properly timber the face results in "stopping the turn" of the miner. As a result, under this treacherous roof, there are comparatively few nonfatal accidents, while the fatal accidents, which are mostly unavoidable, do not exceed the general average for the state.

In my opinion, a large percentage of accidents due to falls of roof and coal can be ascribed to what may be called the "personal equation." It is stated with some truth that probably 50 per cent. of the falls at the working face may be ascribed to the neglect of mine foremen in seeing that their orders, in respect to timbering, are properly obeyed. It has been my duty, frequently, to take mine foremen to task for their lack of discipline in this respect: but the excuse is always, the "scarcity of men" and the "demand for coal."

I want to refer to a peculiarity of the roof in this region, which I have found requires special treatment. Frequent slips occur in the roof slate here, and the general practice among the miners is to set their posts vertical,



A Suggestion in Timbering Roof Slips over Roads

on each side of the road in the rooms, as shown on the left, in the accompanying figure. This invariably causes the slate to break over the roads, which gives no end of trouble. I have found that this difficulty may be largely avoided by setting the first post, next to the road, slightly inclined toward the roadway, and the post behind this, more inclined in the same direction, as shown on the right of the same figure. The advantage is twofold; namely, a break in the roof is resisted by the full thickness of the slate and the inclination of the post tends to arch the weight over the roadway.

Many miners and a large number of foremen know of but one way of setting a mine post, and that is in a vertical position, without regard to the conditions existing in the roof or the seam. I am proud to say, however, that the majority of our good foremen know that the proper position of a mine post is in line with the pressure.

The fireclay formation overlying much of the coal, in the Connellsville coke region and in various parts of the United States and Canada, is a hard roof to handle, except where the coal is thick enough to leave a top bench for roof when driving the rooms up to the limit or, as we say, in the "first working." This top coal forms a good roof and can be taken down when the pillars are drawn back. In a thin seam having no top bench, it is often necessary to resort to crossbar timbering.

A sandstone roof is likewise a dangerous roof. The roof stone often contains joints and irregular fractures that give no warning of their presence. Mine posts are of little use under such a roof, except for giving some slight warning of danger, which, however, often comes too late. This roof breaks in massive pieces, which, when they once start to move, cannot be held except by building substantial cribs. I have seen hundreds of cases where the attempt has been made to hold up a large roof rock that required constant retimbering and was still a constant menace to safety. Time, labor and material are generally saved by allowing such a rock to fall and finding a way around it. When this cannot be done, it should be cribbed and crossbarred in such a manner that cars cannot knock out the timbers and cause an accident.

My experience has taught me that this class of accidents, in the past, has been largely the result of a lack of proper supervision. What has already been accomplished in this direction, proves that perhaps 90 per cent. of these accidents could have been avoided by a system of careful inspection of the roof. Operators now very generally realize the importance of regarding *safety first* and *profits second*. This was the experience, formerly, in England. The district where I worked (1872) was notorious for accidents from roof falls. When the Coal Mines Regulation Act became a law, in that year, roof inspection was made compulsory, with the result that, in five years, this class of accidents was reduced 50 per cent.; and, if my memory serves me right, this reduction gradually increased to 80 per cent.

While it is true that the neglect of miners to properly examine their own working place before going to work and to promptly set any timbers that may be required and, likewise, the neglect of mine officials and bosses to give sufficient time for a thorough inspection of each working place, will account for many accidents, the larger responsibility rests upon the operator for the maintenance of proper discipline in the mine. This responsibility is shared in part by the mine foreman. The discussion of this question in COAL AGE cannot fail to impress the responsibility for proper roof inspection upon every mine worker, foreman, superintendent and operator.

JOSEPH VIRGIN.

Bancroft, W. Va.

Ventilating Breasts in the Mammoth Seam (Penn.)

Referring to the article of Mr. Crankshaw, COAL AGE, Feb. 15, p. 263, in which he describes the method of ventilating the breasts in the Mammoth seam, by separate air splits, I was surprised that no crossheadings are shown connecting the breasts.

The system of mining described is what is known as "rock chute mining." The system of ventilating by splits is good, with the exception that crossheadings should be driven between the chambers or chutes every 60 ft., or less if the conditions require. In the first split to the left, the air current taken up chute No. 5 should not be made to return by that chute to the airway; but should be conducted through the upper crosshead-ing to the face No. 4, from which it should pass through another crosshead-ing to No. 3 and so on, returning to the airway through No. 1 chute.

In the same manner, each air split should be conducted along the faces of the several chutes or breasts, by passing through the crossheadings connecting the chutes near the face, and only returning to the airway by the last chute in that split. To course the air up one side of the chute and down the other, ventilating in this way several breasts without crossheadings, is not in accordance with the best accepted laws of ventilation. Experience has taught us that seams of any considerable inclination should be ventilated, as far as practicable, so that the course of the air will be generally toward the rise; in other words, the ventilation should be *ascensional*. This system should be adopted in all mine ventilation whenever practicable.

By driving crossheadings every 60 ft. or less, between adjoining chutes, the course of the air is much shortened and the mine resistance reduced, which will increase the circulation of air, for the same power. Again, it would be impracticable to drive breasts any considerable distance, either in flat or pitching seams, without crossheadings connecting them, and it would be difficult to remove any accumulation of gas from such breasts and much time and labor would be lost, besides running a risk of gas or dust explosions.

The statement that "if one breast makes gas freely it can be isolated from the other breasts on that split without shutting down the whole gangway" is true; but, in the majority of cases, this would not be necessary if the circulation in each split was properly arranged and the air current conducted through the crossheadings as explained.

Good ventilation at the working face is one of the important factors in the economical operation of a mine; as, thereby, many long delays are avoided, which would otherwise greatly reduce the output and increase the operating expense.

DANIEL J. BOYLE.

Fern Glen, Penn.

Danger of Powder Smoke

The danger from powder smoke is greater than miners commonly suppose. In one of the recent letters discussing the reducing of the ventilation when firing, I was glad to see a reference to the explosibility of powder smoke. (COAL AGE, Feb. 1, p. 196.)

In some mines, the miners have a practice of rushing back to the face immediately after a shot has been fired, so as to light the smoke behind the standing shot before this smoke has mixed with the air to such an extent that it will not ignite. I have often thought the practice should be stopped, as the miner not only runs the risk of being burned, but the shot may have knocked out a prop, leaving a loose piece of slate that is ready to fall at any moment.

Firedamp is not the only danger in mines and I believe it is a great mistake that one or more firebosses are not employed, in every mine, whether gas is generated or not. There are many accidents of this class that a competent fireboss could prevent, in a large mine where it is a practical impossibility for the mine foreman to give proper attention to many of these matters.

WILLIAM ROTHWELL,
Fireboss.

Castle Gate, Utah.

Seven Shifts a Week

I have noticed recently the discussion of the question of working seven shifts a week and want to say that, while we cannot altogether avoid Sunday work at a coal mine, I have never advocated the practice of working seven days in the week. I think there are many jobs set aside for Sunday that could be done as well during the week. I presume I have been "on the job" as many hours as Mine Foreman, COAL AGE, Feb. 15, p. 272; but I have never regarded it as "living on the job."

When a man has worked for me two shifts running, I would not give him 50c. for a third shift. Many men want to work extra time, but it is more the *time*, on the pay sheet, they are after, than the work they assay to accomplish. More and better work is always done by observing regular hours; begin on time and quit on time is generally good doctrine. Men should be allowed to make extra time, only when this is necessary for the continuous operation of the mine. When the work requires, it is all right to put in an extra shift on Sunday or any idle day, although this may cause unexpected trouble.

I have known men to be so anxious to make extra time, that they have called the attention of the mine committee to the fact that they were not employed on certain extra shifts, disregarding the right of the boss to employ such men on an extra job as he considers most capable of doing the work.

While I consider it necessary that any man in charge of the work should be ready to respond to a call at any time, I do not think it is necessary for him to eat and sleep with the job. Extra time is often made at the expense of efficiency and with loss to the company.

AN INDIANA FIREBOSS.

West Terre Haute, Ind.

High Fan Efficiency

Referring to your editorial "Too High an Efficiency," COAL AGE, Feb. 22, p. 306, I infer you do not fully understand the methods that were employed to determine the amount of air exhausted by the fan during the test.

The measurements taken by the Hydro recording gage were not relied upon solely in calculating the results, but the amount of air passing was measured simultaneously by three methods as follows:

(A) By Hydro recording gage; the pitot tubes attached to this instrument being fixed permanently in the main airway, at a point in the cross-section, where the average velocity was obtained.

(B) By an anemometer in the main airway.

(C) By an anemometer in each of the three airways leading to the main airway.

It is, of course, well known that the velocity of the air is not the same in all parts of the airway; that the points where the average velocity occurs remains unchanged for different velocities, has also been established. To determine the point of average velocity, the main airway was divided by wires into sixteen sections and repeated readings taken in each section with pitot tubes attached to a portable recording gage, the dial of which was graduated to read velocities in feet per second. The pitot tubes of the Hydro gage, used during the test, were fixed permanently at the point of average velocity thus determined, and readings taken in both instruments were found to check very closely.

The three splits were sectioned and readings taken consecutively in adjacent squares. In the main airway, the anemometer was moved crosswise at the same height as the pitot tubes. These airways are concrete lined; during the test they were lighted by electric lamps and the time was announced by electric bells, offering the best possible facilities for accurate work. A deduction of six square feet for each operator was made from the sectional area of the airways. The water gage shown by the Hydro recording gage was also checked by two water manometers on opposite sides of the fan drifts. By this method of taking measurements, the volumes of air measured in the main airway should check with each other and also with the total volumes measured in the three splits.

The results of an average test were as follows:

Volume in cubic feet per minute: (A) 322,410. (B) 306,620. (C) 302,550. The water gage was 4.89 and the calculated mechanical efficiencies of the fan 83%, 77.6% and 76.6%, respectively.

The above results are typical and, considering the difficulty and the chance of error in taking anemometer readings in large airways, are probably as close as could be expected.

With the above facts understood, I think it must be admitted that the results of the test are reasonably near the truth, or that all the instruments were inaccurate in the same direction, which is hardly probable.

Good efficiency would naturally be expected of this fan, with its long evasé chimney and low inlet velocities and, granting that all the observers were deceived a reasonable amount, the efficiency would yet be in excess of that obtained in the laboratory experiments mentioned in your first editorial, Feb. 1, p. 193.

U. U. CARR.

California, Penn.

[As all fan engineers know, there are fan tests and fan tests. An important feature in every practical fan test, that is to say, in every test of a fan under working conditions at the mine, is to eliminate other factors acting to assist or oppose the general circulation of air through the fan and in the airways, of which the fan-ducts must be considered a part. This is one of the most troublesome features of such a test, and one that is often unconsciously overlooked, and for which the high efficiencies obtained are often responsible.

Because a certain fan shows a high efficiency, say 80 per cent., or even higher, it does not follow that these troublesome features have not been fully considered and eliminated by the engineers in charge of the test. The writer has made tests in which such high efficiencies were obtained, and is, therefore, of the opinion that they are possible.

In speaking of fan efficiency, it is generally recognized by engineers that such efficiency includes the efficiency of the engine driving the fan, and is the ratio of the power on the air, as measured in the fan drift, to the indicated horsepower of the engine card. The attempt is seldom made to separate these factors, while at the same time it is recognized that an engine of poor design and low efficiency may seriously handicap the ventilator and reduce the efficiency that should be obtained.

The letter of Mr. Carr shows clearly that the test to which he refers was carefully conducted, and the efficiency claimed for the fan is a proper one, barring the unsuspected operation of air columns in the mine.—EDITOR.]

EXAMINATION QUESTIONS

Mine Gases and Ventilation

Ques.—If a water gage of 2 in. produces a velocity of 500 ft. per min., in an air course 4000 ft. long, what water gage will be required to produce a velocity of 800 ft. per min., in the same airway extended to a length of 8000 ft.?

Ans.—In this case, the sectional area and the perimeter of the airway remain unchanged, while the length of the airway is doubled. Since the pressure per square foot varies as the length of the airway and the square of the velocity, the *pressure ratio* will be equal to the *length ratio* multiplied by the square of the *velocity ratio*. Therefore, calling the required water gage x, we have

$$\frac{x}{2} = \frac{8000}{4000}\left(\frac{800}{500}\right)^2 = 2\left(\frac{8}{5}\right)^2 = \frac{2 \times 64}{25} = 5.12 \text{ in.}$$

Ques.—If a water gage of 1.2 in. produces a velocity of 500 ft. per min., in an airway 6x8 ft., 1 mile long; what water gage will be required to produce a velocity of 750 ft. per min. when the length of this airway is increased to 2 miles?

Ans.—As in the previous example, the sectional area and the perimeter of the airway remain unchanged while the length of the airway is doubled and the velocity increased from 500 to 750 ft. per min. The area and perimeter of the airway being constant, the *water-gage ratio* varies as the *length ratio* times the square of the *velocity ratio*. Therefore, calling the required water gage, in this case x, we have

$$\frac{x}{1.2} = \frac{2}{1}\left(\frac{750}{500}\right)^2 = 2\left(\frac{3}{2}\right)^2 = \frac{2 \times 9}{4} = 4.5 \text{ in.}$$

Ques.—If a certain pressure produces 20,000 cu.ft. of air per minute, in an airway 6 ft. in diameter; what quantity of air will the same pressure produce in an airway 12 ft. in diameter, assuming the airways have equal lengths?

Ans.—In this case, the pressure and the length of the airways are constant. Since both these airways are circular, they are similar and the square of the quantity of air passing varies as the fifth power of the diameter of the airway. In other words, the square of the *quantity ratio* is equal to the fifth power of the *diameter ratio*. Therefore, calling the required quantity of air x, we have

$$\left(\frac{x}{20{,}000}\right)^2 = \left(\frac{12}{6}\right)^5 = 2^5 = 32$$

$$x = 20{,}000\sqrt{32} = \textit{say } 113{,}000 \textit{ cu.ft. per min.}$$

Ques.—The total rubbing surface of a square airway being 160,000 sq.ft., the length of the airway, 5000 ft., and the quantity of air passing, 80,000 cu.ft. per min.; find the velocity of the air current, in feet per minute.

Ans.—First find the perimeter of the airway by dividing the rubbing surface by the length of airway; thus, $160{,}000 \div 5000 = 32$ ft. But the airway being square, each side is $32 \div 4 = 8$ ft.; and the sectional area of the airway is then $8 \times 8 = 64$ sq.ft. Now, find the velocity of the air current by dividing the quantity of air in circulation by the sectional area of the airway; thus, $80{,}000 \div 64 = 1250$ ft. per minute.

Ques.—Would you recommend a fan of furnace for a new shaft mine 500 ft. deep? Give reasons for your recommendation.

Ans.—If the seam is generating explosive gas, a furnace could not be used with any degree of safety. If the mine generates no gas, however, a furnace can be used to good advantage in the early development of the mine, as the depth of the mine below the surface would give an air column that would insure ample ventilation, for a considerable time to come.

As the development of the mine increased, however, a ventilating fan would be found to give better satisfaction and be more economical in the end. A furnace should not be used in any mine liable to dust explosion; for the reason that, in the event of an explosion, the circulation in the mine is under better control and the means of ventilation immediately accessible when a fan is employed.

Ques.—Find the entire rubbing surface of three airways each 6000 ft. long, and each having a sectional area of 15 sq.ft. The first airway is rectangular, its width being three times its height; the second airway is square, and the third airway is circular.

Ans.—The first step is to find the perimeter of each separate airway. Calling the height of the first airway h, its width is $3h$, and the sectional area is then $h \times 3h = 3h^2 = 15$ sq.ft. Then, $h = \sqrt{\frac{15}{3}} = \sqrt{5} = 2.$ The first airway is, however, 5×15 ft., in section, and its perimeter is $2(5 + 15) = 40$ ft.

The second airway being square, one side is $\sqrt{15} = 8.66$ ft.; and its perimeter is then $4 \times 8.66 = 34.64$ ft.

The third airway being circular, its diameter is

$$d = \sqrt{\frac{15}{0.7854}} = 4.37 \text{ ft.}$$

and its perimeter or circumference is then $3.1416 \times 4.37 = 13.73$ ft., nearly.

Since the length of each airway is 6000 ft., the entire rubbing surface is

$s = 6000\ (40 + 34.64 + 13.73) =$ say 632,000 *sq.ft.*

Ques.—A volume of 10,000 cu.ft. of air and marsh gas is at its most explosive point; how many cubic feet of marsh gas does the mixture contain?

Ans.—A mixture of marsh gas and air, at its maximum explosive point, contains 9.46 per cent. of the gas. Therefore, a volume of 10,000 cu.ft. of this mixture will contain $10{,}000 \times 0.0946 = 946$ cu.ft. of marsh gas.

Ques.—Under what conditions may afterdamp become explosive?

Ans.—Afterdamp may contain unburned marsh gas (CH_4) or carbon monoxide (CO), either of which gases becomes explosive when mixed with a sufficient quantity of fresh air. Such an atmosphere may have a temperature sufficiently high to ignite these gases, should fresh air have access to the place where they are found.

COAL AND COKE NEWS

Washington, D. C.

Secretary Nagel just at the close of Congress has rendered a report covering the much discussed question, what was the effect of the advance in prices on anthracite coal and how far it was warranted. His investigators have reached the conclusion that the advance of prices took about $9,000,000 out of the consumers in 1912, but that there was no good warrant for the action taken. This is the net result of the so called Difenderfer resolution which was presented and passed about nine months ago.

With reference to wages the conclusion is arrived at that the advance represented about 8 or 10c. per ton and was necessary in order to avoid strike conditions and insure a supply. This cost the companies about $4,000,000. On the average, however, there was an advance of over 31c. per ton. Wholesale prices were increased on the average only about 26c. a ton, but when the advance in price is considered in connection with the change in sizes of coal it figures out at more than 31c. per ton.

The sources of profit to the companies were not, however, exhausted in a mere advance in price, but considerable gain was made by cutting off the discounts of 40 and 50c. per ton usually granted to consumers on purchases made in April and May. Altogether the total excess gathered in from the community was about $13,450,000 more than would have been obtained had the same tonnage been sold at the old prices. Nearly $11,000,000 of this sum came from the advance in prices and about $2,500,000 from the suspension of the discount. There were also some profits made by sales of coal at famine prices in certain instances.

The report goes on to charge the existence of a trust including the mines and the railroads with which they are affiliated. As a result of this community of interest it is claimed that there is nothing in the mere fact that production costs somewhat more to warrant an increase of price to the consumer unless there is some very large advance to bring it about. "The capital invested in coal mining," says the report, "derives its income both from the mining and the transportation of the coal, and a failure to realize profits in the mines may be and often is compensated by the profit in the operation of the railroad on account of coal tonnage. The purpose is simply to operate the coal mines and the railroad so as to produce the maximum profit from both together and not simply to secure profitable results from each source of income separately."

Secretary Nagel is quite severe in his strictures on the retailers, as he asserts that they took large advantage of the increase in cost and were often responsible for the suspension of the discounts. He cites New York, Philadelphia and Washington as places where the retailer shifted the full amount of the increase demanded by the operators, and perhaps something more, to the shoulders of the consumer. He adds that in each of the cities mentioned the increase in retail prices was very similar to the advance in the circular prices quoted by the operator.

This report, of course, comes too late to serve as a basis of any legislation by Congress at the session which closes Mar. 4, but it is expected that the subject will promptly come up again during the special session which has been called for the present month. Specifically, it is believed that the showing made will lead to the removal of the tariff on coal as has already frequently been predicted.

Winston-Salem Rate Decision

In a decision issued by the Interstate Commerce Commission on Feb. 25, it was ordered that the case of the Board of Trade of Winston-Salem against the Norfolk & Western R.R. should be dismissed. The Commission held that the rate of $2.10 per ton on coal from the Pocahontas fields in Virginia and West Virginia to Winston-Salem is not unreasonable. The Commission, however, concluded that the rate of $2 per ton from the same point of origin to Martinsville, Virginia, is excessive to the extent that it exceeds $1.80. The roads were ordered to put the latter rate into effect by Apr. 15.

The Commission further held that the Chicago, Milwaukee & St. Paul and other railways had failed to justify the proposed advances in the rates on coal in carloads from mines in Iowa to stations in South Dakota, North Dakota and Montana. The tariffs were ordered withdrawn. A similar decision was reached with respect to the proposed advances on the rates for soft coal in carloads from Illinois mines to Clinton, Ia., and other points on the Chicago, Burlington & Quincy R.R. The Chicago & Alton and other roads were ordered to withdraw their suspended tariffs not later than Apr. 15.

PENNSYLVANIA

Anthracite

Scranton—At a conference with the officials of the Scranton Coal Co., Feb. 20, the 300 striking miners from the lower seams of the Capouse colliery agreed to go back to work. Instead of returning, however, they not only stayed out, but induced 300 additional men to quit. As a result the whole colliery is idle.

Wilkes-Barre—A cave in the Pine Ridge mine of the Delaware & Hudson Co. at Miner's Mills, Feb. 20, caused the cellar of a house belonging to James Flynn to sink. The house was immediately vacated.

An attempt to call a strike at the Avondale Colliery of the D., L. & W. Coal Co., in Plymouth Township, has resulted in the mine being closed indefinitely, while repairs are being made to the breaker and the mine workings. The subject of disagreement was the price for standing timber, the men claiming that the price had been reduced, and the foreman showing his books to prove that no reduction had been made. The evidence of the books was satisfactory to the members of the committee, and they announced their readiness to return to work the next day, only to be met with the statement by the superintendent that inasmuch as they had quit and thrown the colliery idle contrary to their agreement, work would not be resumed until the long contemplated repairs had been made.

Pottsville—The miners who were entombed, Feb. 25, in a colliery near Mahanoy City were rescued early Feb. 28. Two of them were completely exhausted and had to be dragged through a small aperture, which had been made during the last 10 ft. of digging in the wall. The men were without food for 58 hours, and their clothing was soaked with icy water.

Bituminous

New Kensington—While trapped in a fiery mine of the Valley Camp Coal Co. at Valley Camp, a searching party narrowly escaped death. Four of the party of 10 were badly burned by an explosion and three of these are now in the hospital. Three hundred men employed on the day shift were warned in time to escape, but it is feared that there may be others in the workings.

Dubois—Nearly 700 men employed at the Eriton shaft of the Northwestern Mining & Exchange Co. have gone on strike. It is said that the weighing methods employed at the colliery are the cause of the trouble.

California—Three men were seriously injured Feb. 25, in the mines of the Vesta Coal Co. Two were caught in a fall of slate while a third had his right arm torn off by an electric cutting machine.

WEST VIRGINIA

Charleston—General Elliott, commanding the troops in the martial law district has reported to Governor Glasscock that the mines in and out of the country covered by the National Guard resumed operations Feb. 18. This is taken to indicate that the crisis has passed and that peace will soon be restored. No arrests have been made as yet in connection with the burning of the tipple of the M. B. Coal Co.

Fairmont—Karl F. Schoew, state mine inspector for the first district, is an applicant for the position of chief of the department of mines of the state of West Virginia, to succeed John Laing, whose term expires June 30.

OHIO

Columbus—One of the most important events in coal circles during the past week was the enactment by the Ohio legislature of the Green compulsory workmen's compensation bill, which will apply to every coal mine in the Buckeye State. Effective after Jan. 1, 1914, every individual, firm or corporation which employs more than five people must pay into the state board of awards a premium based on the yearly pay roll,

which is calculated to take the place of liability insurance and to compensate all workmen for injury or their dependants for loss of life. The law provides for a schedule of compensation to be paid to workmen injured by the loss of members. For partial disability, the injured laborer is to receive two-thirds of his weekly wage, providing it does not exceed $12 weekly for a term of six weeks. For permanent disability he is to receive two-thirds of his average weekly wages for life, providing it does not exceed $12 weekly. Employees of less than five persons can come in but are not required to do so. The law will make quite a change in the system of operating mines in Ohio.

The Ohio legislature has also passed a bill giving heirs instead of lineal descendants the right to recover damages caused by death in the mines of Ohio.

KENTUCKY

Louisville—Recent rains throughout the Ohio Valley have resulted in a rise in the river, which is expected to bring a stage of water from Pittsburgh down that will enable the coal fleets to get out with the biggest tonnage in years. Tows are now being made up at Louisville for several of the steamers, which have recently returned from the South with empties, the quantities of river coal now available at this port being ample for this purpose.

The decision of the Interstate Commerce Commission makes permanent the recent suspension of the Louisville & Nashville's advances in rates on coal from mines on the Stony Fork branch to various destinations. The decision upholds also the contention of the coal men that the L. & N. is legally the initial carrier, and is, therefore, responsible for the furnishing of cars.

ILLINOIS

Edwardsville—The Henrietta Mine, owned by the Federal Trust Co. of St. Louis and leased by W. S. Walker, was shut down by action of the miners filing claim for wages. The management claims that the mine was unable to work, because the people of Edwardsville bought outside coal instead of patronizing the local mines.

Cherry—The last death claim against the St. Paul Coal Co. arising out of the mine disaster at Cherry in 1909 has just been settled in the circuit court at Princeton. It is estimated that the company has paid out over half a million dollars in settlements to date.

Peoria—The Illinois miners in state convention Feb. 25, voted to give the striking miners of West Virginia $900,000 to aid them in their struggle. The gift not only means a levy of $100,000 upon the members of the union in this state, but it authorizes the state executive board to spend every cent of the reserve fund of $800,000 if necessary.

PERSONALS

Dr. J. H. Hughes, of Nanticoke, has received an appointment as first-aid advisor for the Susquehanna Coal Co. in Nanticoke and Glen Lyon to fill the vacancy caused by the death of Dr. F. L. McKee, of Wilkes-Barre.

Hiram Smith, general foreman at the Dorrnce colliery of the Lehigh Valley Coal Co., has resigned, and his place has been taken by Hugh Price, foreman at Mineral Spring colliery. James Weston, assistant foreman at the Dorrance, has been promoted to foreman at Mineral Spring.

N. W. Campbell, C. H. Peacock and S. L. Kinzer have resigned from their positions with the Pennsylvania Coal & Coke Corporation at the Philadelphia office. Their places will be filled for the present by E. S. Lawrence, assisted by N. C. Ashcom, G. A. Brown, H. G. Mettlach and W. J. Ryan.

The annual meeting of the stockholders of the Goulds Mfg. Co. was held at Seneca Falls, N. Y., Feb. 24. No change was made in the board of directors, and the following officers were reëlected: President, N. J. Gould; vice-presidents, D. V. Colby, W. D. Pomeroy, W. E. Davis, W. E. Dickey; secretary, H. S. Fredenburg; treasurer, B. R. Wells; assistant treasurer, E. W. Medden.

RECENT COAL AND COKE PATENTS

Mine Door—N. Jacho, Allentown, Penn., 1,052,147, Feb. 4, 1913. Filed June 7, 1912. Serial No. 702,257

Coke Oven—W. Felchs, Bethlehem, Penn., 1,051,875, Feb. 4, 1913. Filed Oct. 12, 1910. Serial No. 586,630.

Coaling Apparatus—F. E. Davis, Payette, Idaho, 1,051,699, Jan. 28, 1913. Filed May 11, 1912. Serial No. 696,796.

Mine Car Wheel—I. W. Jones, Birmingham, Ala., 1,051,892, Feb. 4, 1913. Filed Sept. 18, 1911. Serial No. 649,831.

Mining Machine—P. J. & J. S. Kelley, Pana, Ill., 1,051,417, January 28, 1913. Filed Feb. 8, 1911. Serial No. 607,598.

Steam Boiler Furnace—E. Buckley, Philadelphia, Penn., 1,051,546, Jan. 28, 1913. Filed May 27, 1912. Serial No. 699,914.

Mine Car Couplings—O. & C. Anderson, Bitumen, Penn., 1,051,536 Jan. 28, 1913. Filed April 5, 1909. Serial No. 487,852.

Conveyor—G. C. Horst, assignor to J. A. Jeffrey, Columbus, O., 1,052,253, Feb. 4, 1913. Filed May 14, 1903. Serial No. 157,160.

Mining Machine—J. McDonald, New Philadelphia, Penn., 1,052,359, Feb. 4, 1913. Filed March 14, 1911. Serial No. 614,417.

Loading and Unloading Apparatus—O. N. Gardner, Jamestown, N. Y., 1,051,994, Feb. 4, 1913. Filed March 15, 1912. Serial No. 683,972.

Process of Briquetting and Pressing Fuels—A. Ronay, Berlin, Germany, 1,052,093, Feb. 4, 1913. Filed July 21, 1909. Serial No. 508,784.

Superheater Boiler—J. E. Beel, Assignor to Babcock and Wilcox Co., New York, N. Y., 1,051,829, Jan. 28, 1913. Filed May 21, 1906. Serial No. 317,856.

Water Tube Boiler—D. S. Jacobus, assignor to Babcock and Wilcox Co., New York, N. Y., 1,051,890, Feb. 4, 1913. Filed Sept. 21, 1912. Serial No. 721,531. Also 1,051,891, Feb. 4, 1913. Filed Sept. 21, 1912. Serial No. 721,532.

Water Tube Boiler—A. D. Pratt, assignor to Babcock & Wilcox Co., New York, N. Y., 1,051,912, Feb. 4, 1913. Filed July 3, 1912. Serial No. 707,419. Also 1,051,913, Feb. 4, 1913. Filed July 3, 1912. Serial No. 707,420.

CONSTRUCTION NEWS

Middlesboro, Tenn.—The Mary Moose Mining Co. is preparing to sink a shaft at its mines, four miles below town.

Mt. Union, Penn.—The Lehigh Coal and Navigation Co. intends to erect 100 new houses at Summit Hill next summer instead of only 50.

Shamokin, Penn.—The local engineering department of the Philadelphia & Reading Coal & Iron Co. have completed plans for the sinking of a new shaft at the Sterling colliery.

Friedens, Penn.—A gigantic electric power plant has just been completed here for the Stauffer Coal Co. Many other improvements are being planned and will be carried out in the spring.

Coshocton, Ohio—The stockholders of the Ohio Cannel Coal Co., of Coshocton, Ohio, met recently to discuss plans for building a large number of houses and generally improving its property. The mines are located near Warsaw.

Birmingham, Ala.—A new crusher of 200 tons capacity, a new tipple and other machinery is being installed at the mines operated by the North Alabama Coal Iron and Railroad Co. Another slope soon will be started to tap another ore vein. Improvements will cost $10,000.

Montreal, Can.—The Albert coal branch of the Grand Trunk Pacific R.R. has been completed and the work on another branch line to the Yellowhead Coke Co.'s mine is now well under way and will probably be finished by the end of the month. On a line to the Mountain Park mines, steel has been laid five miles west of Edson.

Columbus, Ohio—Reports from Bellaire say that extensive improvements are being planned on the property of the Hall & River Coal Co., recently purchased by the Grand Trunk R.R. The program announced will involve the expenditure of $250,000 in the three mines of the company. When the proposed improvements are completed it is expected that 1500 more men will be employed.

Kansas City, Mo.—An English syndicate, headed by Col. L. B. Drage, of London is to begin at once to develop the Christie coal tract in the Waverly-Lexington field. They propose to extend one mine that is now a small producer and to sink other shafts. They expect to be able to offer Kansas City several thousand tons of coal daily. Christie Tract, formerly the property of C. C. Christie, of Kansas City, is 2500 acres in extent.

Whitesburg, Ky.—It is reported that R. E. Echols and associates, of Huntington, W. Va., have been purchasing numerous tracts of coal lands in the Carr's Fork Creek section of Knott County, where their holdings will aggregate from 10,000 to 12,000 acres when deals now pending are completed. It is the intention of the purchasers to start development work during this year, which will involve the construction of a twelve-mile branch from the Lexington & Eastern's new extension.

Pottsville, Penn.—The Philadelphia & Reading Coal and Iron Co. is paying considerable attention to the improvement of its mines in the Shamokin region. The four-way shaft of the Reliance colliery at Beaverdale is being sunk, and when finished, will be 620 feet in depth. The Dolan Bros., of Pottsville have taken charge of the sinking and will push the work as rapidly as possible.

The Reading Co. expects to have this shaft completed within ten months.

The P. & R. C. & I. Co. will spare no expense to make this shaft one of the finest in the anthracite coal fields. It also intends in the very near future to have Reliance, Alaska, Locust Springs and Potts collieries equipped with electricity, motor cars, electric hoist and light. They will all receive the power from the electric plant at Locust Spring. The company expects to enlarge this plant and will ship in a few days a Corliss engine of 700 horsepower and one of the largest in that section. When completed this plant will be able to furnish power for all the collieries in that district and Potts colliery at Locustdale. At the Locust Spring colliery the work on the electric hoist at the new rock slope has been started.

Bluefield, W. Va.—The Virginian R.R. is making a survey along the water course of New River for a direct line from its present connection at Rich Creek, Va., to its subsidiary line, the Piney Creek R.R. The latter road was one of the several lines recently acquired by the Virginian. The cutoff extension will probably be seventy-five miles in length. Engineers are at present engaged in making estimates on this proposition and preparations will probably be made for actual work by the latter part of the summer.

Ft. Worth, Texas—The development of coal fields in the northern part of Stevens County containing estimated deposits of 100,000,000 tons of coal and the construction of a railroad from Knox City on the Orient Ry. to this city will begin within a few weeks. The line will pass through oil lands aggregating 20,000 acres and located between Bomarton and Crystal Falls. The estimated cost of its construction is $1,650,000. Six towns, Knox City, Munday, Goree, Bomarton, Throckmorton and Woodson have agreed to furnish the right-of-way for the railroad and land for stations, and to purchase coal from the newly discovered deposits to the value of $750,000.

Connellsville, Penn—Preparations are under way to increase the capacity of the Provident Coke & Mining Co.'s plant at the Kelly station, in the Allegheny Valley. The present output of the mine is 500 tons a day. This will be increased to 2000 tons as rapidly as possible. The company owns 3250 acres of land under which run three seams, the Upper and Lower Freeport and the Middle Kittanning. About 50,000,000 tons are contained in the tract and the coal is of excellent quality.

The plant is being electrically equipped. The West Penn Co. will furnish curent for the haulage system, the cutting machines and other equipment.

NEW INCORPORATIONS

Hazleton, Penn—The Cranberry Creek Coal Co.; capital stock, $10,000.

Helena, Mont.—The Lock Bluff Coal Co.; capital stock, $15,000. Incorporators: J. L. Wester, Jens Rivenes and Harry Wold.

Louisville, Ky.—The Schwind Coal Co.; capital stock, $10,000. Incorporators: Ernest E. Schwind, John C. Schwind, Jr., and George Miller, Jr.

Hazard, Ky.—The Hazard Dean Coal Co.; capital stock, $50,000. Incorporators: C. R. Luttrell, J. R. Jones, W. R. Marsee and Hiram H. Owens.

Wheeling, W. Va.—The Warren Coal Co.; to mine coal; capital stock, $25,000. Incorporators: Johnson C. McKinley, Harry O. Wills, M. B. Mather and John C. Beury.

Wheeling, W. Va.—Warwood Coal Co., $25,000. Incorporators, Johnson C. McKinley, W. R. Warwood, Harry O. Wells W. B. Mathes and John C. Berry, all of Wheeling.

Indianapolis, Ind.—The Warren Coal Co.; to operate mines; capital stock, $100,000. Directors: William P. Ijams, Thomas H. Gill, Albert L. Pfau, Clem J. Richards, J. W. Ijams.

Charleston, W. Va.—The Claybrook Coal Mining Co.; to mine coal; capital stock, $100,000. Incorporators: J. E. Chilton, John A. Thayer, S. B. Chilton, S. Hess and T. S. Clark.

Chicago, Ill.—The Lignite Products Co.; to mine lignite, coal, metals and other natural minerals; capital stock, $5000. Incorporators: Charles Martin, T. A. Sheehan and H. M. Byall.

Chicago, Ill.—The Harkes Coal Co.; to mine and sell coal and clay and their products; capital stock, $6000. Incorporators: Arthur Connor, Thomas J. Luney, Christopher Walen.

St. John, N. B.—New Brunswick Coal, Iron & Clay Co. is asking incorporation, with $275,000 capital, to develop coal, iron and clay deposits and carry on business incidental thereto.

Fairmont, W. Va.—The Ross Coal Co.; chief works in Logan County; capital stock, $75,000. Incorporators: C. E. Hutchinson, C. H. Jenkins, E. C. Curry, R. A. Johnson and H M. Piermont, all of Fairmont.

Wilmington, Del.—The Octave Mines Co.; capital stock, $1,000,000; to acquire mining rights of all kinds; acquire mining sites. Incorporators, George Steigler, W. M. Pyle, Edmund S. Hellings, all of Wilmington, Del.

Oklahoma City, Okla.—A charter has been granted to the Hillock Oil & Coal Co., of Welcetka; capital, $100,000. Incorporators, Robt. F. Turner and J. H. Bynum, of Indianola, Okla., and M. H. Sharp, of Mena, Ark.

Hazard, Ky.—The Mabel Hill Coal Co. is a recent entry into the field around Hazard, Ky., the capital stock being $100,000. The company has taken over the properties formerly owned by the Gaddie Coal Co., and has engineers on the ground making surveys for additional improvements. A daily output of 500 tons is aimed at.

Salt Lake City, Utah—The Utah Coal Sales Agency has been organized under the laws of the State of Utah and after Mar. 1 will handle the output of the Consolidated Fuel Co., Black Hawk Coal Co., Castle Valley Coal Co., and Castle Gate Coal Co. The officers of the company are: W. D. McLean, president and manager; W. O. Bridgman, vice-president; G. E. Forrister, secretary-treasurer; J. H. Mays, director; H. R. Macmillan, director. This is a departure from the established method of handling the sales department of the mines in the Intermountain territory and will be closely watched by the other operators.

INDUSTRIAL NEWS

Dalfax, Penn.—The Pett Mountain Coal Co., near Matamoras, has installed a new 10-hp. hoist and engine and a new pump.

Punxsutawney, Penn.—Annie M. Guthrie, of Center Township, sold 174 acres of coal land to the Tide Coal Mining Co. for $17,500.

Scranton, Penn.—The various collieries of the D., L. & W. Coal Co. were idle Feb. 22, to give their men a holiday on Washington's birthday.

Waynesburg, Penn.—The Enterprise Realty Co. has transferred 600 acres of coal land in Springhill Township to Robert Norris, of Connellsville.

Ravenna, Ohio—The Hudson Coal Co. has recently purchased a 400-acre tract of coal land at Hopedale. The removal of mine No. 8 will soon commence.

Indiana, Penn.—F. L. Neff and E. I. Berry are opening a coal mine on the John Lydick farm in Cherryhill township, where they own 30 acres of high-grade coal.

Gadsen, Ala.—The North Alabama Iron, Coal & R.R. Co. has received a 200-ton ore crusher. The capacity of the mine will be brought up from 75 to 200 tons a day.

Klee, Ohio—The Klee coal mine, known as the Brutchey & Eberling Coal Co., will hereafter be known as the Eberling Coal Co. Mr. Eberling has bought out his partner's interest.

Washington, Penn.—A. B. Kirsch, of Nicktown, is optioning many hundreds of acres of coal lands in the vicinity of Bradley. For whom Kirsch is acting no one has any information.

Altoona, Penn.—The mine operated until three years ago by the Ashville Coal & Coke Co., at Ashville, has been reopened under the direction of Clair P. Burtner, with offices in the Altoona Trust Building.

Connellsville, Penn.—Jas. M. Clark has sold to the Washington Coal & Coke Co. 206 acres of coal underlying his farm in Jefferson Township. The price will be about $200 an acre. The coal is the 9-ft. seam of Pittsburgh coal.

Gary, W. Va.—The United States Coal & Coke Co., a subsidiary of the United States Steel Corporation, has announced a general advance in wages to its employees averaging about 8 per cent., effective Mar. 1. Three thousand men are affected.

Columbus, Ohio—Columbus capitalists headed by Attorney E. D. Howard are negotiating for the purchase of extensive coal rights in Lawrence County, Ohio. The tract comprises about 12,000 acres, and will be developed during the summer if the deal is closed.

Charlestown, W. Va.—Announcement has been made that the coal holdings of the Dixon Pocahontas Fuel Co., together with all the property of the company, has passed by purchase into the hands of the Lake Superior Coal Co. The price paid is said to exceed $500,000.

Bellefonte, Penn.—The Pennsylvania Coal & Coke Corporation have fired up some 400 coke ovens at its No. 10 mine at Gallitzin. They have been idle for the past week or more for repairs, and these have been finished and all will be put into operation as quickly as possible.

Reynoldsville, Penn.—A coal deal involving over 5000 acres of land was consumated in Perry Township when the Buffalo company bought the Adam Eyler Farm and opened negotiations to secure the surrounding territory. It is believed that an opening will be made in the spring.

Lester, Ark.—The Camden Coal & Clay Co., of Camden, has acquired and will develop 10,000 acres of lignite coal land, and also the clay. The clay will be ground and washed at the mines and shipped to Pittsburgh, Penn., for pottery use. The lignite is a somewhat unmatured deposit.

Connellsville, Penn.—The Indian Head Coal & Mining Co. began operations Feb. 24 at the two mines just opened at Indian Head. The number will be increased as the workings are developed. Lloyd Reese, of Indian Head, president and general manager of the company, is in charge.

Connellsville, Penn.—The possibilities of large coal deposits as yet untouched in the Ozark regions will be investigated by Eastern capitalists headed by A. D. Vance, of Pittsburgh, who will go to Taney County, Mo., and begin prospecting in the country near Gretna, Branson and Hollister.

Connellsville, Penn.—The Operators' Coal Co., composed of Johnstown men, has taken over the holdings of the Pennsylvania Smokeless Coal Co. in Somerset County. More than 1000 acres near Holsopple changes hands. Two mines, with an output of 1000 tons a day, are being operated.

Columbus, Ohio—Announcements were received here recently that a special meeting of stockholders of the Provident Coal Co. will be held Mar. 20, to vote on increasing the capital stock from $300,000 to $600,000, to finance improvements made at the company's property in Belmont County.

Birmingham, Ala.—The Alabama Coal & Coke Co. have sold their mine and coal lands at Waverly, Union County, Ky., on the Illinois Central R.R., to the Drury Coal Co., of Morganfield, Ky., and it is now being operated by A. Maben Hobson, of Birmingham, Ala., as trustee for the purchaser.

Charleroi, Penn.—The Carnegie Coal Co. is surveying the block of 1400 acres of coal near Hickory, recently bought by them. The work is under the supervision of Engineer Thomas. This is the company that bought the Charleroi Coal Works at Charleroi, which it will operate as soon as a new tipple is built.

Huntington, W. Va.—The management of the Chesapeake & Ohio R.R. expects soon to let a contract for the construction of 3000 seventy-ton coal cars. Half of the 50 locomotives which the company ordered last year have been completed and delivered. The remainder will be finished and delivered within the next two months.

Morgantown, W. Va.—J. A. Comley has sold a tract of Pittsburgh coal along the Buckhannon & Northern R.R. to Pennsylvania men with the understanding that it is to be operated on a royalty basis. The purchasers must mine at least 10,000 tons per acre. The deal involves $70,000. The mines will be opened at once.

Georgetown, Colo.—The Blue Ridge Mining Co., operating the Millington group of mines on Columbia Mountain, promises to soon have one of the heaviest producing properties in the upper Clear Creek district. A big force of men is being employed, and as fast as ground has been placed in condition more miners will be given work.

Rockwood, Penn.—A syndicate composed of Baltimore capitalists have taken options on about 8000 acres of mineral land lying along the Baltimore & Ohio R.R., one mile west of Rockwood. The operations will then at once be commenced on a large scale and the mined products will be shipped to the Eastern markets as soon as the syndicate takes over the land.

Indiana, Penn.—What promises to be the biggest coal deal made in this county for 10 years, may be closed on May 1, when a block of 6000 acres of Greene township, which is now under option, may be bought by Philadelphia capitalists. Elmer E. Davis, of Johnstown, representing Philadelphia capitalists, is securing the options. The entire tract lies along Twolick Creek.

St. Louis, Mo.—Interest was aroused in Alton by the announcement that the Clark Brothers syndicate, owning the East Side electric lines and systems in East St. Louis, Alton, Belleville, Edwardsville, Collinsville and Granite City, has organized the East Side Coal Mining Co., and that a site for a power house has been bought by the company from Mrs. Janet Watson at Alton for $25,000.

Pittsburgh, Penn.—A Pittsburgh coal land broker has sold to the Welsh combine, headed by David Andrew Thomas, 227,000 acres in West Virginia and Kentucky at a price aggregating $10,000,000. Of this land 175,000 acres are represented as being in the Gauley River district, of West Virginia and 52,000 acres in Belle, Whitely and Knox Counties, Kentucky. The report, as yet, lacks confirmation.

Fairmont, W. Va.—The Mineral Fuel Co. announces that it has purchased between 4500 and 5000 acres of coal land in Letcher County, Ky., and is planning an expenditure of $500,000 to $700,000 for development work, including the opening of mines, machinery installation, building houses, and the like, for a modern coal operation with an annual output of something like 750,000 tons. The property was purchased of the Mineral Development Co., and adjoins the 100,000-acre holdings of the Consolidation Coal Co.

Huntington, W. Va.—J. W. Parshall, an agent for Eastern capitalists, who has been inspecting coal and oil lands in West Virginia and Kentucky, expected to close a deal by Mar. 1 for a 50,000-acre tract on New River. It is the intention of this syndicate to build and open up six new collieries on New River before next winter. An expenditure of $7,000,000 is planed. This sale will mean the opening up of three new towns. Over four thousand workmen and officials will be brought into the state to help in the developing of the first big tract which it is decided to open up.

Barbourville, Ky.—The recently-organized Raccoon Coal Co. has acquired 1200 acres of rich coal land near Hazard, Ky., and will proceed to develop it at once, the daily capacity being estimated at 500 tons. The company intends to install sufficient electrical generating machinery to operate four six-ton motors, four fans and eight machines, as well as four electric rock drills. Machinery bids will be opened about May 1. It is probable that an electric-lighting franchise will be asked for, in order that the company may sell its surplus current.

Wilkes-Barre, Penn.—The Buttertub coal property, in the borough of West Wyoming, has been sold by Messrs. Stark and Kintz to J. D. Davis, of Kingston. No announcement is made as to what company is to acquire possession of the tract. The property consists of about 15 acres, which, according to the account of the mining engineer, carry six veins of coal. The property is bounded on one side by the Mt. Lookout Colliery of the Temple Coal & Iron Co., and on the other side by the Lehigh Valley Coal Co. An opening was made on the property about 25 years ago, but no mining operations have ever been conducted.

Corbin, Ky.—The Louisville & Nashville is planning to double-track that portion of the Cumberland Valley division between Varilla and Corbin, Ky., the latter point being the juncture with the Knoxville division, and the former being the point a which the new Harlan County extension joins the Cumberland Valley division. The cause for the decision to make the improvement is the crowding of the present single track by the increase in coal traffic during the past few years, and the increasing development along the extensions will naturally increase this condition. Work on the additional track, which will be about 35 miles in length, will begin early in the spring.

Louisville, Ky.—At a recent special meeting of the stockholders of the Tennessee-Jellico Coal Corporation, held at the company's office in the Equitable building, in Louisville, it was unanimously decided to increase the capital stock from $300,000 to $400,000, for the purpose of providing capital to develop a large tract of coal land recently acquired by the company near Hazard, in the rapidly developing Perry County field. Most of the stockholders are residents of Louisville, the officers being Robert Wedekind, president; L. I. Coleman, vice-president and general manager; John P. Gorman, general superintendent of mines, and W. P. Polk, secretary and treasurer.

COAL TRADE REVIEWS

GENERAL REVIEW

All kinds of prices are being quoted on individual hard coal in anticipation of the April reduction in the company's circular. Few sales are being made, however, only a small volume of coal moving into consumption and this only for the purpose of carrying the consumers over until the reduction goes into effect. The dealers in particular are quite active, endeavoring to dispose of their stocks, but indications are that there will be considerable on hand the first of the month. April, May and June will no doubt see heavy buying for storage purposes, in order to take advantage of the reduced prices in effect and the present inactivity is giving the companies a welcomed opportunity to accumulate surpluses against this impending demand.

The most striking feature in the bituminous market is the evident determination on the part of the larger companies to obtain an advance on next season's contracts, and this, in the face of an unusually adverse market. With the contract season now at hand, the operators are making every effort to get control of the market. Ordinarily prices are high at this season of the year, but now spot quotations are firmly established well below contract asking prices, and as a result consumers are reluctant to close and will not do so until forced.

In the Eastern Coastwise trade concessions are becoming more frequent and there appear to be too large accumulations to permit of any great stability to the market. Comparatively high water-freights are making spot buying slow at some points, and the more competitive contract business has not yet developed. The Pennsylvania grades are dull, but firm. Buyers generally believe there is an abundance of coal and are showing a disposition to buy only as they require the product. In the Pittsburgh district there is some irregularity as to prices due to concessions on the part of the small operators, but the uncertainty about obtaining shipments of these, in time of a heavy demand, makes the buyer hesitate to close with them.

The volume of trade in Ohio is considerably restricted by the higher temperatures, but the price list shows little change. The manufacturing demand is good, but buyers are anticipating cheaper coal in the near future and are confining their orders to immediate requirements. Contracts are being renewed on the same basis as last year. Domestic prices in the Southern market have been advanced 25c. over last year's circular.

The Middle Western mines are running on a still shorter schedule and the demand is so light that there is not even any incentive to reduce prices further. Quotations have, in any event, about reached an irreducable minimum and even, on occasions, run off to below the cost of production. February proved a good month for the Rocky Mountain operators and the higher temperatures prevailing over the first part of the current month indicate a continuance of these favorable conditions.

BOSTON, MASS.

Only a rigid curtailment can improve the present situation on Pocahontas and New River, and it is understood that such a move is in prospect. The $2.85 price is going hard; the accumulation of coal at Hampton Roads is too great to give any stability to the market. Concessions have been made perhaps more freely the past week than at any time so far this year and if there really is to be a restriction it will be interesting to see how it works. There is apparently little doing on contract; the more competitive business has not yet come into the market to any extent. There is no activity at the distributing points and Southern coals are dull in every quarter. Strike rumors in the New River field will be followed closely in this section and for the spring outlook much will depend on the news that comes from the seat of the threatened troubles.

The high range of water freights, particularly from Hampton Roads, has interfered with the ready absorption of spot coal and will likely make the movement slower still if there is a concerted move to realize the $2.85 price f.o.b. The Georges Creek shippers seem well supplied with orders. An influx of government steamers at Baltimore has taken up whatever slackness there was.

The Pennsylvania grades are dull but with a fairly firm attitude on the part of most of the operators to net higher prices than in 1912. There is only a scattering business at tide, and all-rail there are no new features. Buyers feel there is to be an abundance of coal and they are following a hand-to-mouth policy of ordering.

It is "between seasons" on anthracite and all kinds of prices are current on independent coals. As low as $5, $5.25 and $5.50 alongside for egg, stove and chestnut, respectively, have been quoted; in other words the individual shippers are anticipating the expected 50c. reduction in the companies' circular, Apr. 1. Few sales are reported, however, for the dealers are generally loyal to the companies who saw them through the hard season and what cargoes they are taking are largely of the sizes on which there will be no reduction. Individual operators are having difficulty in moving the steam sizes as well as egg and chestnut. This is where the companies with their storage depots here and there have a distinct advantage in dull periods.

The retail price in Boston for bituminous was reduced Mar. 1 from $5 to $4.75 per net ton delivered in teams.

Current quotations at wholesale are about as follows:

Clearfields, f.o.b. mine	$1.25@ 1.50
Clearfields, f.o.b. Philadelphia	2.50@ 2.75
Clearfields, f.o.b. New York	2.80@ 3.05
Cambrias, Somersets, f.o.b. mines	1.35@ 1.60
Pocahontas, New River, f.o.b. Hampton Roads	2.65@ 2.70
Pocahontas, New River, on cars Boston	3.85@ 4.00
Pocahontas, New River, on cars Providence	3.75@ 3.85

NEW YORK

Bituminous—The soft-coal consumers are still holding off on contracts and the weather has been such that the domestic consumption has been reduced to a minimum with the result that there is little or no demand. Only a small proportion of the contract business has been closed so far this year, but such is not unusual; last year it is believed most of the larger companies closed as many contracts during April as in March.

However, conditions for contracting are particularly unfavorable this season. Last year at this time there was a strong spot market, with prices ruling well above contract asking prices, with the result that consumers were eager to get under cover by closing business. During the current season, the conditions are almost reversed, the spot market being substantially less than contract asking prices, so that consumers will hold off closing until they are absolutely forced to do so. The prospects for obtaining higher prices for next year's contracts are looking more favorable, consumers appearing to have accepted the advance as inevitable particularly on the higher grades.

The larger companies are still curtailing production prefering not to sell at the prevailing low prices in the spot market. The supplies at tide are a trifle low and the car supply is fairly good and much better than last week.

The New York soft-coal market is not quotably changed from last week and continues dull and quiet on the following basis: West Virginia steam, $2.60@2.65; fair grades, Pennsylvanias, $2.65@2.70; good grades of Pennsylvanias, $2.75@2.80; best Miller, Pennsylvania, $3.05@3.15; Georges Creek, $3.25@3.30.

Anthracite—While there is some hard coal still moving, the volume is relatively small and confined entirely to the small tonnages required to carry some of the consumers over until the spring discount goes into effect Apr. 1. Shipments of any grades can be had promptly and individuals are offering discounts well down to the spring circular. Such conditions, of course, makes it difficult for the larger companies to maintain circular prices with the result that much of their coal is now being diverted into storage. The operators are now looking forward to a great activity after the first of the month. Consumers of all kinds are working their supplies off down to the lowest possible point in anticipation of the reduced prices, and will be in the market for large tonnages.

We quote the New York market on the following basis:

	Circular	Lehigh	Individual Scranton	Individual Schuylkill
Broken	$5.00	$5.00	....	....
Egg	5.25	4.55	....	....
Stove	5.25	4.85	....	....
Chestnut	5.50	....	....	$4.90
Pea	3.50	3.60	....	....
Buckwheat	2.75	....	$2.50	2.15
Rice	2.25	....	2.25	1.80
Barley	1.75	....	....	1.15

PHILADELPHIA, PENN.

A long continued spell of unseasonable weather, broke here and there by a cold snap, has reduced the market to almost a standstill. There is actually no size at the present time which cannot be furnished at a moment's notice, and orders are promised prompt delivery, without hesitation. Some coal is moving, of course, but the tonnage is comparatively small, and is only to piece out, until the opportunity is presented of buying at the spring or opening prices. The dealers are trying to get rid of what coal they have, so as to carry as little as possible of the high-priced product over into spring; judging from the number of idle men and teams many of them complain about, there may, however, be considerable coal on hand Apr. 1. Some of the most severe snowstorms in this vicinity have occurred during this month, in former years, and the dealers are living in hopes that such will be the case this year.

The demand for the steam sizes, however, continues good, and furnishes the only firm feature of the market. The individual operators are already in the market with April coal, that is, 50c. off the prevailing circular prices, and even less than this it is said. Taking their mid-winter prices of $5.25@5.50 at the mines, this represents at least as much as $1.75@2 shrinkage in the value of individual coal. The large companies are still adhering to their circular prices of $3.75 for egg, $4 for stove and $4.15 for chestnut, and what they cannot dispose of at this figure is going into stock, to provide against the heavy demand that is likely to prevail during the months of April, May and June.

Production still continues at top notch, none of the collieries having suspended operations owing to the unfavorable market, and the prevailing dull condition really comes in the shape of a blessing, as it will give them an opportunity to place some coal in stock, which a winter of even normal temperature would have rendered impossible. When it is recalled that most if not all of the companies went into last June with no coal in stock at all, and have had no opportunity until the present to divert any to their storage places, it will place the companies in a much more comfortable position to take care of their spring and summer business.

The bituminous market shows no improvement whatever. Constant production has thrown large quantities of coal on the market, which has to be disposed of, and in most cases, at ruinous prices.

PITTSBURGH, PENN.

Bituminous—It continues to be between seasons as to contract coal, buyers having contracts expiring Apr. 1, being slow to close. There is some irregularity in prices quoted on contracts, due to cutting by small operators, but the large producers are adhering strictly to the regular prices and as supplies are usually somewhat uncertain from the smaller companies, in the event of high prices for prompt coal, the cut prices named are not readily accepted, though occasional sales are made. Demand for prompt coal is not heavy, as the weather has been unusually open for winter, and retail demand is rather light. Slack for early shipment usually brings a premium of 10c., occasionally more, and can be quoted at $1@1.05. Regular prices are: Slack, 90c.; nut and slack, $1.05; nut, $1.25; mine-run, $1.30; ¾-in., $1.40; 1¼-in., $1.55.

Connellsville Coke—The improved prices noted a week ago as having been reached through the stiffening which followed the unloading of considerable stock coke, have been maintained without difficulty, and the present outlook seems to indicate further increases rather than a recession. Demand for prompt furnace coke has not been particularly heavy, but shipments have been larger on contracts and it seems evident that the recession, which began late in January was, as suggested at the time, due simply to a few furnaces working badly temporarily, and to some furnaces starting to consume portions of stock piles accumulated late in the year against the irregularities in shipment, which are usually experienced in the winter, but which were absent this time.

Prompt furnace coke has been held at a minimum of $2.50, and while demand has been rather small in point of tonnage, the figure has been well maintained. For contract coke, operators have held to higher figures than expected, and in one instance a moderate tonnage was placed at $2.65, for regular shipments to July 1. There are few operators quoting as low as $2.50, but the price could probably be done either to July 1 or for second-half. Foundry coke has undergone considerable stiffening. Transactions are now based on standard foundry coke, the foundries no longer purchasing the indifferent grade they were glad to get around holiday time. We quote: Prompt furnace, $2.50; contract furnace, largely nominal, $2.50; prompt foundry, $3@3.25; contract foundry, $3@3.25, per ton at ovens.

BALTIMORE, MD.

The market underwent no change whatever during the week. The low grades of coal are still being quoted around $1, but the car situation improved slightly. Operators are still quoting contract prices for the better grades at 10c. to 15c. above last year's level. About two weeks ago, a number of contracts were closed on this basis, but the buyers are inclined to hold off for a while, and are talking of seeking other fields, if the trade insists on the higher prices. The coal men claim that they are entitled to the advance, owing to the increased operating cost.

West Virginia operators were in Baltimore during the week to confer with Baltimore & Ohio officials relative to the suggested change in the car-distribution system prevailing on that system. Many complaints have been made regarding the present distribution, and the railway company is endeavoring to satisfy its shippers. It is thought that some plan will be evolved which will be satisfactory to all concerned. There is some talk of this road building another coal pier at Curtis Bay.

BUFFALO, N. Y.

The weather has spoiled anthracite so completely that it will require a more severe freeze than March is likely to develop, to restore it to its former activity. Sometimes the semiwinter season continues so persistently that there is a fairly good market all through April, but that does not appear to be expected now. February was only a winter month for about two-thirds of the time, and spring is too near for much return of the demand.

Bituminous naturally suffers less from the unseasonable weather than anthracite, but even it is now standing still because of the increased efficiency on the part of the railroads. During the first half of February the roads became badly demoralized and prices were strong in consequence, but now the delayed shipments are coming forward freely and there is plenty of coal being offered. But the soft-coal market is not so weak as the small sales would seem to indicate. The large operators are holding firm, and if the surplus coal on track can be worked off in a short time it is possible that no break of consequence will take place. Still the tendency is to mine more coal than is needed, and if the railroads can move a full output, it is going to be difficult to hold the quotations.

Jobbers, as a rule, refuse to concede of any lower quotations, saying that the extra quietness of the bituminous market does not necessarily indicate weakness. Pittsburgh select lump continues at $2.80; three-quarter, $2.65; mine-run, $2.55, and slack, $2.15, with Reynoldsville and Allegheny Valley 15c. to 25c. lower. Coke continues to decline. It went too high and, now on the decline, it does not seem to know where to stop. Jobbers find no other reason for its present weakness. Quotations are on the basis of $5.20 for best Connellsville foundry, with very little stock coke yet to be had. The consumption remains good, or stock piles would mount up.

Anthracite premiums are a thing of the past, and Buffalo has three Lake cargoes made up of surplus large sizes, with more to be loaded right along. So far only the Lehigh Valley company has done any water loading, though the D., L. & W. would begin soon but for the seizure of the water trestle by the government on a charge of trespass.

COLUMBUS, OHIO

During the past week the temperature rose and the demand for domestic grades became less, although the general price list showed only a slight change from the previous week. The volume of trade is considerably restricted and operators believe that there is not much in store for them in the future, unless weather conditions become more favorable.

Operations in most of the Ohio fields have been curtailed because of the weak demand. In the Hocking Valley district it is estimated that the output was only 65 per cent. of the average and the same is reported from Pomeroy Bend district. In Eastern Ohio where the steam trade is more active, the output was about 75 per cent. of normal. In the strictly domestic fields the production was below 50 per cent.

Steam business is as active as could be expected under the circumstances. Manufacturing plants are still taking a fairly large tonnage although they are not stocking up any, believing that cheaper coal will prevail in the future. Quite a few of the steam contracts are expiring about this time and they are being renewed generally at the same figures that prevailed during the past twelve months. In eastern Ohio practically all of the larger fuel contracts are being entered into at a slightly higher figure than last year. Re-

tail stocks are fairly large and as a result orders are not coming in fast from that source. Dealers have not been having much business and they are inclined to pull in and prepare for the summer season.

Quotations in the Ohio Field are as follows:

	Hocking	Pittsburgh	Pomeroy	Kanawha
Domestic lump	$1.50		$1 50	$1 45
2-inch	1.35	$1 20	1 35	1 30
Nut	1.30		1 30	
Mine-run	1 15	1 05	1 15	1 15
Nut, pea and slack	0 90		0 90	0.90
Coarse slack	0 80	0 85	0.80	0.80

CLEVELAND, OHIO

The demand for soft coal continues light and conditions indicate that the production exceeds the consumption. The reduction on slack is most noticeable and prices fell off from 10c. to 15c. per ton.

Wholesale quotations per short ton f.o.b. cars at the mines are as follows:

District.	Freight rate	¾-in. lump	Mine-run	Slack
Youghiogheny	$1.00	$1 40	$1 30	$1 00
Pittsburgh No. 8	0.90	1 20	1 10	1 00
Goshen No. 6	0.70	1 35	1 25	1 10
Coshocton	0.70	1 55	1 35	1 15

Pocahontas lump and egg is quoted at $1.70, run-of-mine $1.10, slack $1 f.o.b. mines. Hocking is going at $1.55; Massillon domestic lump at $2.50 mines. Furnace coke is quoted at $2.25 f.o.b. ovens with about 75c. added for the foundry grade.

LOUISVILLE, KY.

The market is swamped with fuel and prices are nearly at an irreducible minimum, yet fail to move the coal. It is said that the quantity of fuel in the principal markets of the South was never before so great at this season of year. The best grades of lump and block are going begging at prices as much as a dollar below normal, and even the steam market is exhibiting astonishing weakness.

Good Eastern Kentucky lump and block has been sold during the past few days as low as $1.50 a ton; and round can be had at $1.15 or thereabouts. The better grades of nut and slack are held at 75@85c., with a weak demand, which may presage still lower prices, unless manufacturers realize their opportunity and take advantage of it to lay in a supply against the almost certain scarcity which must follow a dead domestic market. Western Kentucky nut and slack is selling at about 60c., and pea and slack ranges from 40@55c.

HAMPTON ROADS, VA.

The past week has been a quiet one in the tidewater market and there has been no change in the price of contract or spot coal, which remain around $2.60 f.o.b. Hampton Roads, for standard New River and Pocahontas coals. The inferior grades are selling as low as $2.50, while high-volatile coals, of which there is always a small supply on hand, are bringing about $2.40 to $2.45. The movement continues good and the coal roads are all receiving new equipment, and placing further orders for still more. Contracts are being made on the basis of $2.85 f.o.b., but buyers are slow, apparently expecting a break in prices before April, but this is hardly justified by the present outlook.

Considerable talk is heard of the likelihood of a general strike in the West Virginia coal fields, based on the evident intention of the Miners Union to make a determined effort to effect an organizatiion of the miners in these fields, especially in the New River-Pocahontas section; it is quite likely that these efforts will be more successful than ever before, if persisted in.

There are still quite heavy accumulations of coal at the piers and the congested conditions at Newport News continue, although slightly improved, as is shown by the increased dumping. Dumping at Lamberts Point pier for January was 484,343 tons as compared with 482,102 for February; Sewalls Point handled 260,544 tons in January and 258,183 in February; Newport News, 243,571 and 284,706 respectively.

BIRMINGHAM, ALA.

Orders are now being booked by the domestic producers at the new schedule of prices, as follows:

Month	Fancy Lump	3x6-in. Lump
April	$2 50	$2 00
May	2 60	2 10
June	2 70	2 20
July	2 80	2 30
August	2 90	2 40
September	3 00	2 50
October		
November		
February	3 25	2 75

Protests are being made by some of the dealers at paying 25c. per ton more than for last season's coal, but this increase is necessary to take care of the advance in miners' wages and operating costs in general. It is a well known fact that the quantity of high-grade domestic coals in Alabama are more limited than are the steam and coking grades. Many of the domestic mines are already working to a great depth, which accounts for the high cost of mining this grade.

The steam market is approaching the season of the year when a natural decline takes place all along the line and it is not believed that the high prices ruling at this time can be maintained over a long period. Producers of blacksmith coal are enjoying an unusual era of prosperity and prevailing prices are higher than for many years past. Foundry cokes are in good demand and quotations firm. Virginia ovens, however, are shading prices to some extent and a sympathetic weakness may develop in the local market at any time.

INDIANAPOLIS, IND.

The coal situation remains unchanged, with the exception that the mines have been on shorter schedule. The report from Terre Haute is that 3000 miners have been idle and are trusting to a little colder weather that ushered March in, to improve conditions. But the cold spells this winter have, as a rule, been too short to get in good action before mild weather ensued. Prices both at the mines and in the retail yards hold steady, the former being at the bottom. The demand is so poor that there is no incentive for retailers to reduce quotations, so they are holding them at the high level that came in with the beginning of winter. There are some bargains to be picked up by them, but most of them had their winter supply contracted and have had enough trouble to dispose of that, without looking for more.

Steam coal is almost all sold on contract, but those who depend on the open market have had opportunity to get some cheap fuel. Operators are now concerning themselves with renewals for next season. Whether the experiences of retailers the past season will make them backward in entering into similar agreements for the future remains to be seen.

DETROIT, MICH.

Bituminous—With all the large users of steam coal well stocked, and the dealers with a large supply of domestic on hands, both the steam and the domestic markets bring the situation to a standstill. Slack is not strong but should be with the larger sizes as they are; however, the demand is not worrying shippers. The price is slightly affected, but it is predicted it will advance to normal.

Current quotations are as follows:

	W Va Splint	Gas	Hocking	Cambridge	Ohio No. 8	Pocahontas	Jackson Hill
Domestic lump	$1.50		$1 60	...	....	$1 75	$2 00
Egg	1.40	..	1 40	. .	. ..	1 75	2 00
1½-in. lump	1 25					....	....
¾-in. lump	1.10	$1.10	1.10	$1 10	$1 10	....	...
Mine-run	1 00	1 00	1 00	1 00	1 00	1 25	
Slack	1.00	1.00	1 00	1 00	1 00		

Anthracite—Demand for anthracite has been falling off until it is down to circular. However the bulk of hard coal for this vicinity is going at $5.75, for egg and stove and chestnut, $6 f.o.b. Suspension Bridge.

Coke—There seems to be an increase in demand for this product just at the present time. Connellsville is quoted at $3.50, Semet Solvay $4 and gashouse, $3.75 f.o.b. ovens.

CHICAGO

Dullness prevails in the Chicago coal market; prices, in a measure at least, are at the same level that usually obtains during the summer months. Some operators are selling coal at a loss of 5c. a ton or more.

Six-inch egg has been offered on the local market for shipment direct from the mines on the basis of 85c. and many of the Illinois operators seem willing to dispose of their coal at almost any price. Mines in Franklin County are being operated on about a half-time basis. While the Franklin County operators are adhering to reasonable figures, other companies are slashing prices right and left. The latter have been accepting $1.25 for high-grade domestic lump, egg and nut and in some instances have scaled the price to $1.10.

Springfield operators are selling domestic lump for $1.25 to $1.35. There has been a good demand for Hocking Valley coal, the price being firm at $1.50. Smokeless lump and egg ranges in price between $1.50 and $1.75. There is little activity in the coke trade.

Prevailing prices in Chicago are:

	Sullivan Co.	Springfield	Clinton	W Va
Domestic lump	$2 47	$2 07 @ 2 22	$2.27	. ..
Egg	2 47	.	.... ..	$3 95
Steam lump	$2 12 @ 2 37	1 92 @ 1 97	2 17	.....
Mine-run	. .. .	1 87 @ 1 92	1 97	3 30
Screenings	1.67 @ 1 72	1.57 @ 1.62	1 67	. .. ..

Prevailing prices for coke are: Connellsville and Wise County, $5.75@6; byproduct, egg, stove and nut, $5.50; gashouse, $5.50.

ST. LOUIS, MO.

Weather conditions have been more favorable to the coal men the past week than for over a month, but it was not of sufficient strength to create any market. Movement of coal for Northern points picked up some, but the local demand showed but a slight increase. The operators have settled down with the knowledge that there will be nothing more doing now until next fall, and many of the mines are making arrangements to shut down for several months.

For the last week or ten days coke has been a drug on the market, and the demand for smokeless coal has dropped off wonderfully. It has been actually hard to give away, at the circular or under, the different sizes of anthracite. The St. Louis coal market was perhaps never in a more deplorable condition at this season of the year than it is at the present time.

The circular prices are:

	Carterville and Franklin Co.	Trenton and Big Muddy	Mt. Olive	Standard
2-in. lump				$0 85 @ 0 90
3-in. lump			$1 15	
6-in. lump	$1 20 @ 1 25		1 25	1.00 @ 1.10
Lump and egg	1 25	$2 25		
No. 1 nut	1 10 @ 1 20			
Screenings	0 85 @ 0 90			0 60 @ 0 65
Mine-run	1 05 @ 1 20			0 80
No. 1 washed nut	1 35 @ 1 40			
No. 2 washed nut	1 25 @ 1 30			
No. 3 washed nut	1 20 @ 1 25			
No. 4 washed nut	1 15 @ 1 20			
No. 5 washed nut	1 00 @ 1.05			

MINNEAPOLIS—ST. PAUL

There are no new phases in the Northwestern trade at the present time. While the weather of the past two weeks has stimulated a few orders they have been few and far between. There has been so much free coal on track in this territory that few orders go direct to the mines. The Twin Cities during the past two months have been made a regular dumping ground for surplus tonnages and this has had a demoralizing effect on the market; in many cases such coal has been sold for the freight.

OGDEN, UTAH

February has been a good month both for the operator and dealers. In the early part of the month shipments were decreased slightly, due probably to the fact that most dealers anticipated warmer weather, but this condition did not prevail and orders were freely placed for additional shipments the month finishing quite strong. Conditions in Nebraska and Kansas have not improved and consignments to that territoty are at a low point. A general storm with lowering temperatures is now visiting these two states and if of any duration, should relieve the situation to some extent.

California is experiencing some wet weather and the Utah mines report good shipments to that territory; however, the prices for that market have been lowered to: Lump and nut, $2.50, effective Mar. 1.

Quotations throughout the balance of the territory remain unchanged as follows: Wyoming lump, $2.75; nut, $2.25; mine-run, $1.85; slack, $1; Utah lump, $2.75; mine-run, $1.85; slack, $1.25.

PORTLAND, ORE.

The cold weather is practically over for the winter and signs of spring have already appeared in the Pacific Northwest, particularly along the coast where the weather is seldom severe, although the temperature is low enough to create a good demand for fuel. Coal dealers here expect no changes in the market situation till next July when summer prices will undoubtedly be made upon the strength of concessions from the mines.

PRODUCTION AND TRANSPORTATION STATISTICS

PENNSYLVANIA RAILROAD

Statement of coal and coke carried on the P. R.R Co.'s lines east of Pittsburgh and Erie during last December and January, with the increase or decrease over the same period last year, in short tons:

	December	Difference	January	Difference
Anthracite	1,036,717	— 178,088	1,014,259	— 26,276
Bituminous	4,271,702	+ 290,216	4,210,196	+ 628,831
Coke	1,242,882	+ 331,911	1,288,514	+ 347,583
Total	6,551,301	+ 444,039	6,512,969	+ 950,138

VIRGINIAN RAILWAY

Total shipments of coal over this road for January of the current year were 453,886 tons as compared with 317,405 tons for the month previous.

BALTIMORE & OHIO R.R.

Coal tonnage moved over the B. & O. and affiliated lines during January of the current year was 3,003,404, as compared with 2,443,528, for the same month last year; coke tonnages for the same months were 439,176 and 329,556, respectively, making gross of 3,442,580 tons for 1913, as compared with 2,773,084 in 1912.

IMPORTS AND EXPORTS

The following is a comparative statement of imports and exports in the United States for the years 1910-11-12, and for December of 1911-12 in long tons:

	Year			December	
Imports from:	1910	1911	1912	1911	1912
United Kingdom	13,124	9,278	8,697	988	2,403
Canada	1,675,692	980,174	1,404,139	106,969	109,723
Japan	56,278	16,031	30,621	4,658	4,958
Japan	240,899	232,969	162,671	25,024	10,743
Australia & Tasmania					
Other countries	5,950	356	2,222	1	20
Total	1,991,943	1,238,808	1,608,350	137,580	127,847
Exports:					
Anthracite	3,021,627	3,553,969	3,688,789	241,244	283,831
Bituminous,					
Canada	7,567,297	10,609,587	10,433,010	691,847	594,309
Mexico	197,316	396,830	462,659	45,087	39,332
Cuba	675,980	470,674	302,487	21,003	33,480
West Indies	858,776	1,053,703	1,152,004	112,199	118,784
Canada	487,519	565,882	650,617	54,214	48,211
Other countries	697,351	682,138	1,459,201	74,062	76,109
Total	10,784,239	13,878,754	14,459,978	998,412	910,225
Bunker coal	6,445,593	6,667,338	7,340,100	548,844	578,667

FOREIGN MARKETS

GREAT BRITAIN

Feb. 21—Prompt business is difficult to arrange, owing to congestion at the docks. Colliery owners are adopting a very firm attitude forward, in anticipation of high pressure being maintained until after Easter. Small coals are very scarce and dear. Prices are approximately as follows:

Best Welsh steam	$4 44@4 56	Best Monmouthshires	$4 14@4 20
Best seconds	4 32@4 38	Seconds	3 96@4 02
Seconds	4 20@4 32	Best Cardiff smalls	3 72@3 84
Best dry coals	4 20@4 44	Seconds	3 36@3 60

The prices for Cardiff coals are f.o.b. Cardiff, Penarth or Barry, while those for Monmouthshire descriptions are f.o.b. Newport; both exclusive of wharfage, and for cash in 30 days—less 2½%.

British Exports The following is a comparative statement of British exports for December and January of the last two years, in long tons:

	December		January	
	1911	1912	1912	1913
Anthracite	221,359	230,803	241,924	298,308
Steam	4,255,301	4,210,302	3,945,278	4,417,993
Gas	910,050	829,435	827,198	901,361
Household	166,491	141,763	139,679	145,726
Other sorts	240,710	284,447	267,096	306,927
Total	5,793,911	5,697,368	5,421,175	6,070,318
Coke	115,956	97,409	113,871	107,095
Manufactured fuel	103,912	171,400	148,932	196,739
Grand total	6,010,770	5,966,177	5,683,978	6,374,152

BELGIUM IMPORTS AND EXPORTS

The following is a comparative statement of the imports and exports from Belgium for January, 1912-13.

	Imports		Exports	
	1912	1913	1912	1913
Coal	722,495	693,923	304,161	390,386
Coke	73,963	114,188	75,509	8,4080
Briquettes	31,756	10,146	38,228	40,641

FRENCH PRODUCTION IN 1912

Coal production of the Pas-de-Calais and Nord basins for the year 1912 was 29,888,015 tons, as compared with 28,152,993 in 1911. Coke production for the same periods was 2,443,142 and 2,328,715 tons, respectively.

FINANCIAL DEPARTMENT

Monongahela River Consolidated Coal and Coke Co.

President John A. Donaldson, under date of Jan. 15, reports, in part, for the fiscal year ended Oct. 31, 1912, as follows:

Trade improvement in the fiscal year balanced the special difficulties. The river was frozen up for 48 days during January and February, no loading being done at the river tipples, and there was an entire suspension of all operations during April in negotiating a labor wage scale, which together materially decreased production and lessened profits from the transportation department; but both were offset by an unusual demand during the lake shipping season and a betterment in prices.

Four steamers and one tug being out of commission, entirely dismantled, and valued on the books at $142,452, with a depreciation fund of only $50,753 to the credit of the account, left a balance of $91,699 unprovided for. It was decided as an equitable disposition of such balance to charge one-half, or $45,849, against the profits of the fiscal year just ended, and the other half against undivided earnings account, for the reason that some of these boats have been out of commission for several years. Adjustment of the active river craft equipment net book value to its present trade worth is being considered.

COAL ACREAGE PURCHASED TO DATE, MINED OUT AND SOLD—REMAINDER

	Orig. Purchased	Since 1899	Total	Mined Out	Balance
Pennsylvania	33,075	6,551	39,626	22,754	16,872
Kentucky	2,119	558	2,677	242	2,435

[A reserve fund of $100,000 each has been created to provide for future loss by fire and sinkage.

Bonds have been redeemed and canceled during the year amounting to $214,000. Certificates of indebtedness have been redeemed during the year amounting to $145,000.]

EARNINGS, ETC., FOR YEARS ENDING OCT. 31

	1911—12	1910—11	1909—10	1908—09
Coal mined (tons)	x7,910,300	7,509,413	7,637,553	5,947,826
Ohio Valley Coal & Mining Co., additional tons	157,602	122,641	117,591	84,566
Earnings	$2,628,843	$2,258,456	$2,117,960	$2,134,587
Less—				
Maint. & rep. river craft	474,654	436,965	422,740	405,548
Depreciation charged off	y954,788	913,099	937,426	834,927
Interest on bonds, etc.	490,863	506,753	526,571	560,858
Loss by storm Sept. 20, 1909				*709,410
Div. on pref. stock	(7%)700,000	(4)400,000	(2)200,000	
Total	$2,620,305	$2,256,817	$2,086,737	$2,510,743
Net balance for year	sur.$8,539	sur.$1,639	sur.$31,223	def $376,154

* Loss on coal, river craft and harbor equipment sunk during storm on lower Mississippi River. y Depreciation, $954,788 in 1911-12, includes depreciation on mine equipment, $254,549; depreciation on river craft, etc., $354,527; depletion of coal acreage, $299,863, and one-half book value of certain steamboats worn out and dismantled, $45,849.

BALANCE SHEET OCT. 31

	1912	1911		1912	1911
Assets—			**Liabilities—**		
Cash on hand, etc.	$269,579	$161,029	Preferred stock	10,000,000	10,000,000
Reinvestment fund with trustee	8,614,529	8,240,597	Common stock	20,000,000	20,000,000
Bond sinking fund	260,039	248,118	Bonds	7,342,000	7,538,000
Bonds purchased		143,554	Certificates of indebtedness	890,000	1,035,000
Accts. and bills rec., etc.	2,859,748	2,821,946	Bond premium res've	50,690	126,950
Stocks and bds. oth. cor.	352,029	454,883	Mortgages		5,319
Def. chgs. agst. oper.	90,728	11,679	Accounts and bills payable	1,899,906	2,649,633
Coal on hand	1,236,437	1,429,039	Fire insur. fund	100,000	100,000
Supplies on hand	395,146	260,890	Coal sinking fund	100,000	100,000
Lumber, &c., sup.	185,020	185,594	Undividedprofits	1,596,104	1,587,564
Empty coal boats	245,461	289,957			
Investments	27,901,984	28,595,190			
Total	42,410,700	43,142,466	Total	42,410,700	43,142,466

There was an increase of 14% in tonnage sales of steel, yet as most of the smaller products, representing about 30% of total output, were sold at generally lower prices, there was not a corresponding gain in steel department earnings, though the ratio of increase in gross was maintained in the net earnings.

COAL SECURITIES

The following table gives the range of various active coal securities and dividends paid during the week ending March 1:

Stocks	Week's Range High	Week's Range Low	Week's Range Last	Year's Range High	Year's Range Low
American Coal Products	91½	91½	91½	94	94
American Coal Products Pref.	..	....	109¼	109¼	109¼
Colorado Fuel & Iron	34½	31½	33¾	41¼	31
Colorado Fuel & Iron Pref	....	....	155	155	150
Consolidation Coal of Maryland	102¼	102¼	102½	102½	102¼
Island Creek Coal Pref.	86	85	85	....	....
Lehigh Valley Coal Sales	240	204	204	....	....
Pittsburgh Coal	22	19¾	21½	24¾	19¼
Pittsburgh Coal Pref.	88	84½	87½	95	84
Pond Creek	23½	22	23½	28¼	22
Reading	158⅜	153⅜	156⅛	168⅜	153⅜
Reading 1st Pref.	90⅜	89⅜	90	91½	89⅜
Reading 2nd Pref.	90	87⅞	90	93	87⅞
Virginia Iron, Coal & Coke	50	44½	50	54	44½

Bonds	Closing Bid	Closing Asked	Week's Range or Last Sale		Year's Range	
Colo. F. & I gen. s.f.g 5s	99	100	99	Feb. '13	98	99½
Colo. F. & I gen. 6s	....	....	107½	June '12	....	....
Col. Ind. 1st & coll. 5s. gu	81½	82	81½	82	81½	85
Cons. Ind. Coal Me. 1st 5s	....	....	85	June '11	....	....
Cons. Coal 1st and ref. 5s	....	94	93	Oct. '12	....	....
Gr. Riv. Coal & C. 1st g 6s	96	102½	102½	Apr. '06	....	....
K. & H. C. & C. 1st s f g 5s	....	....	98	Jan. '13	98	98
Pocah. Con. Coll. 1st s f 5s	87½	88	87½	Feb. '13	87½	87½
St. L. Rky. Mt. & Pac. 1st 5s	76½	77½	76½	Feb. '13	76½	80
Tenn. Coal gen. 5s	100¼	Sale	100¼	100¼	100¼	103
Birm. Div. 1st consol. 6s	101	103½	102½	Feb. '13	102½	103
Tenn. Div. 1st g 6s	101	103½	102	102	102	102
Cah. C. M. Co. 1st g 6s	....	....	110	Jan. '09	....	....
Utah Fuel 1st g 5s	....	....	....	....	....	....
Victor Fuel 1st s f 5s	....	79½	79½	Feb. '13	79½	79½
Va. I. Coal & Coke 1st g 5s	96½	97½	97½	Feb. '13	96½	98

No Important Dividends were announced during the week.

⁂

The Rock Island R.R. Co.—This corporation owns stock in coal companies as follows: Coal Valley Mining Co., $50,000; Consolidated Indiana Coal Co., $2,400,600; Crawford County Mining Co., $100,000; Dering Coal Co., $1,700,000.

Burns Bros.—The recently formed consolidation under this name will have net tangible assets after depreciation allowance of $2,407,309. This figure includes only the salvage value of equipment carried at $269,000, and which is appraised at $1,029,100, the difference, $760,000, having been transferred to the item good will, leases and contracts.

Pittsburgh Coal Co.—This company was incorporated in New Jersey, September, 1899. It owns about 150 coal mines and 100,000 acres of coal land in or within a radius of 40 miles of Pittsburgh, together with 5000 coal cars, operating over railroads radiating from Pittsburgh. Dividends paid were: On preferred, 1900 to April, 1905, 7% yearly; 1906 to 1909, none; 1910, 1911 and 1912, 5 per cent.

Reading Co.—In 1896 this corporation was bankrupt, but in the past decade it has expended from income, on additions and betterments, an amount equal to 45% of its $70,000,000 common stock. This is at the rate of $3,150,000, or 4½% per annum. For the fiscal year ended June 30, 1912, this expenditure was $3,469,482, and had this not been charged to income, the common dividend would have amounted to 12½% for the fiscal year.

Jefferson & Clearfield Coal & Iron Co.—This company was organized under the laws of Pennsylvania in May, 1896. The maximum production per year so far was 2,595,161 tons. The $1,500,000 common and $300,000 of the $1,500,000 of 5 per cent. noncumulative preferred stock is owned by the Rochester & Pittsburg Coal & Iron Co. On the common stock 5 per cent. was paid in 1900, nothing in 1901, 5 per cent. per annum during 1902 to 1905, since which date nothing further has been paid. On the preferred stock 5 per cent. per annum has been paid regularly since August, 1897.

PRICES OF MINING SUPPLIES

MARKETS IN GENERAL

Business did not improve during February, either in the volume of orders, or in sentiment. The distinct feeling of unrest which was discernible a month ago continues, and the most disquieting thing about it is that it is as prevalent in the agricultural region as in eastern cities. Business men seem to be afraid of a number of different things, which in all probability will pass away without leaving any mark on affairs.

The continual drawing of gold from the United States to Europe must soon have a serious effect on interest rates and money conditions here. The continent of Europe has been hoarding currency, and in as large amount as was laid away in the United States during the money panic of 1907.

The continued unrest in the Balkan States and an outbreak of a revolution in Mexico have not been favorable factors in business.

The steel market is barely holding its own. Prices have shown practically no change, but the demand is falling off. This is not at all serious, and the unfilled orders of the U. S. Steel Corporation decreased less than 2% in the month of January. Since that time, too, there has been an almost unheard of amount of buying by the railways of cars, locomotives and all kinds of materials. Those conversant with the situation appear to think that the railways will secure their desired increase in rates some time this year.

Labor conditions are not especially unsatisfactory, although there are a number of strikes reported, including a rather serious one among the carbuilders on the railways. The fact that the firemen on the railroads and the railway managers have reached an agreement regarding the arbitration removes this danger, and at one time it was a serious question whether or not a strike could be averted.

Continued activity is noted in shipbuilding work. Several new vessels have been laid down, or plans prepared during the last month, and the activity continues as great as ever.

LABOR

The defeat of the attempt to pass the Immigration Bill over the veto of the President is one of the most important topics which has confronted the labor world for some time. While it may be granted that a strieter supervision is needed of some of the immigrants coming into the country, it does not mean, by any stretch of imagination, that we are to put up barriers against all comers except those who can pass an elaborate educational test. What the country needs is the best kind of workers it can obtain, workers who are capable of wielding a pick and shovel, without any pretension as to educational fitness.

The threatened strike of the firemen on the railways was averted at, almost the last moment. Some hold the opinion that it would have been better to have had a strike at this time, fighting it out once and for all, and thrashing the matter out regarding higher freight rates and the like, even if it did stop business, and cause discomfort to thousands of disinterested people. It is a test of the Erdman Act which may go a long way toward its further use in industrial dissensions, or result in a modification of the bill to make it more applicable to all kinds of disputes. As the railway managers claim, it does put an enormous responsibility on the third arbitrator.

Unrest continues among the garment workers in New York, one result of which has been the establishment of factories outside of New York City. On the Lehigh Valley, men employed in the car building and repair shops are striking in Buffalo, and there is a threat to carry the trouble all along the line.

IRON AND STEEL PRODUCTS

Continued activity in the purchase of rolling stock, rails and track fastenings by the railroads, has been the interesting feature of the market during the month. The railroads have been just as active buyers as they were during the last month of 1912, and, had general mercantile consumers purchased as freely as they did then, the tonnage disposed of would have been as large, if not larger, than at any other time in the last year. As it was, the early estimates regarding the total booking of steel orders during February were revised more than once during the month, and while it is probable that some diminution will be shown in the volume of orders on the books of the leading steel company, these will be by no means as large as was first expected. The fact that orders fell off less than 2% in January, is sufficient reason to believe that the present activities in steel production will continue for the next six months, at least.

Building operations were larger in January than last year, and, outside of New York, indications are that they will continue just as large as during 1912. Manufacturing concerns are making some additions and extensions to plants, but these are by no means as numerous as they were last year.

The decline in coke has affected sentiment, and a further weakening in the price of foundry iron in Birmingham has had a depressing effect on eonsumers who ordinarily purchased in that market. There has been very little pig iron sold for forward delivery during the last month.

Iron trade conditions in Europe are not as satisfactory as they were, and, in Germany especially, prices are only maintained through the operation of a strong syndicate. It is probable that there will be more active competition for export orders this year than last.

The scrap market shows an improvement in the West, but in the Pittsburgh district there is a continued falling off in the number of new orders, and prices have likewise declined.

Rails—A significant feature of the buying of rails this month has been the comparatively large number of orders, all of them for small lots. Big railway companies have purchased freely, and these purchases are much earlier than usual. More activity is noted in light rails than in any other branch of trade, and there is considerable delay in making shipments.

Quotations continue unchanged as follows: Standard sections, 50 to 100 lb. per yd., 1.25c. per lb.; 40 to 50 lb., 1.21c.; 12 lb., 1.25c. Relaying rails in Chicago of standard sections are held at $24 per ton.

Track Supplies—Specifications on contracts are heavy for all kinds of track supplies, but spikes seem to be in especially large requisition. The Great Northern recently ordered 15,000 kegs of spikes; the Pennsylvania is taking as many spikes as can be sent it by the two mills making special kinds used by this railroad, and other railroads are having difficulty in securing the materials needed.

Prices of spikes are $1.90 to $2 for small lots, but for prompt delivery, as high as $2.25 has been paid in Pittsburgh. In Chicago, prices are $1.95 to $2.05; track bolts with square nuts, $2.30 to $2.40; angle bars, $1.50. These quotations are per 100 lb. An especially heavy demand is noted for tie plates, and probably more have been sold this year than ever before. Quotations are from $32 to $34.50 per net ton.

Structural Materials—The market is considerably better than for several weeks past, and quite a little new work is cropping up, especially in the West. Most of this is for small jobs, although an order for 15,000 tons of merchant shapes for the Newport News Shipbuilding Co. has been taken and some enormous orders have been placed for cars. There is a prospect that contracts for the operation of the new subways in New York will be signed this week which will call for a great deal of structural material. The trade has been expecting these contracts for a long time.

Much plate work is being taken for water supply, as well as for cars and shipbuilding work. Prices for structural shapes are unchanged at 1.50 to 1.55c. Pittsburgh, for future delivery, and 1.75 for prompt. In Chicago, quotations for future shipment are made at 1.58 to 1.78c., while prompt delivery commands 1.88 to 1.93c. Plates are held at 1.55 to 1.60c. Pittsburgh, for future delivery, and 1.75 to 1.80c. for fairly prompt. In Chicago, plates are 1.68 to 1.73c. on contract, and 1.88 to 1.93c. for nearby shipments. These are base prices, and small sizes are held at advances above this quotation. All quotations are per 100 lb.

Pipe—Business continued just as heavy during February as in January. Some large orders have been received from Canada where a great deal of work is going on in natural gas fields. For the smaller sizes of pipe, the demand is not quite as active as a month ago.

Discounts continue unchanged as follows: Steel pipe, 1½-in., in large lots from mill, black, 77%; galvanized, 66%; ¾ to 2-in. black, 80%; galvanized, 70½%; 2½- to 6-in. black, 79%; galvanized, 70½%.

Based on these discounts, the net prices of pipe are as follows in carload lots, f.o.b. Pittsburgh:

Size, inches	Cents Black	Cents Galvanized
¾	2.30	3.40
1	3.40	4.85
1¼	4.60	6.55
1½	5.50	7.70
2	7.40	10.30
2½	11.50	16.70
3	15.40	21.75

Sheets—Business offered the mills for third-quarter delivery at present prices has been refused, and many jobbers would be willing to place orders for such shipments, provided they would be accepted at these quotations. Activity continues, and many orders are being received for delivery during the first half of the year, yet there are only a few mills that can spare any tonnage for delivery before July. On the ordinary grade of black and galvanized sheets, mills are from twelve to fourteen weeks behind in shipments.

Should the general steel business improve, there seems to be little doubt that prices will be advanced from $1 to $2 per ton later in the year. The following table gives the price of sheets in Pittsburgh, and likewise in Chicago:

	Cents per pound—Pittsburgh Black	Pittsburgh Galv.	Chicago Black	Chicago Galv.
Nos. 22 to 24	2.20	2.90	2.65	3.60
Nos. 25 and 26	2.25	3.10	2.70	3.65
No. 27	2.70	3.25	2.75	3.90
No. 28	2.85	3.40	2.90	4.15

WIRE PRODUCTS

Wire—Business continues active, with more orders being received than is usual at this time of year. One mill has advanced its quotation on wire nails, but other mills have not followed. Quotations are unchanged, painted barbed wire in Pittsburgh being held at $1.75, and galvanized at $2.15. Annealed fence wire in carload lots is $1.55 and galvanized in $1.05. In Chicago, annealed fence wire is $1.73; galvanized, $2.13, while barbed wire in that market is $1.93 and galvanized $2.33. All of these quotations are per 100 lb.

Wire Rope—Prices are without change, 2-in. rope being held in Pittsburgh at 57c. per ft.; 1¼-in., 23c.; ¾-in., 10c. These quotations are the minimum for large lots, and for the better grades, higher quotations are demanded.

Telegraph Wire—Prices are without change for lots of fair size. Measured in Birmingham Wire Gage, the prices in cents per lb. are as follows: "Extra Best," Nos. 6 to 9, 4⅝c.; Nos. 10 to 11, 4½c.; No. 1, 4⅝c.; No. 14, 5⅛c.; "Best," Nos. 6 to 9, 3½c.; Nos. 10 and 11, 3⅝c.; No. 12, 3½c.; No. 14, 4c. Actual freight is allowed from Trenton, N. J., where it does not exceed 25c. per 100 lb.

Copper Wire—As a result of the steady decline in copper metal, the prices of wire declined, almost, day by day. The base price now quoted is 16c.

MISCELLANEOUS

Bar Iron and Steel—Prices are unchanged from last month, and quotations from jobber's store, either New York or Chicago, are as follows:

	Per lb.
Refined iron:	
1 to 1⅞ in., round and square	2.15c.
1½ to 4 in. x ¾ to 1 in.	2.15c.
1½ to 4 in. x ¼ in. to ½ in.	2.35c.
Norway bars	3.60c.
Soft steel:	
¾ to 3 in., round and square	2.10c.
1 to 6 in. x ⅜ to 1 in.	2.10c.
1 to 6 in. x ¼ and ⅜ in.	2.25c.
Rods—⅝ and ½ in.	2.20c.
Bands—1½ to 6 x 1/16 in. to No. 8	2.40c.
Beams and channels—3 to 15 in.	2.25c.

Nails—The demand is not as heavy as a month ago, but is as large as usual for this time of year. Stocks are not large, as manufacturers of nails who make other wire products are devoting as much raw material as possible to other lines which are more profitable. Quotations are unchanged as follows: Large lots of carloads and over are $1.75 Pittsburgh. In Chicago, carload lots are $1.98; less than carload lots $2.03. In New York, wire nails from store are $2.05. Cut nails are $1.70 to 1.75, Pittsburgh, and $2.05, New York. All of these quotations are per 100 lb.

Packing—There is more demand for packing than a month ago, and quotations are as follows: Asbestos wick and rope, 13c.; sheet rubber, 11 to 13c.; pure gum rubber, 40 to 45c.; red sheet packing, 40 to 50; cotton packing 16 to 25c.; Russian packing, 9 to 10c.

Brattice Cloth—Prices are higher than last month and no relief appears to be in sight before the end of the summer at least. The mills are now quoting on April, May and June shipments which, of course, means late arrivals. The deliveries are still delayed. Despite the usual February dullness, the volume of business seems normal.

Chain—Prices of chain are firm, but the buying has not been especially large. Ruling quotations per 100 lb., f.o.b. Pittsburgh, are as follows:

1/4 in.	$7.50
5/16 in.	4.95
3/8 in.	3.95
7/16 in.	3.40
½ in.	3.20
½ and 9/16 in.	3.00
5/8 and 11/16 in.	2.90
¾ and 13/16 in.	2.80
7/8 and 15/16 in.	2.70
1 to 1¼ in.	2.60
Extras for BB	
¼ in.	1.50
5/16 in.	1.50
⅜ in. and larger	1.25
Extras for BBB	
¼ and 5/16 in.	2c.
⅜ and larger	1.75c.

Portland Cement—The market is especially firm, [illegible] manufacturers in New York State are securing as much as $1.10 per bbl. in bulk at the mills. The greater part of the business transacted for mills in the Lehigh Valley district is at 90c. per bbl., but some few sales have been made around 95c. Quotations in Pittsburgh and New York delivered are $1.58 per bbl. with an allowance of 40c. for the bags returned. These are for shipments in cloth bags.

Manufacturers of cement are especially optimistic over the situation, and believe that the present year will be make a new record in the matter of shipments and are also of the opinion that prices may work somewhat higher as the season advances.

Bars, Concrete Reinforcing—The demand has not been as active in the last month as previously, and some of the largest interests are refusing to sell bars beyond July 1, at the quotation of $1.50 Pittsburgh. The supply from warehouse stock is somewhat better than a month ago, and likewise mill shipments are being made a trifle more promptly.

PITTSBURGH PRICES IN CENTS PER POUND

	Mill Shipments	Warehouse Stock
¾-in.	1.50@1.55	2.00@2.10
⅝-in.	1.55@1.60	2.05@2.15
½-in.	1.60@1.70	2.10@2.20
⅜-in.	1.70@1.80	2.25@2.35

Triangular Mesh—Business is active, but producers are able to ship promptly on receipt of orders. Stocks are very fair, and a large production is looked for this year.

From mill in De Kalb, Ill., quotations are 18c. per 100 lb. higher. Prices are as follows per 100 sq.ft., f.o.b. Pittsburgh district, for less than carload lots and lots of more than 10,000 sq.ft.:

No. 3	$1.23	No. 32	$2.62
No. 23	2.05	No. 36	1.05
No. 26	1.42	No. 40	3.25
No. 28	1.97	No. 41	2.48

THE MULE MARKET

Mules—The demand for mules in Kentucky and Tennessee is reported to be active. Two-year-olds have sold recently at Danville, Ky., at from $120 to $150 per head. Buyers in the Lancaster, Ky., market have paid from $175 to $215, while several excellent pairs have sold at $550. Four hundred mules were sold at Mt. Sterling, Ky., recently, at from $200 to $350 per head. A large lot of three-year-old mules sold in Danville recently brought $160 per head. Prices in the Paris, Ky., market range from $200 to $225. Five hundred mules disposed of at a recent sale at Franklin, Ky., brought prices ranging from $125 to $250. Fancy prices are being quoted in some of the Tennessee markets. At Lawrenceburg, pairs are selling at as high as $600. Lynchburg, which, with Columbia, takes rank as the leading mule market of Tennessee, has shipped over 1800 mules this season. Some unusually high prices have been paid for the fancy stock offered there, the record price of $900 being paid for a single pair recently. The average is about $275 per head. Two pairs of two-year-olds sold recently for $1025. A Louisville, Ky., mule firm recently purchased three carloads of mules in Hardin County, Ky., at $250 a head.

COAL AGE

Vol. 3 NEW YORK, MARCH 15, 1913 No. 11

Payday at the Mine

By Berton Braley

Written expressly for Coal Age

I

Say Jimmie, git the whiskey out
An' order up the gin,
We want the boys to go the route
When they come rollin' in,
It's booze that starts 'em in to spend
An' gits 'em feelin' fine,
Till each guy's treatin' of his friend
—It's payday at the mine.

II

They stops fer just one little drink
To wash their throats of coal,
We'll keep 'em blowin' in their chink
Until we git their roll,
An' if it gits 'em wild an' rough
Or lyin' round like swine,
Aw, we don't care, we got the stuff
—It's payday at the mine.

III

If, full of booze, they row an' fight
An' bruise an' smash an' maim,
Aw well, we got our cash all right
An' they—they gits the blame,
It's they that has to go to jail
Or pay the court their fine,
An' we're the boys that gits the kale
—It's payday at the mine.

IV

They risks their lives an' sweats to make
Their little wad of pay,
But we're the wise ones—an' we take
The most of it away,
So let their women weep an' cry
An' let their children whine,
We're coinin' dough an' livin' high
—It's payday at the mine!

Coal Mining in Carbon County, Utah

By A. C. Watts*

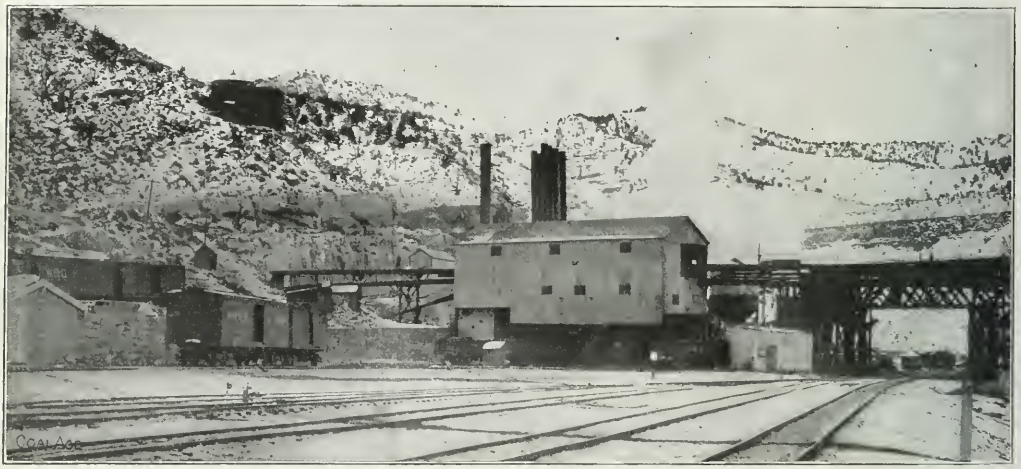
SYNOPSIS—Description of one of the most important of the Western coal fields. Relatively thick seams prevail and mining conditions are generally favorable. The district is subject to those peculiar freaks, which have on occasions proved so disastrous, termed "bounces." Dikes and faults are encountered and the crop coal has been found burned for a distance of 1500 ft. from the surface.

The advent of railroads in Utah marked the dawn of coal mining in this state. Soon after the completion of the Union Pacific R.R. in 1869, mines began to be opened, and in 1871 the Summit County R.R. began operations between Echo on the Union Pacific R.R. and the mines at Coalville, a distance of nine miles. In 1880 a line was in operation between the Coalville mines and the rich silver and lead mines at Park City, which required a cheaper fuel for their operations than the timber found on the mountains. In 1876 the Utah and Pleasant Valley R.R. commenced operations between the coal fields of Pleasant Valley at Scofield and the town of Springville.

This date probably marked the first coal mining on a commercial scale in Carbon County. In 1881 the Rio Grande Western Ry. began construction between Salt Lake City, Utah, and Grand Junction, Colo., connecting with the Denver & Rio Grande R.R. at the latter point. In 1889 the coal deposits at Castle Gate on the main line of the Rio Grande Western were opened and the second mine for commercial business in Carbon County came into being. This date has some significance not only in the history of coal mining in Utah, but in the United States as well, for it was at this mine, at about this date, that the dangers of coal dust were fully recognized and sprinkling by hose, the turning of exhaust steam into the mine, the use of electricity in the coal mines of the state and the practice of shooting from the outside of the mine with electricity, after all the men were out, were first introduced.

Although the coal measures of Utah embrace a wide territory and mining is being carried on in many places, by far the greater part of the coal produced, approximately 90 per cent., comes from Carbon County, so that a description of the methods employed by the companies operating there will cover the best practices in the state.

Carbon County lies approximately in the center of the state. The county seat, Price, a town of about 2000 inhabitants, is situated 121 miles east of Salt Lake City on the D. & R. G. R.R., and lies in the center of the agricultural district of the county. It is also an outfitting point for freighters to the Uintah Reservation.



Utah Fuel Co.s Steel Tipple and Screening Plant at Castle Gate

The principal drainage stream of this county is the Price River which heads in the Wasatch Mountains at Soldier Summit and also near the Scofield coal-mining district. The waters from this drainage area flow east in the Price River to the Green River, thence south in the Green to the Grand River, and south and southwest in the Grand to the Colorado, which empties into the Gulf of California.

Outside of the coal-mining towns of Castle Gate, Clear Creek, Winter Quarters, Sunnyside, Kenilworth, Black Hawk and Hiawatha, the principal towns of the county are Price, Helper (a D. & R. G. R.R. division point) Scofield and Wellington. The D. & R. G. R.R. is the only trunk line passing through this territory and Castle Gate is the only coal-mining town on the main line of the railroad. All other camps are reached by branch lines of the D. & R. G., or by railroads under the control of the mining companies.

The coal production of the county in 1912 was 2,750,265 short tons, an increase of 504,210 tons over 1911. Practically two-thirds of the total production of the state is consumed within its boundaries, the amount be-

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ing almost equal to the total output of Carbon County. The balance of the production goes to Idaho and the Northwest, Nevada and the Southwest, and to California.

The coal of the various seams is a good bituminous variety, and, although there are many grades having a coking tendency, none but that from Sunnyside field make a good coke. The coal as a rule is hard and clean and stands storage and shipment well. The analyses will vary generally between the two following:

Moisture	3.49	1.87
Volatile matter	43.35	39.22
Fixed carbon	47.23	54.78
Ash	5.93	4.13
	100.00	100.00
Sulphur	0.67	1.022

A good ultimate analysis is about as follows:

Hydrogen	5.07
Carbon	79.06
Nitrogen	1.09
Sulphur	0.76
Oxygen	10.03
Ash	3.99
Calories	7720

of the Cretaceous period. There are three formations, locally known as the Upper, Main and Sub, coal horizons.

On top of the Upper horizon is a massive gray sandstone from 200 to 700 ft. thick, called the Castle Gate Reef. This forms the high vertical cliffs seen from the train in the Price Valley Cañon in the vicinity of Castle Gate, and near the bottom of the formation are some shale and thin coal seams.

The Upper Coal Horizon is from 200 to 500 ft. thick and consists of thin beds of sandstones and shales with thin seams of coal, occasionally 5 ft. thick, occurring locally. At present these seams have no commercial value.

The Main Coal Horizon is from 200 to 500 ft. thick and consists of alternating beds of sandstones and shales. The latter are often arenaceous and the sandstones, massive. In this horizon are all the workable coal seams at present known in this field with the exception of the Sub coal seam in Spring Cañon between Castle Gate and

General View of the Town of Kenilworth in Carbon County, Utah

Average analysis of the coke is as follows:

Moisture at 115° C.	0.15
Com. volatile matter	1.05
Fixed carbon	88.61
Ash	10.19
Total sulphur	1.25

The roof and floor as a rule consist of hard, unyielding sandstones, although in some places there will be a few feet of shale on top of the coal. When two seams come to within a few feet of each other the parting is often a shale. The roof is generally so good that it is misleading and operators are sometimes led to trust too much to it. After extensive areas have been opened up, and the extraction of pillars begun, roof troubles often start and "bounces," which do much damage to pillars and are a serious menace to life, occur. The amount of cover over the coal varies, of course, a great deal; some mining is being done under 1500 to 2000 ft. of cover.

Geology

The coal measures in Carbon County occur in the Laramie, or as some call it, the Mesa Verde formation

Helper. There are two, and sometimes three, workable seams varying in thickness from 5 to 20 ft. The Castle Gate seam is the most important one in the district, and, although it pinches out in places, it is generally between 5 and 18 ft. in thickness. This seam rests on what is known locally as the Castle Gate coal floor, a massive, grayish white sandstone from 60 to 80 ft. thick, which serves to identify the seam and the workable horizon.

The Sub Coal Horizon is from 100 to 160 ft. thick and lies directly under the Castle Gate coal floor. One seam of this horizon, though usually thin, occasionally attains a workable thickness as noted above. This seam rests on a sandstone floor of from 10 to 60 ft. in thickness which lies on the Montana Shales.

The pitch of the seams varies in different localities from practically level to 10 or 12 per cent., and the two extremes may be found within a few miles of each other. The Scofield district, or Pleasant Valley coal fields, is traversed with north and south faults having throws ranging from a few feet to 1500, and with many cross faults, which add considerably to the difficulties and ex-

pense of mining. Dikes are encountered as thick as 50 ft. The width of these dikes does not seem to have any influence on the amount of coking of the coal; the smallest dikes sometimes have the greatest amount of coked coal adjoining them. These dikes, as encountered in the mines, run approximately east and west.

From the Castle Gate district east, great areas of burnt coal are encountered. In many places the burning has penetrated a distance of 1500 ft. from the outcrop. It is usually the case that the upper seams have been burnt the most; the lower ones are often found to be good for a considerable distance under a burned area of the upper seams. This burning must have occurred many years ago, as evidenced by the growth of trees over some parts of the burnt area.

rock from weathering, minimizes the amount of timber required, and affords an easy way of recovering a large percentage of the coal.

Entries as a rule are driven on sights as well as rooms, as experience has shown that water-level entries make the maintenance of proper pillars for safe mining difficult because the seams are so irregular. The seams are so thick, as a rule, that the grading of entries is comparatively easy and inexpensive. The pillars between entries will vary between 30 and 60 ft. with barrier pillars between the rooms below of from 50 to 150 ft. Main slopes and haulageways have thick pillars, from 100 to 250 ft. on each side. The general heavy cover requires substantial pillars and careful work in drawing them. All mines thus far opened are slopes or drifts. The pos-

Inspection Party at the Kenilworth Mine. Note the Great Thickness of the Seam

System of Mining

The room-and-pillar system of mining is generally practiced. Rooms vary from 18 to 30 ft. wide, according to mining conditions. Where mining machines are used in low coal, the rooms are 30 ft. wide and have two tracks, one on each side. Pillars between are from 30 to 50 ft. thick, depending upon the nature of the coal, roof and floor and depth of cover. The length of rooms will average 350 ft. Those in pitching seams are turned off level entries at such angles as will permit them being worked on, or quartering to, the face cleavages of the coal and not have the grade too steep for animal haulage. In large seams, from 11 to 18 ft. thick, a roof of coal varying generally from 3 to 8 ft. is left up until retreating is started. This method gives additional safety to the miners, as the coal forms a good roof and protects the

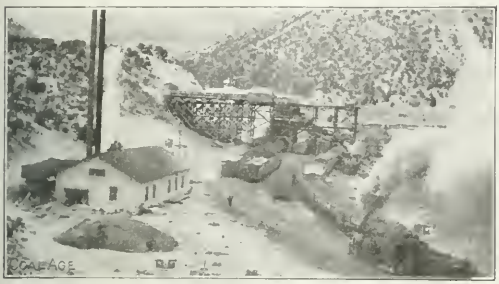
sibilities of shaft mining are limited as the mountains are precipitous and high.

Undercutting the coal by hand is followed at many of the mines, and in some places where conditions demand, overcutting is practiced. The undercutting by chain-mining machines is being introduced and will probably be followed to a greater extent in the future. The continuous cutter, short-wall machine seems to be the best adapted to the work. In several mines shooting off the solid is still in vogue. Black powder is still used at some mines, but the use of permissible explosives is becoming more general.

Shotfiring and Sprinkling

In some mines shotfiring is done by the miners, usually at stated periods during the day. Shotfirers or in-

spectors are employed, whose duty it is to continually inspect the preparation and firing of shots. Rigid inspection is the general practice, as the explosive nature of the coal dust has taught operators to be careful. At two of the mines of the Utah Fuel Co., Castle Gate and Sunnyside, shotfiring by electricity from the outside, after all men and animals are out of the mine, has been prac-



Surface Plant at the Hiawatha Mine

ticed with excellent results for years, and this is looked upon with favor by most people. This method of firing was adopted at Castle Gate about 1889, and as far as is known this was the first time this commendable safeguard was tried. It was the outgrowth of a series of experiments to reduce the number of dust explosions and was used in conjunction with sprinkling and exhaust steam. With electric shotfiring both dynamite and permissible explosives are used, with wet wood pulp or clay tamping.

The state mine law requires all mines not naturally damp to be thoroughly wet down by some sprinkling device, although the moistening by turning in live or exhaust steam is recognized when shown to be efficient, and this method is used in many dry mines. Not only is the floor sprinkled, but the sides, roof, timbers, overcasts, brattices, doors and in fact all places in the open parts of the mines where dust can lodge. The dust must be so wet that it can be easily pressed into a ball by the hand. The mines are laid with pipe and the places sprinkled by hand through hose carried by regularly employed sprinklers.

Water is pumped into the mines in most cases, although in some mines the pumps are so connected as to be used in part for this purpose. Pipes are laid in the return airways when there is any danger from freezing in the cold weather. In the intakes where the water freezes, salt is used. While sprinkling has been compulsory since about 1900, it was adopted at the Castle Gate mine of the Utah Fuel Co. as early as 1889, and sprays, operated by steam in connection with the water, were placed at regular intervals along the main intake. That the system has proved its worth can be shown in many ways as, for instance: Samples of dust have been taken from abandoned places where there was no water, and which had not been sprinkled for four years, and have been found to contain 50 per cent. moisture, and were of about the consistency of mud. The objections that dust cannot be successfully moistened; that moisture injuriously affects the roof and the health of the men; that it forms wet places which seriously inconvenience the men, have been proved not to apply in this region.

Gases and Methods of Ventilating

Explosive gas is found in some mines, although in but one is it in sufficient quantities to make the use of safety lamps imperative. These are, however, used in other mines in the pillar workings where bounces sometimes occur. This is found to be necessary, because the dust generated by the bounces crushing the pillars, can be readily fired by open lights.

Ventilation is accomplished entirely by mechanical means and there are various types of fans. The older installations were large, slow-speed fans, but of late the adoption of the smaller, high-speed type is coming more into vogue. Most of the fans are situated near the power houses so that steam is used to run them, but when the workings are at some distance, electricity is used. Almost all fans are run exhausting and are equipped with reversing doors; they are generally so located that they have not been destroyed by the explosions in the past. Some booster fans of the Stine variety are used and have given excellent results. The split system of ventilation is used almost entirely, the state law requiring that not more than 75 persons shall work at the same time in one split. The law also requires 100 cu.ft. of air per min. for each person and 300 cu.ft. for each animal. Stoppings and overcasts of concrete are becoming more popular.

Consolidated Fuel Co.'s Upper Camp and the Hiawatha Mine Opening

Haulage and Hoisting

As a general rule all gathering from rooms to partings is done by animals, heavy horses being used a great deal. In pitching seams the coal is taken to partings in level entries and either let down or raised to the main haulage-roads where locomotives take it to the tipple. Few steam

hoists are used, electricity being the general practice. At some mines it is necessary to have long outside rope tramways to lower the coal to the tipples.

Cars are generally made of wood with a capacity of from one to three tons and track gages from 36 to 42 in. Gathering locomotives are used in some mines where the coal seams are flat. Main haulage locomotives vary in weight from 6 to 15 tons. Sixteen-pound rails are used in rooms and from 30 to 60 lb. for main haulage roads.

All mines have their own steam-power plants using run-of-mine, slack and sometimes dust under the boilers. The majority of boilers used are the horizontal, return-tubular type of from 125 to 150 hp., although there are some internal furnace boilers used, having steam pressures of between 100 and 150 lb. At some mines American Automatic stokers are used. Of late there is a tendency toward central power plants for mines of the same company, situated within a few miles of each other.

Almost every mine is using electricity for hoisting, haulage and lighting. Reciprocating engines, direct connected to the generators, have been the usual installations up to the last year when turbo-generators appeared in the field. Direct current, of voltage varying from 250 to 500 is used in the mines, while alternating current of from 2200 to 4000 volts is used for transmission lines outside the mines. This is converted to direct current by motor-generator sets at the mines.

Preparation of Coal

All mines where commercial coal is mined are equipped with shaking-screen plants, making four principal sizes, as follows:

Lump over 4½ in. round perforations
Nut through 4½ in. and over 1¼ in. round
Slack through 1¼ in. and over ¾ in. round
Dust through ¾ in. round

These sizes will vary a little, owing to the nature of the coal, as some break into more angular and slabby shapes than others. At mines where the coal is wet, rescreening of the smaller sizes, by means of revolving screens, is resorted to. At the Winter Quarters mine of the Utah Fuel Co., in the Pleasant Valley district, the first steel tipple and screening plant was built in the winter of 1909-10. At the Castle Gate mine of the same company the second steel tipple and screening plant was built in the summer of 1912, while the third installation of this kind is being erected by the Spring Cañon Coal Co.

The general practice is to dump the coal by Phillips or Wilson cross-over, or rotary dumps, after having been weighed with registering scales, into receiving hoppers, from which it is fed to the shakers by reciprocating feeders. As the seams mined are, as a general rule, clean throughout, picking is not resorted to, to any extent, and washing is unnecessary. Picking can be done at some plants which use conveyors for carrying the coal from the receiving hoppers to the screens. The boxcar loaders, used for loading run-of-mine, lump and nut into boxcars, are the Ottumwa and Christy types.

Railroad Yards

Railroad yards at the mines are laid out to suit conditions and no general plan is or could be adopted. At some plants there are tracks for each grade of coal, with scales under the tipple on each track. At others, one track may be used to serve for two and sometimes three different sizes of coal. Another plan is to have but one track scale, with deal rails, on which all cars, empties and loads are weighed with a locomotive. At the Castle Gate mine of the Utah Fuel Co., two railroad track-scales are used, one above the tipple for weighing empties and one below for the loads. As all the mines are located in mountain cañons, the grades of the yards must conform in most cases to those of the cañons and as high as 4 per cent. is found.

The only coking is done by the Utah Fuel Co. at its Sunnyside mine, where it has 650 beehive ovens. The production of coke in 1912 was 347,356 tons, an increase of 134,988 tons over 1911. The coal for coking is crushed to pass through a ⅜-in. square opening.

Tipple and Incline at the Kenilworth Operation

Nationalities Represented and Sociological Conditions

Of a total of 4063 men employed at the mines Americans comprise 35 per cent., Greeks 30, Italians 16, Austrians 11, Japanese 3 and Negroes, French, Scandinavians, Swedes and Germans make up the balance, or 5 per cent. During 1912 the larger producers averaged 280 working days and the average tonnage per man was 770.

As most of the mines are situated in mountain cañons, the laying out of towns in a regular manner is a difficult proposition, and as water is a rather expensive luxury, the possibilities of having attractive homes with lawns and gardens are limited. The altitude of some of the camps adds to the difficulties of garden making, and none but the hardiest and quick growing variety of flowers can be raised in these places where heavy frosts often occur in midsummer.

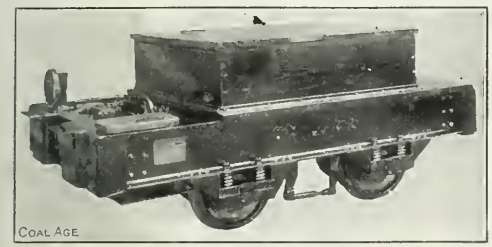
Mines are equipped with Draeger helmets, and have regularly trained men ready for emergencies. The motto, "Safety is the First Consideration," is evidenced by the methods adopted at all mines.

A Storage Battery Gathering Motor

Special Correspondence

SYNOPSIS—One of the latest application of the storage-battery electric-haulage locomotive is for gathering work in coal mines. One of these machines, manufactured by the General Electric Co., was recently installed in the Glendower colliery of the Philadelphia & Reading Coal & Iron Co. The locomotive is designed specially for the service and built for hauling six cars.

Electric locomotives, of both the storage battery and overhead-trolley types, have been employed advantageously for industrial service. Comparatively recently a number of motors of this type were also introduced and have operated successfully in the work of excavating the



Motor Assembled Ready for Work

Catskill Aqueduct Tunnel in New York. In general, locomotives of this kind are designed specifically for short-distance hauls, at moderate speeds, where it is not feasible to install the overhead-trolley system. Under these conditions, the storage-battery machine has proved to be both economical and well adapted for the purpose.

Description of the Motor

The locomotive for service in the Glendower colliery is equipped with two, 85-volt motors and controller. The batteries are Type A-8, Edison, 70-cell and have a 300-ampere-hour capacity with a discharge rate of 60 amperes for five hours. They provide, at the full rated drawbar pull and speed, for a mileage of nine miles with one charge of the batteries. Under an assumed car and track friction of 30 lb. per ton on level track, this rating is equivalent to 300 ton-miles on one charge. The machine is fitted with the usual ampere-hour meter, indicating the amount of charge and discharge, headlight and gong.

The locomotive is built to conform to the following specifications:

Total weight	8000 lb.
Length overall	8-ft. 9-in.
Width overall	5-ft. 3-in.
Height over platform	2-ft. 4-in.
Height over battery compartment	3-ft. 9-in.
Wheel base	4-in.
Diameter wheels	20-in.
Track gage	44-in.
Rated drawbar pull	1000-lb.
Speed at rated drawbar pull	3½ m.p.hr.

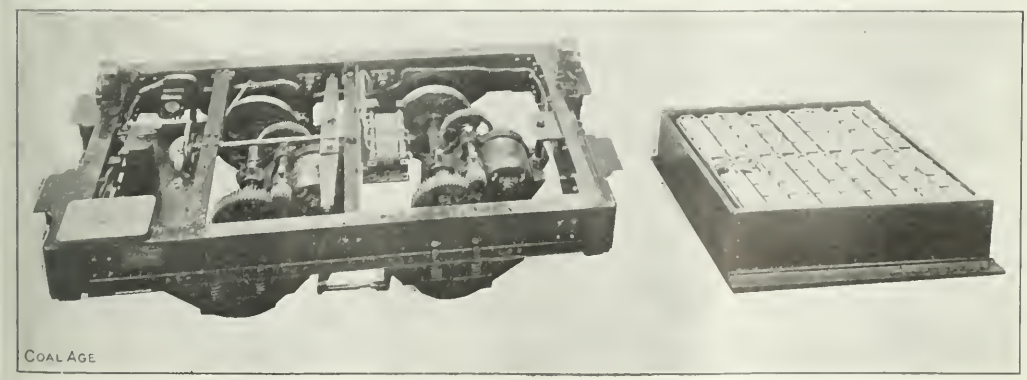
The batteries are designed for the particular service, and are of rugged construction; the plates are made specially to give the high service efficiency. The cells are grouped in 18 trays and are mounted on top the locomotive frame in a wooden case.

The mechanical design of the machine is in accordance with the latest modern practice. The frame consists of steel channel sides and steel plate ends carefully fitted at the joints and held together rigidly by bolts and steel angles. The end plates are faced with wooden bumpers, to which suitable couplers are attached. A seat for the operator is provided in the rear. The cast-steel pedestal jaws, which carry the journal boxes, are securely bolted to the lower web of the channel side-frames.

Details of Construction

The cast-steel journal boxes are of special design and fitted with roller bearings, which assures efficient mechanical transmission of power and consequent economy in battery current consumption. The weight of the car is supported from the journal boxes by two coiled springs. The wheels are of chilled iron, and are pressed on and securely keyed to the axles, which are made from a special grade of steel, case-hardened at the journals. Thus the wear on either the roller bearings or the axles is practically negligible.

Brake tension is effected by means of a square, threaded, brake-spindle. A square-threaded nut travels



View of Motor Truck with Battery Removed and Showing Driving Mechanism

on the spindle and carries an equalizing bar, to the ends of which are connected chains leading from the brake levers. This device admits of locking the brakes automatically, without the use of pawls or ratchets, in any position left by the operator. The controller is of the drum type and built for this particular class of work.

The motors are series wound, totally inclosed and of the familiar automobile type. They are designed especially to operate from batteries and have characteristics that develop the maximum possible economy in the use of battery current. They have high efficiency, large overload capacity and operate with practically sparkless commutation. The high efficiency is obtained by designing them with a small air-gap and running the iron at low densities. By reason of the latter provision, the speed and torque characteristics are steeper than in the ordinary series motor, thereby tending to limit the overload which can be thrown on the batteries.

The motors drive the axles through double reduction gearing, an intermediate shaft, supported in the bearing housing integral with the suspension cradle, carrying the intermediate gearing. As slow-speed service is ordinarily required of a storage-battery locomotive, the use of double reduction gearing affords such speeds with minimum rheostatic losses; and due to the large gear ratio from armature shaft to wheel tread, high tractive efforts are obtained at comparatively small current inputs to the motors.

Stripping Operations, at Pittsburg, Kansas

All the steam shovels used in the coal stripping operations in the Pittsburg district are working continually, and four new ones are being erected. It is expected that by the end of February there will be 20 in active operation. A noteworthy fact is that all have been installed within the past two years, thus demonstrating the greater advantage and economy in strip mining as compared with underground shaft mining. The coal in this field averages 3 ft. in thickness, or 3000 tons to the acre, and it is claimed that a depth of 10 to 30 ft. of overburden can be removed with the new type of revolving steam shovel, at a low cost per ton of coal mined.

There are many thousand acres of good coal land available for stripping, with an overburden varying from 10 ft. to 25 ft. in depth. This land can be bought or leased and operated at a good profit; in fact, the Kansas coal fields offer as great inducements for stripping as any other section of the country. The coal is of a good quality and is quite free from sulphur. It burns freely, with but little clinker.

The increased demand for soft coal is largely due to the withdrawal of crude oil from the market and the failure of the natural-gas supply.

Two large 175-ton Bucyrus shovels have been erected for Smith, Scott & White, contractors on the Weir fields, two miles east of Chicaope, and a third is being installed. The Pittsburg-Scammon Coal Co. is also using a Bucyrus shovel of 150-tons capacity, on their field two miles south of Scammon.

The E. H. Markham Coal Co. is operating a 150-ton Bucyrus steam shovel of the revolving type, which is capable of handling 2000 cu.yd. of overburden and soft shale a day. The Markham Co.'s Workings are located at Curranville, about 10 miles north of Pittsburg. The coal in this locality is of good quality, about 3 ft. thick, and the overburden varies from 15 to 22 ft. in depth.

Another 150-ton Bucyrus shovel has been purchased by the Roy Millner Coal Co., of Weir City, and is now being installed. This shovel carries a 60-ft. boom, 2½-yd. dipper, and will handle 2000 cu.yd. of earth per 10-hr. day.

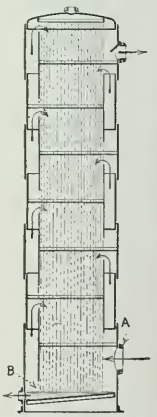
A Marion steam shovel, model 270, has been installed at the Ellsworth-Klaner Co., two miles east of Chicaope. This shovel is likewise of the revolving type, with a 90-ft. boom, a 5-yd. dipper, and will handle 2000 cu.yd. a day. This long boom enables a 40-ft. depth of overburden to be removed.

The Sternberg Construction Co., who have been stripping coal with a Marion steam shovel, model 250, have recently sold their plant three miles north of Weir City, to the J. R. Crowe Coal Co. They have purchased a tract of 400 acres near Minden, Mo., and will proceed to develop it at once.

Kubierschky's Gas Cooler and Washer

By Alfred Gobiet*

A frequent fault of coolers and washers, such as are used for coke-oven gas, results from the unequal temperatures of the different strata of the gases. As they enter at the bottom they are cooled and tend to remain there while the hot gases following them, which lack the velocity needed to sweep them up and overcome the resistance of the falling water, seek short cuts of less resistance to the upper regions. Moreover, gases that have been washed and cooled will sink to the bottom. Thus the efficiency of the apparatus is seriously affected.



Kubierschky's Gas Cooler and Washer

To obviate this difficulty, Dr. Kubierschky has patented the washer shown herewith.

It is divided into vertical compartments, with sieve bottoms which let the water drip through in a fine rain from one to another, but are so clogged by the liquid that they obstruct currents of gas from passing through. The gas enters *A* and as it is cooled, sinks. The light gas following it floats over it like oil upon water, during which time it is well exposed to the streams.

As it cools, it presses downward and crowds the lower layer through the outlet *B* into the compartment next above, where the same process is repeated. Finally the heaviest, coolest and best washed gas escapes from the top chamber. The gases have no liquid resistance to overcome in ascending, and the water flow harmonizes with that of the gas instead of opposing it. This device is said to effect a perfect washing and cooling.

Note—Abstract of paper appearing in "Montanische Rundschau" (Vienna), Oct. 1, 1912.

*Engineer, the Witkowitzer Mines Ostrau, Moravia, Austria.

CURRENT COAL LITERATURE

A British Byproduct Coking Plant

Until quite recently the beehive coke oven held undisputed sway in Cumberland, England. Indeed, to go no further back than 1910, out of the total of 582 ovens which were then in operation, no less than 502 were of the beehive and square types, the remaining 80 being Koppers regenerative byproduct ovens installed at Watergate Colliery, at Flimby and at St. Helens No. 3 mine, at Siddick. Naturally other coke makers in the district paid close attention to the operation of these new ovens, which proved from the first a marked success, perhaps the best testimony to this being that the whole of the Allerdale Coal Co., Ltd., was making coke in beehive ovens at both their Buckhill and Clifton collieries. A few of these are still in operation at Buckhill, where the waste heat is used for raising steam for the colliery. The plant installed at the Clifton collieries—with a capacity of 7000 tons of coke per month—is designed to deal with the smalls from the whole of the company's properties. Of the coal required at the ovens, the Clifton colliery supplies about a half and Buckhill and Brayton collieries each about a quarter, only a little outside coal being bought. The coal from Buckhill is delivered in a washed condition, while that from Brayton Knowe is washed, together with the Clifton smalls, in a Shep-

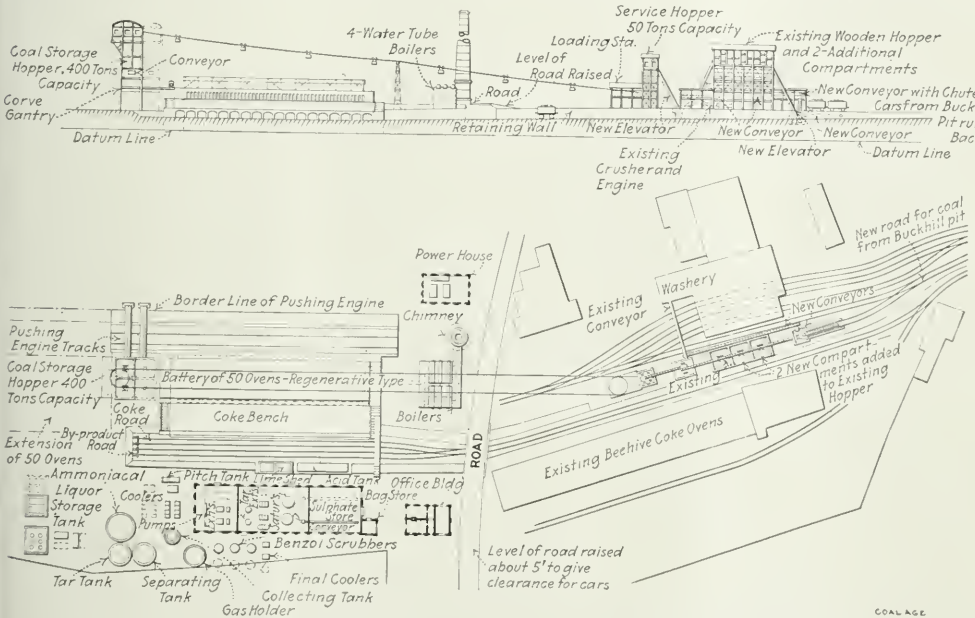


FIG. 1. GENERAL PLAN AND ELEVATION OF BYPRODUCT PLANT AT THE CLIFTON COLLIERY

pard washery, adjacent to which is the drainage bunker, which serves the disintegrator.

The new installation comprises a battery of 50 Koppers latest regenerative coke ovens, with recovery plant designed on the makers' patent direct-recovery principle for the extraction of tar and benzol. Provision is also made for the manufacture of sulphate of ammonia, together with auxiliary plant, comprising machinery for elevating and conveying the washed coal to the drainage bunker of 300 tons capacity, an aërial ropeway with a feed hopper of 560 tons capacity, and a combined coal-compressing and coke-discharging machine. In addition, four Stirling boilers and an electric generating plant for power and lighting are erected. The contract for

byproduct ovens in Cumberland, both in operation and under construction, are of the same type.

Though the introduction of the regenerative oven into Cumberland was somewhat belated, its development has since been rapid, for while in 1910 there were only 80 such ovens installed, there are today 230 in regular service, and a further 100 in course of construction. These last comprise an additional 10 to the existing battery of 50 for the Moresby Coal Co., Ltd., a battery of 50 for the Harrington Coke Ovens, Ltd., and an initial installation of 40 ovens for the Oughterside Coal Co., Limited.

Prior to starting the plant with which this article deals,

Note—From "Iron and Coal Trade Review," London, England, Jan. 17, 1913.

the whole of the work was placed with the Koppers' Coke Oven & Byproduct Co., Sheffield.

The general arrangement of the plant will be seen in our illustration, Fig. 1. The whole of the washed coal is delivered to the drainage bunker, that from Buckhill colliery, which is delivered washed, being raised by a bucket elevator, and the locally washed coal, treated in the Sheppard washery, delivered by conveyor. The coal is allowed to drain until the moisture does not exceed 8 per cent. From the drainage bunker the coal passes to the disintegrator, which at present is driven by a high-speed engine. This, however, will shortly give place to a Siemens motor of 100 hp. From the disintegrator the crushed coal is elevated to a 50-ton feed hopper, which serves an aërial ropeway of the Pohlig type, in connection with which an Avery automatic weigher and totalizer will shortly be installed. The ropeway buckets have a holding capacity of 9½ cwts., and are automatically discharged into the crushed-coal storage hopper at the ovens, which has a capacity of 560 tons. The ropeway is equal to handling 800 tons of coal in 12 hours.

From the storage bunker the coal is discharged through openings in the bottom onto a conveyor and thence into the receiving hoppers fitted to a combined coal-compressing and coke-discharging machine. The hoppers on this machine have a capacity equal to two full charges, thus enabling two ovens to be charged for each visit of the machine to the coal bunker. The stamps for compress-

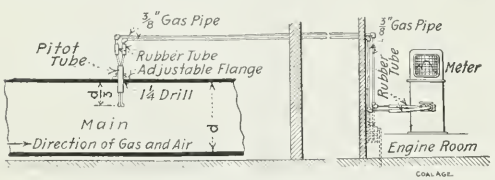


Fig. 2. The "Factum" Gas and Air Meter

ing the charge are driven by a Brush motor of 8-10 hp. The combined ram and charger, which travels upon a double set of rails, is operated from a 50-hp. motor taking current from bare overhead wires. Any coal which may be split during charging operations is tipped down a chute at the end of the battery nearest the storage bunker, to which it is raised by means of a bucket elevator.

The Koppers Ovens

Most of our readers will, no doubt, be familiar with the general principles of the Koppers ovens, in which the gas and air for combustion are separately distributed on each side and along the whole length of the oven. Each oven wall is formed of about 30 vertical flues with a gas jet in each, so that the ovens are heated from 60 points. The means of regulation are simple and effective, and absolutely uniform heating from end to end is rendered easily possible. This uniformity is, of course, the salient point of success in a coking plant, as not only is it essential to the production of a homogeneous coke and enables the charge to be burnt off more quickly, but it effects a considerable economy in gas, thus giving a larger available surplus.

The ovens, as previously stated, are of the regenerative type, the advantages claimed over those of the waste-heat type being important, though that does not seem to be so fully appreciated in England as upon the Continent and in America. It may not, therefore, be out of place to point out that the chief advantage to be derived from regenerative ovens is that the surplus heat in the coal (i.e., the heat over and above that which is required for heating the ovens) is produced wholly in the form of a combustible gas, while the surplus heat from waste heat ovens is produced mainly in the form of a hot waste gas, which can only be used for firing boilers and must be consumed on the spot directly it is produced. Gas in a combustible form, such as is obtainable from regenerative ovens, on the other hand, can be employed for illuminating purposes, for raising power in gas engines, or for firing steam boilers. This last is, of course, by no means an economical application, as the gas engine would probably yield from two and one-half to three times the power produced from the steam raised with an equal quantity of gas.

The distinctive feature of the Koppers regenerative oven lies in the employment of separate regenerative chambers for each oven, so that each is an independent unit; thus the air for combustion and the chimney draft can be separately regulated. The average charge for each oven is 9½ tons of wet coal. The coke is discharged through a quencher onto a sloping bench, covered with cast-iron plates, from which it is loaded by gripes into the trucks, the coke being of exceptionally good quality and homogeneous character and little breeze being made.

As already stated, the byproduct recovery is on the direct-recovery system, or what is perhaps better known as Koppers low-temperature principle. The hot gases from the ovens pass by way of a common main to a series of multitubular water coolers, where the temperature is reduced and the condensation of tar and aqueous vapor brought about. The gas is then drawn by a turbo-blower, and driven forward to the tar extractors, where the last remaining traces of the tar are effectually removed, an operation which cannot be successfully performed without cooling the gases.

The turbo-blowers referred to (which, like all the important apparatus and engines in the plant, are in duplicate) work at 25-in. water gage. Their normal speed is 3400 r.p.m., but this is governed by the pressure in the main. The governor is a simple and ingenious arrangement which can best be described as a miniature gasometer, the top of whose gas tank is connected by levers to the stop valve of the turbine. After being freed from the tar the gas is superheated to such a degree that it may be passed directly into the saturator without condensation taking place. The salt produced is of excellent quality, being white in color and containing no trace of tar.

The sulphate factory adjoins the exhauster and pump house. The exhaust steam from the blowers provides the necessary heat for the superheaters, and the surplus exhaust, together with the exhaust steam from the pumps, is used for distilling the gas liquor without the addition of live steam. The benzol plant is arranged in a parallel line with the sulphate factory. After passing through the saturators, the gases are conducted to final coolers, where the temperature is reduced to the degree required for the efficient extraction of the benzol, which is washed out in the usual manner. From the scrubbers the gases pass in part back to the ovens and in part to the boilers, while a considerable portion is at present going to waste.

As a matter of fact, of the total gas evolved from the coal, approximately 70 per cent. is available for purposes other than heating the ovens.

The Benzol Recovery

The Koppers method of benzol recovery is as follows: The rich oil containing the benzol is run into a collecting tank, where its temperature is about 20 deg. C., whence it is pumped into a preliminary heater, where the temperature is raised to about 40 deg. C. It then goes to the superheater and finally to the still proper, where it is subjected to distillation by means of live steam at a temperature of about 105 deg. C.

In this way the whole of the benzol is removed from the washing oil, and the benzol vapor, together with the steam, passes away into coolers, where the two liquids separate, owing to the difference in their densities, the washing oil, from which the benzol has been removed, passing out at the bottom of the still, through a series of water coolers, into the storage tanks to be used again. Water for condensing the gases is drawn from the River Derwent, which is distant about a quarter of a mile and is 145 ft. below the works' level. For this purpose Worthington centrifugal pumps are installed in duplicate. Each pump is driven direct by a 62-hp. motor, and is capable of delivering 822 gal. per minute.

The power-house equipment comprises two Browett-Lindley combined sets, each of 120 kw., generating three-phase current at 500 volts, and a small lighting set, consisting of a Robey high-speed engine coupled to a continuous-current dynamo generating at 230 volts.

Steam is raised in four Stirling boilers at 150 lb., fired entirely by waste gases. The power units exhaust to a Wright feed-water heater. In addition to firing these boilers, three of the Lancashire boilers at the colliery have a gas-burner fitted to each of the flues.

As previously stated, the results obtained at the Clifton colliery plant are of a remarkable character. We are indebted to the coke-works manager for the following figures, indicating the yield of the various products, as also for diagrams showing the gas yield and consumption.

Records of the gases are taken on a "Factum" meter (Fig. 9), which is installed in the manager's office. One reads: Coke, 72.5 per cent. of coal carbonized; tar, 5.25 per cent. of coal carbonized; sulphate of ammonia, 1.62 per cent. of coal carbonized; crude benzol, 3 gal. per ton of coal carbonized; surplus gas, 60 per cent. of total quantity evolved from coal. The surplus gas would certainly appear to be an abnormally high percentage; but the manager is satisfied as to its accuracy.

Requirements of British Electrical Rules

In the course of his presidential address to the British Association of Mining Electrical Engineers, at Sheffield, on Sept. 21, 1912, W. C. Mountain referred to the new Home Office rules for the installation of electricity in Mines. Claiming an intimate knowledge of what the rules demand, he briefly stated the requirements as follows:

Armoring Compulsory, Voltage Unspecified

1. All cables in future must be armored, the conductivity of the armoring being 50 per cent. of that of the cables inclosed if three-core, and if single armored cables are used for continuous current, then the armoring must be 25 per cent. of the conductivity of the cable inclosed and this armoring must be bonded every 50 feet.

2. No restriction is placed upon the voltages used underground (within, of course, reasonable limits), except that motors below 20 hp. must not be supplied at a pressure higher than 650 volts.

Leakage Detectors and Grounding Required

3. Leakage detectors are required, and all systems must be grounded to the surface, preferably through the armoring or the outer sheath.

4. Direct-current electric lighting circuits which exceed 250 volts must be grounded. Similar alternating-current circuits must be grounded if the pressure exceeds 125 volts.

5. The method of grounding portable machinery, such as coal cutters and conveyors is described in the memorandum and the grounding arrangements must be such that the earth connection is made before the live connection. The live circuit must also be broken before the earth connection.

In brief, the main object of the new rules is to make armoring compulsory in the future; and there is no question but that armoring affords a good mechanical protection and is also convenient for grounding. Grounding may seem to be a simple matter but it is sometimes difficult to secure satisfactory results.

In a recent case, although the installation complied in all details with the new requirements, it was found that the resistance measured from the earthplate on the surface to the armor at the inby terminal was nearly 12 ohms, which is much more than it should be.

The Difficulty in Grounding

Insulating strata exist in many mines. It is extremely difficult to bond the armoring to the junction boxes, and there is also the risk of the armoring being damaged, or the joints broken by falls and by corrosion. Therefore it is questionable whether a grounding system consisting of as many earthplates as possible is safer underground than an installation where grounding is avoided.

In every case it is necessary to consider the local circumstances, and only those experienced in this particular work can satisfactorily determine the right method of obtaining a good grounding system. There can be no question but that grounding in some form or another is desirable and in fact necessary.

Our Front Cover This Week

The illustration on the front cover of this week's issue shows the 550-ft. Link-Belt chain-retarding conveyor and tipple, designed and built for the E. E. White Coal Co., Stotesbury, W. Va., by the Link Belt Co. of Philadelphia. The capacity of this equipment is 300 tons per hour over two dumps. A 60-in. wide Link-Belt picking table in the head house delivers the coal to the retarder. The storage bin is shown at the bottom of the incline. This is one of the most modern and efficient tipple equipments in the West Virginia field.

Some Notes on Diamond Drill Prospecting

By J. B. Dilworth*

SYNOPSIS—An interesting review of the current practice in prospecting large undeveloped coal fields with the diamond drill. A number of useful hints are given with regard to the location of the holes, subterfuges of unscrupulous contractors and size of holes. The author regards $1.75 per foot as an average price for work of this character, although this cost often amounts to $2 or $2.50 in some districts. The article is confined more particularly to the drilling of relatively shallow and horizontal seams.

The following article treats of the method of laying out a field for drilling; the character of drill employed; the form of contract; the supervision of drilling; the instrumental location of holes and the compilation of data obtained, which have proved most satisfactory in testing extensive areas of shaft coal in the Appalachian and Interior coal fields With the rapid exhaustion of the more accessible areas of crop coal in the older bituminous fields within recent years, the attention of operators and capitalists has naturally been drawn to those localities where coal seams, known to be of commercial thickness and quality in neighboring fields, are buried beneath a few hundred feet of rock measures.

The seams are frequently as thick and pure in those areas as elsewhere and, when operated on a large scale, can be mined almost as cheaply as in drift or slope mining. The chief obstacle to their earlier development has been the difficulty of obtaining accurate information concerning the structure, bed section and quality of the seams, conditions which can be disclosed most satisfactorily by judicious prospecting with the diamond drill.

Preliminary Examination

The engineer's first duty upon undertaking the prospecting of such a field is to familiarize himself with general geologic conditions in adjoining areas. There the seams, to be sought by the drills in the locality under consideration, will frequently be found to outcrop, and valuable data as to the structure of the region, its geologic section and the characteristics of the principal coal beds can be secured, which will prove a great help in interpreting the drill records obtained.

In determining the number of holes to be drilled, consideration must be given first, to the object of the drilling, whether a knowledge merely of the general value of the field is sought—to determine its desirability for purchase as a whole, for instance—or whether such detailed information is wanted as will closely define the best mining areas, determine the most suitable shaft sites, etc. And, second, the regional character of the principal coal seam, as regards persistency and uniformity of bed section. Thus one good core would "prove" a much larger area of the regular Pittsburgh seam in southwestern Pennsylvania than of the Freeport or Kittanning in the Alleghany Mountain district of that state.

As a rule, where the object of the drilling is to ascertain the general commercial value of the field as a basis for purchase and where the coal beds are fairly regular, as those of the Lower Productive Measures in the northern Appalachian field, one hole for each square mile of area is sufficient. If the property tested is in a comparatively solid block this will place the holes about one mile apart. This rule will usually be found quite satisfactory, though at times a bed in one portion of the field will prove so variable that closer drilling in that particular area will be required. After tentatively locating the drill-holes on a map, the points selected should be visited on the ground, where it will frequently be found desirable to shift them somewhat that the drill may be readily set up, on firm ground and near water.

In a hilly region the location will naturally be selected in valley bottoms, if possible, to avoid needlessly deep holes. A local prejudice against such locations will sometimes be found, based on a belief that the underlying coal seams have been disturbed by the streams. Generally speaking, there can, of course be no relation between a valley and the character of the much older strata in, and over which it courses. If the coal seam has not been actually reached by erosion, or, in other words, if the natural, stratified roof is found above the coal, it is safe to assume that a core from under a valley is as typical as one from beneath a hill. It rarely happens that erosion has extended more than 50 ft. below the present surface even in a flat valley, so if the coal bed sought lies at a greater depth than that it will usually be found intact.

Character of Drill

The most satisfactory machine for the work under consideration is the light, easily moved diamond drill of a type similar to that generally used in the coal fields east of the Mississippi River. It consists essentially of a hollow stem about 6 ft. long, held in either a vertical or inclined position and moved upward or downward by two hydraulic pistons. The drill rod passes through this stem, in which it is clamped by a chuck at the lower end and the whole is rotated by two small steam engines. This apparatus, together with a small boiler, a steam windlass for lowering and withdrawing the drill rod and a pump, for forcing the water down the drill rod, and supplying the boiler, are all mounted together on a wheeled truck. The whole weighs about three tons and can be hauled to any ordinary location by two teams.

The main accessories are derrick poles, drill-rod sections, core barrels, hand tools and, where the location is more than a few feet from the water supply, a mounted pump and boiler with 1-in. water pipe and a small tank. The entire outfit can be moved over fair roads by seven teams and set up by three men in 10 hr., or dismantled in half that time. The best results in coring bituminous coal have been obtained in using an eight- or ten-diamond bit attached to a double core barrel and cutting a core 2¼ in. in diameter. A careful driller thus equipped will usually secure a perfect core even of the soft, low-volatile coals; indeed it is customary for him to guarantee such a core when drilling in fields with which he is familiar.

The speed of drilling with such an equipment naturally varies with the character of the strata penetrated and the skill of the driller. In the ordinary Carboniferous shales

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and sandstones 50 ft. per 10-hr. day of steady running is a good average, though occasionally more than twice that speed will be maintained for a single shift. In estimating the *total* time required to drill a field one should allow a shift of 10 hr. for each 20 ft. of hole to be drilled by one machine. This is generally sufficient to cover the time consumed in moving to new locations, laying water lines, maintaining bits and machine, and redrilling an occasional hole where a core has been lost.

The amount of fuel required for such drilling may be roughly estimated at one-third bushel of coal per foot of hole, or a long ton per one hundred feet. If a separate pump boiler is used, the fuel allowance must be increased somewhat, probably to one and one-half tons per hundred feet of hole. The water requirement of a drill in full operation is about two-thirds of a barrel per minute. Considerably less will suffice in an emergency if the discharge from the hole can be repeatedly pumped back into it; but this is not always possible, owing to rock fissures, through which the water sent down the rod escapes. As already stated, an auxiliary pump and boiler are necessary if the location is more than a few feet from water. The type generally used will force sufficient water for drilling for about a mile against a moderate head.

Form of Contract

Most drill prospecting in the Eastern coal fields is done, under supervision, by special contracting firms. Under the contract usually in force the drilling company agrees to furnish a certain number of machines with all necessary appliances and men for their proper operation; to transport the equipment into the field; to move it to the various locations assigned; to supply all fuel and water; to drill holes of a specified size to the depths desired by the engineer in charge, and, usually, to furnish perfect cores of the coal seams penetrated. The maximum and minimum depths to which any hole may be carried is usually specified; also the minimum total amount of drilling to be done.

The contract price for such work in the Pennsylvania coal fields, when several thousand feet of drilling is to be done and the maximum depth of hole is approximately 600 ft., averages about $1.75 per foot for a hole yielding a 2¼-in. core. In less accessible localities, farther from the base of supplies, as in many portions of West Virginia, Kentucky, Illinois and the Middle West, the contract price ranges from $2 to $2.50 per foot, or even more if an exceptionally hard formation—such as the Raleigh Sandstone of the New River field in West Virginia—has to be penetrated.

Supervision of Drilling

Usually the engineer in charge of drilling operations is responsible for the accuracy of the reported records rather than the drill contractor or his machine runner, and very properly so. As large expenditures of money for purchase and mining development are frequently based wholly upon the records of a few holes, it is essential that the supervising engineer know, beyond all reasonable doubt, that the coal cores secured, represent the full thickness of the beds, and not be dependent on the word of the driller, who is sometimes tempted to overlook a few inches of ground-up core—especially when his contract calls for the hole to be redrilled unless complete coal cores are obtained.

To secure these results it is not necessary that the engineer remain constantly at the drill, but only while the coal and a foot or so of strata immediately below are being cut. His free time can be advantageously utilized in safeguarding his employers' interests by familiarizing himself with all the local conditions and in general surveying as a basis for his complete graphic records.

The time of striking a given seam can usually be predetermined with some accuracy if the structure and geologic section of the field are at all regular. When the driller reaches the coal, which can be readily told by the action of the machine, he at once stops and sends for the engineer. After the latter marks the position of the drill rod the coal is cored and the point at which the floor is struck is noted. Measuring between these two points gives the total thickness of the seam. When the drill has gone a foot or so into the floor, to give a hold for the key piece, the rod is drawn and the contents of the core barrel carefully pushed out. Detailed measurement of the coal core can then be checked with the rod measurement, from which it should not vary more than an inch.

There might be raised the objection to this method that an unscrupulous driller, fearing he would grind up and lose part of the core, would run some distance into the bed before calling the engineer and thus have less core to account for than should properly be present. But this is most improbable, for no driller could tell just how much of the core he would grind up, and if he should produce more than the rod readings called for his deception would be at once apparent.

It is well to have a long, narrow box in which the coal core will fit snugly when pushed from the core barrel, as it is sometimes very tender and difficult to measure accurately unless prevented from falling to pieces. Usually it is best to let the core dry before it is finally measured in detail and broken up for chemical analysis, as bony coal and small partings of bone or black slate are apt to be overlooked in a wet core.

Instrumental Surveys and Office Records

To properly interpret the results of drilling a series of holes it is essential that both the position and elevation of each be known. Neighboring mines or outcrop openings should also be located for the light they may throw on structural and other conditions in the field, and all referred to a definite bench mark in the district. A stadia survey is usually sufficiently accurate for the purposes involved in the examination. If so, it is particularly desirable because of the rapidity with which the surveyor can obtain, not only the locations and elevations of the drill holes and coal exposures, but also a wealth of topographic and cultural data useful in preparing a general map of the field.

The common method is to measure the distances by stadia on a self-reading rod, the horizontal angles by compass and the vertical angles, from which elevations are calculated, by reading the vertical arc on a carefully leveled transit. When running a continuous line the transitman and rodman occupy alternate stations, the transit pointing first back then ahead. In a fairly open country two men can readily average four miles of line a day.

Drill records are usually most intelligible when seen in graphic form where the character of the various strata

penetrated, the relative position and thickness of the coal seams, and the variations of these features in different parts of the field can be comprehended at a glance. A scale of 40 ft. to 1 in. has been found suitable for plotting the drill logs, though it is usually desirable to supplement these records with magnified sections of the coal seams plotted on a scale about ten times as large.

The map accompanying the plate of drill records should show the location and elevation of each hole and coal opening; the lines of the property tested; the drainage and important culture and geographical features of the field and, by contours based on survey elevations, the structure of the principal coal seam. With such data at hand the engineer is able to discuss intelligently and with a fair degree of accuracy the geologic conditions of a field; to determine its economic value, and to outline a general plan for future development. The cost of such methods of investigation amounts to such a trifling sum per acre of coal involved that, viewed as a tentative or permanent record, there can be little doubt of its value and expediency, particularly so with the advancing prices of good coal lands and the greater security vouchsafed to any professional opinion which may be rendered in the premises.

A New Rotary Dump

The rotary dump here illustrated is a type used by the Rheinischen A. G. für Braunkohlenbergbau und Briquettfabrikation, Cologne, Germany. It is described by Christian Steg in "Glückauf," Oct. 12, 1912.

From the central switching station the cars are distributed to the several dumps, run upon them by gravity and after dumping pass on to a chain road for the empty cars.

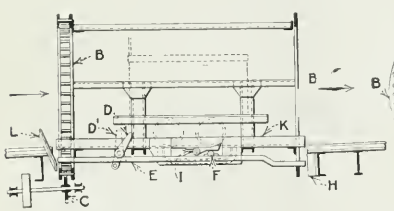


Fig. 1. Side View

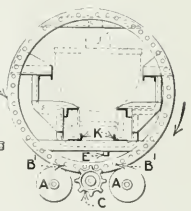


Fig. 2. End View

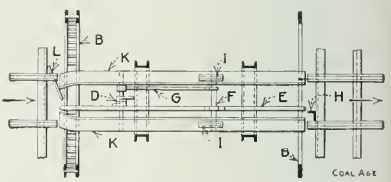


Fig. 3. Top View

The dump is adapted to the form of the car, and it is mounted in the usual manner on four rollers *A* which support its two end rings *B*. It is inclined as is the approach track. The double ring *B* at the front is provided with pins to form a lantern gear meshing with the driving pinion C. The pins of this lantern gear are lacking, however, for a distance of about 20 inches, between the points *B'* and *B''*, Fig. 2, which interval corresponds to the initial and final position of the dump rotation. Thus the pinion C, which keeps on turning, has no further effect upon the lantern gear when this open space is reached.

The axle of the car, in running upon the dump pushes down and passes over the lever *D*, which moves the longitudinal bar *E* away from the catch *H*. The weight of the car upon the rails (which are not in the exact center), then starts the dump in its revolution.

As soon as the open space above referred to in the lantern gear has been passed, the pinion *C* meshes therewith and causes the dump to turn completely over. Upon nearing its initial position, the guide *L* forces the locking bar *E* back into its former place, thus locking the dump upright, in which position it remains until the next car is run upon it ready to be emptied.

Coal Mining in Holland

Special Correspondence

From a return dealing specially with the Limburg (Holland) coal industry, it appears that in 1911 the coal raised from the seven mines working amounted to a total of 1,654,240 short tons against 1,447,040 tons in 1910 and 1,255,520 tons in 1909. The total number of workmen was 7477 of whom 5499 were below the surface and 1978 above. They included 6122 Hollander, 1397 Germans, 200 Belgians and 244 Austrians.

Dealing specially with the state-owned mines, the report states that a fair tendency is noticeable toward the nationalization of the Dutch Limburg basin, the determining reasons being on the one hand, the increasing competition in Holland of the German-Westphalian Coal Syndicate and, on the other, the apprehension that concessions granted to Dutch firms may pass into foreign hands.

The state-owned area extends over 62,600 acres, containing an estimated total of a billion tons, of which 593,000 lie at a depth of less than 3281 ft. or 1000 m., as compared with an area of 17,291 acres in the hands of private firms. The only state-owned mine in regular exploitation is the Wilhelmina, which was responsible for a total of 275,555 tons in 1911. About 65 per cent. of the state output was sold abroad.

Work is still in progress for completing the two shafts of the Emma Colliery, sunk by the freezing process. These in 1911 produced 662 tons. The coal formation was reached at a depth of only 650 ft., and four workable seams from 27½ in. to 47 in. thick were intersected at between 650 and 912 ft. At the third state-owned mine, Hendrik, a depth of 722 ft. of cap rock had to be passed through before the coal formation was reached.

It is estimated that when completed the Emma and Hendrik Collieries will yield 3400 tons daily. The probable production of the state collieries is put at 672,000 tons in 1915 and 3,920,000 tons in 1930, the number of workmen occupied being estimated at 3000 in 1915 and 17,000 in 1930, and the capital invested at $12,000,000 in 1930, against $3,200,000 at present.

It is claimed that the increasing invasion of the Dutch market by German coal is attributable to the reduced railway tariffs and the low freight rates on the Rhine.

Switch Gear for Collieries

The development of switch-gear design has of late years received a considerable impetus owing to the remarkably rapid way in which electric power has been adopted for use in collieries and other mines. The problems attending the use of power in such situations make electric mining machinery a class by itself, since not only is the danger of coal dust and gas to be contended with, but the necessity of placing machinery in dark and damp situations under the control of inexperienced workmen have introduced difficulties which it has taken a considerable amount of careful design to overcome.

Two New Pieces of Apparatus

Among the firms who have carefully investigated the problems of mining machinery is the Morely Electrical Engineering Co., Ltd., of Stanningley, near Leeds, and two of their latest productions in mining switch gear are worth attention. It is therefore proposed to describe

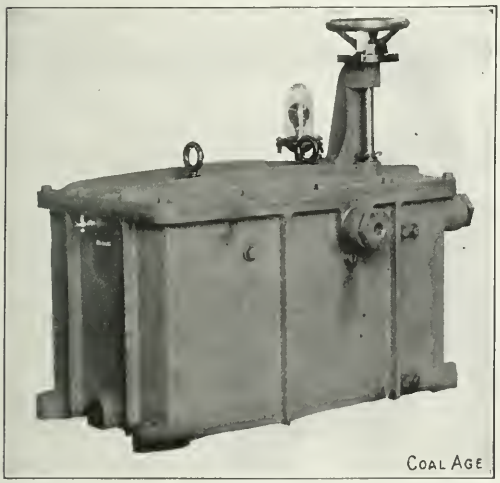


Fig. 1. Oil-immersed Starter and Controller

briefly, first an oil-immersed drum type starter and controller, which is shown photographically in Fig. 1.

Those who have had experience in the manipulation of colliery switch gear for direct current, know that although there is a great advantage in having the switch resistance and joint boxes combined in one self-contained, transportable or semi-transportable box. Many designs which have been previously attempted on these lines have not been entirely successful on account of the fact that the work of inspection, always difficult in collieries, has been impeded by the way in which the parts of the gear have been arranged with relation to one another inside the case.

Where bad lighting is the rule rather than the exception, it is extremely desirable that the utmost facilities for inspection of the working parts should be given, and it is in this feature that several of the previous designs have to some extent failed.

This disadvantage, in the present instance, has been avoided. By means of hinging the two drums and also by a suitable arrangement of the plugs, a few minutes will suffice to dismantle the whole of the switch gear and thoroughly inspect the same.

It is hardly necessary to describe this device to any great length, but it may be said that the general specifications conform in all particulars to the British Home Office regulations for apparatus used generally in mines. The design allows of a certain flexibility of arrangement and as no two collieries are alike in desiring the same class of apparatus, the manufacturers are able to vary the position of the component parts in order to suit individual requirements.

A Double-pole Mining Switch

The second piece of apparatus of interest which this firm has recently placed on the market is the double-pole mining switch of the oil immersed type, with patent fuses and joint boxes, shown in Fig. 2. When the switch is placed in the off position, there can be no possibility of its being turned back again unless the man in charge of the machine which it controls unlocks the switch frame.

This voluntary act prevents any unauthorized person from tampering with the fuse or putting larger sizes of conductor into the fuse holders than the current of the machine warrants. That this is important will be readily granted, inasmuch as considerable damage has before

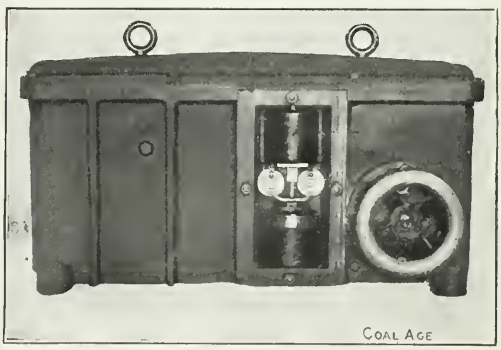


Fig. 2. Double-pole Mining Switch

now been done in mines, owing to unauthorized tampering with fuses.

These switches have been standardized and made in various sizes from 25 to 250 amp. capacities, and have been found especially suitable for controlling coal cutters, drills and similar mining machinery. It will be seen also that this type of switch gear lends itself equally to use in such situations as flour mills, powder factories, or other dangerous places, and therefore possesses a wide range of technical interest.

The U. S. Geological Survey classifies land as coal land only when the coal lies at what is now considered a minable depth in this country. The character of the coal determines the depth to a certain extent. The higher-grade coals are allowed a maximum depth of 3000 ft.; less is allowed for poorer grades. Lands underlaid with coal at a depth of 3500 or 4000 ft. are classed as "non-coal" lands. The amount of coal below 3000 ft. has not yet been estimated, but it is without doubt large. The coal above this depth is estimated by the Survey to be 2000 billion tons. Less than 11 billion tons have been mined. A large part of the estimated 2000 billion tons consists of the comparatively low grades of lignite.

Loading Coal for the Retail Trade

Mechanical loaders for loading coal wagons from storage have fairly jumped into prominence. A year and a half ago there were probably not over half a dozen in use the country over, while now hundreds are in successful operation. This method of loading wagons is such a decided improvement over the hand-shoveling, that manufacturers are finding it difficult to build enough machines to meet the heavy demand.

The accompanying illustration shows the Link-Belt Wagon Loader in the yards of the Scranton & Lehigh Coal Co., of Brooklyn, N. Y. This is the company's standard Type "D" bituminous loader, which will load a 2-ton wagon with bituminous or small anthracite coal in about two minutes, or a 5-ton truck in five minutes. It fills a

THE WAGON LOADER AT WORK

wagon so quickly that it hardly pays the driver to leave his seat, if the loader can be fed without his help. Where considerable coal is handled and rapidity of loading is essential in order to avoid delaying teams, greater capacity is secured by using another yard man to feed the machine, in addition to the operator. The driver then stays on the wagon and simply trims the load. Operating in this way an average of 40 or 50 tons an hour, or 400 to 500 tons in ten hours can be loaded.

The Link-Belt Co. has recently published a 16-page book which describes the method of operating the machine and the results to be expected with it.

⁂

Acetylene Lamps Permitted in Ohio Mines

Section 974 of the Ohio General Code has recently been amended by the General Assembly. One item of revision provides that it shall be lawful to use acetylene gas in lamps in mines subject to the following conditions and restrictions:

First, no person shall take into a mine a greater quantity of calcium carbide than will be a reasonable supply for his own lamp for one day's work.

Second, no person shall deposit, or keep in his possession, in a mine any calcium carbide, or refuse therefrom, in anything except air-tight containers These containers must be taken out of the mine at the end of each day's work.

Third, no person shall be allowed to use acetylene gas in lamps where there are old or abandoned workings, where large quantities of blackdamp or other poisonous gases are liable to accumulate, until such places have been examined by a competent person and pronounced free from a foul or poisonous atmosphere.

Up to the present time all efforts to introduce acetylene lamps in Ohio mines have proved unavailing. The Ohio Mining Law as amended June 11, 1910 (Section 974), it may seem, was drastic in respect to the use of acetylene or carbide lamps in the mines. The position taken by the commission appointed to revise the mining law at that time was that, owing to the many dangerous conditions incident to the use of calcium carbide for the generation of acetylene gas, in the mines, the use of this lamp should be prohibited by law.

This ruling of the commission, it may be supposed, was not wholly acceptable to all classes of mining men and efforts have been made from time to time to overcome the prejudice that existed in the Department of Mines of Ohio against the use of the lamp.

Under the new administration these efforts have been successful, and Section 974 of the mining law was revised Feb. 13, by action of the Ohio Assembly. The revised law was approved by the governor, Feb. 24. In justification of the previous action of the Mining Commission in this regard, it may be stated that the section as now amended provides certain restrictions, which cover all of the objections raised against the use of the lamp in mines.

BY THE WAY

Advice after mischief is like medicine after death.

⁂

First driver to second driver: "Lend me your pipe and tobacco and be fumbling for a match while I'm filling up." Second driver: "——— —— ———."

⁂

It is easier to bear adversity than to forget prosperity.

⁂

The flywheel of any industry is in its storage capacity, and as most coal will not stand storage, the greater part of the coal industry is reciprocating without a flywheel.

⁂

Many people see a glow-worm and think it a conflagration.

⁂

The man who holds the bag sins as much as the one who puts into it.

⁂

A mining camp weekly says: "Apparently we were erroneously informed as to the nationality of Joseph Remas, as in our account of the burglary at the A. C. M. Co. store, we stated that he was a Finn. Later we were waited upon by a delegation of that nationality whose sensibilities were highly outraged by the statement. We apologized for the error and were informed that he was a Lithuanian. If this is a mistake, we are prepared with another apology," which goes to show that the way of the editor is hard.

⁂

When we are in the valley we should act in such a way that we need not fear those who stand on the hill.

⁂

Mine Inspector James Taylor, 4th District, Peoria, Ill., has issued a neat booklet presenting the Compliments of the Season, 1913, and extending "greetings" to the coal operators and all employees in and about the mines. He reports but one fatal accident having occurred in his district during the first six months of the fiscal year. To everybody Mr. Taylor says: "Don't fail to brighten the usual gray of life with a bit of the rosegold of kindness." He then gives a series of "Don'ts" for operators and superintendents, mine managers, miners, mine examiners, shotfirers, hoisting engineers and drivers. The ground of necessary precautions in coal mining is pretty fully covered by these worth-while suggestions.

EDITORIALS

Storage of Powder

A few years ago the coal industry began to realize that an urgent campaign must be made to protect the miner at his work, but more recently operators have begun to take the larger view that workmen should also be taken care of at their homes.

Unfortunately when laws were made restricting the amount of powder which might be taken into the mines at one time, the ordinance made it necessary that each miner should either buy powder in small quantities, which was an extravagant practice, or store a broken keg of powder at home. At one mine, a genial clerk of the commissary, on his own responsibility, agreed to keep the partly used powder supplies of the miners in his "general supply house" and dole out the powder to each man as he desired it, supplying every individual from his own keg until that receptacle was empty.

The mine inspector arrived and condemned this practice, which, of course, was dangerous, as the miners persisted in calling for powder with lighted lamps in their hats, and, it being winter, there was an open fire not far distant. So the miners reverted to the old practice which was at least as bad. They took the powder home and left it often where the children could play with it, subject to fires should the house burn, a danger to neighboring houses and a terror to the local fire department.

Powder cannot well be sold like milk, of which a certain amount is purchased each day, the consumption always being regulated by the consumer to equal the quantity ordered. The men use part of a canister of powder one day and on the day following have less on hand than will serve them for a full day's run. Consequently, they desire to purchase a quantity running to a certain number of odd pounds or even ounces, only to be determined by weighing the can from which the powder is transferred both before and after depletion. This involves excessive clerical work, which it seems reasonable to add to the price of the powder.

Every coal company should have, in addition to the regular storehouse, a safety magazine where the miners may store their powder and where their cans may be filled every night. They should never be permitted to enter the magazine and no stove should be allowed within its walls. The men should be obliged to leave their depleted kegs at this place of storage and on quitting the mine at night should deposit their numbered canisters for storage and replenishment.

This will not only serve the purpose of safety, but should also lower insurance risks. In Great Britain the men are required to bring out their canisters nightly.

The Coal Mines Order of 1911 reads:

> No explosive substance shall be stored underground in a mine. The owner, agent or manager of the mine shall provide a suitable place or places of storage above ground for all explosives intended to be used in the mine and shall make suitable provision conveniently near the entrance of the mine for the storage of surplus explosive brought out of the mine at the end of each shift.
>
> If any explosive remains in the possession of a workman at the end of his shift, either he shall bring it with him, out of the mine and return it at once to the place of storage provided for the purpose or if the explosive is required for a shift immediately following, he shall deliver it personally to the workman succeeding him in his working place.

In view of the possibility that explosions may occur from the falling of rock on canisters of powder, it seems desirable that the American operators should require here what the law demands in Great Britain, that every man bring the remnants of his day's supply of powder to the surface when his shift is done and deposit it in a magazine.

In places where cartridges of permissible explosives are sold, there is less difficulty in arranging the sale of the powder in small units, but the need for a place for storage over night and idle days should be carefully considered in this case also.

⁂

The Need of Efficient Mining Legislation

Much confusion is liable to exist in the minds of legislators, in relation to what is needed or desired in mining legislation. The confusion arises from the variety of mining bills that are being presented for the consideration of the legislature now in session at Harrisburg. While some of the proposed bills that have been brought to our attention contain commendable features and are based upon a practical knowledge of mining conditions and requirements, there are others that have seemingly been drawn more for the purpose of defeating good and needed legislation than to supply a recognized need or to meet certain known dangerous conditions existing in mines. An example of this is to be found in House File No. 592, which is a bill introduced by Representative J. Wilfred Donahoe and referred to the committee on Mines and Mining, Feb. 12.

Mr. Donahoe is a native of Schuylkill County, having been born at Ashland, Nov., 1880, and educated in the public schools of that place. At the time of his election to the House of Representatives, Nov., 1910, Mr. Donahoe was engaged in clerking at a stationery store.

What the author of the bill knows of mining may be judged better by some of the features of the bill. For example, one of its first provisions is that "the Board of Examiners for Inspectors of Mines and the examinations provided for in Art. 2 of the Act approved June 2, 1891, be and are hereby abolished."

The bill further provides for "two chief officers of the Department of Mines, one to be known as chief of the bituminous mining district and the other chief of the anthracite mining district." By the provision of the bill, both of these officers of the Department are to be "elected by the qualified electors of the counties" of their respective districts, "for a term of four years or until their successors are duly qualified."

Under the present law, approved April 11, 1903, estab-

lishing the Department of Mines in Pennsylvania, the chief of the Department is *appointed by the governor.* Under the provision of the bituminous mining law (1911), Art. 19, the bituminous mine inspectors are *appointed and commissioned by the governor,* from a list of names certified to him by the Examining Board. In the anthracite district, under the Act approved June 8, 1901, and amended May 3, 1909, the mine inspectors are *elected by the qualified voters in the counties of the district.* If the proposed bill should become law, the *elective system* would control the Department of Mines as well as the anthracite mine inspectors, leaving the bituminous inspectors to be appointed by the governor.

In abolishing the requirement of the examination of candidates for the office of inspector of mines, the proposed bill provides that

> Any person shall be eligible for election to the office of inspector of mines in the anthracite mining district who shall be a citizen of the State of Pennsylvania, not less than 30 years nor more than 60 years of age at the time of his election, shall have not less than ten years' practical experience as a miner in mines where noxious and explosive gases are evolved and shall have a mine foreman's certificate, granted to him in accordance with the provisions of Art. 8 of the Act approved June 2, 1891, and who has been employed in or about a coal mine within five years prior to his first election to the office of inspector of mines.

By the proposed bill the expenses of the Department of Mines would be increased from the present $19,500 per annum to $21,800, or an increase of $2300 per annum. Instead of the present force of one chief, one deputy, six clerks, three stenographers and one messenger; the working force, under the new bill, would be two chiefs, two assistants, four clerks, two stenographers and two messengers. The clerical force, including messenger, would be reduced from ten persons to eight, with a reduction of $4400 for the expense in the clerical department of the work, while the force of supervision is doubled, with an increase of $6700 in expense for supervision.

No argument is required to show that the work so efficiently done under the present system, would be greatly hampered and its efficiency impaired by the proposed division of the Department. The questions presented are: 1. Is there any existing need for such division in the Department of Mines? 2. Would the work of the Department be conducted harmoniously under two heads?

While the conditions in the two districts, in Pennsylvania, are recognized as substantially different and are regulated by a separate code of laws, the anthracite mine inspectors and the bituminous mine inspectors report to the same head, and we predict greater advantage and harmony in the working of the present system than would exist if the interests in these two districts were completely divorced.

We believe that the committee on Mines and Mining, that must pass on this and other bills before they can be presented to the legislature, will be too wise to handicap the work of the committee appointed some time ago to revise the anthracite mining law. That committee has given much time and study to the conditions existing in the state and the anthracite district, and the report will be presented in due form for such action as the Assembly deems fit. In view of the extended work of the committee and the time it has consumed in the codification of suitable laws to govern the mining of anthracite coal in the state, the introduction of similar bills at this time, would seem to have no other purpose than to block legislation in this regard, by confusing the true estimate of the situation and conditions.

The Downsitting and the Uprising

With what deliberate purpose we sit down between the arms of our office chair to think on the whys and wherefores of our tonnage cost, our output and our sales.

It would be well if we would often compel ourselves to re-sit, with the same, earnest, knitted brow, and view awhile in anticipation that unforseen, because unlooked for, group, or it might be even a succession of groups, proceeding slowly, with frequent stops, carrying the injured on stretchers from our mine.

If a stranger were to travel unbidden, without carping spirit or the hope of journalistic reward, the length and breadth of coaldom, we cannot but think he would be impressed that many were the provisions of safety resulting from such downsittings.

But most of these provisions have not come as the result of such deliberation. Too many carry the blood mark on them. It would be well; it would be worthy of this our new century, and this our modern outlook, if we did not wait for misfortune, for maiming, for death, for hecatombs even, before we roll that chair into position and deliberately sit down and review, and again review, the question of safety.

And having sat down and considered, let us go around and explore. It is not here can be written down all the thoughts we will think and the places we will visit.

Let us hark back to our first visit in some large city, recall with what difficulty we found our way around, stopping here and there a man and plying him with the endless question, the way to reach the object of our visit. Remember our strictures on that city for omitted, defaced and misplaced signs and on the pioneers for crooked, happy-go-lucky twisting of the streets.

Cherish that memory; it will help us to understand the predicament of strangers, of that foreigner, newly arrived, who barely learns the way to work and may never learn the way to safety, to whom the maps of our labyrinth are inexplicable puzzles, to whom the general principles on which our mine is based are unknown, who is not enlightened by converse with his more competent fellows.

In semi-darkness, in complete darkness, in terror, facing the eye of death, after cavings have destroyed landmarks, through roadways rarely traveled, he must thread his way to safety. Have we explored that roadway which he will travel if he has the knowledge to choose and the power to reach it, and which he must strive to pass before we, following time-honored precedent, restart the fan driving the afterdamp on him.

Is that roadway free of water? Is it likely to be after the shock has jarred down the slate in the heading? Is it reasonably straight? Can a man in the dark, groping, wandering, ignorant, unerringly follow it? Is it low and narrow? It will be lower and narrower after a fall.

And now let us uprise and make our mine in this and all other ways a compliance with the law, with the spirit of the enactment, nay more, a reflection of this present age of altruism, even more, a foreshadowing of that age of psycho-sympathy which is yet to come.

SOCIOLOGICAL DEPARTMENT

How the H. C. Frick Coke Co. Takes Care of Its Men

By Thomas W. Dawson*

SYNOPSIS—The company realizes that safety is promoted as much by preparedness and discipline as by the introduction of mere devices for protection. The personal aspect of safety is as important as the material.

The H. C. Frick Coke Co. has carefully considered the risks of mine and village fires. For the illumination of the mines and mine buildings, only the best and safest oils are used. Open lights are prohibited in all buildings around the mine. No oils and explosives must be stored in the underground workings.

Stables, pump rooms, haulage-engine rooms, shaft bottoms, underground offices, and all such places where men might congregate, are of fireproof construction and are kept clean and neat.

All mine rooms, as well as those on the surface, must be well ventilated and kept both neat and clean. Cans are provided for the reception of oily waste, grease, small quantities of oil, etc.

Hay and straw are taken into the mines in bales, not loose. All electric wiring, either for lighting or power, is carefully installed and properly examined at stated intervals. All stoppings and overcasts along main airways are of fireproof construction. In the newer shafts, concrete linings have been provided.

Village Fire Departments

At every mine there is an organized fire-fighting force. The equipment is standard for all plants and interchangeable. Scattered throughout the towns, as well as at the mine, are hose, reels and drying towers. Fire signals are printed on cards and posted at the convenient points, as is customary in the larger well-ordered towns. Water systems are laid, having sufficient water head for fighting fire. On about every fifth or sixth house in the town you will note a ladder and water buckets ready for immediate use.

All bare power lines underground and on the surface are properly guarded for their entire length by a neat wooden guard, so as to prevent the workman or his tools from coming in contact with the same. To insure the same security, trolley wires for coke-drawing machines are placed at a sufficient height to make contact with tools unlikely.

An improved system for checking men in and out of the workings is maintained at all the mines. This shows *HOW MANY* men and *WHO* are underground at all times.

The Personnel

Article No. 5 of the general rules provides for the employing of only steady, reliable and sober men as mine foremen, firebosses, master mechanics, hoisting engineers, boiler and fan tenders and stable bosses. The use of intoxicating liquors by any employee on duty is absolutely forbidden.

Article No. 16 of the general rules says: "No one will be permitted to interfere with the religious or political opinions of the workmen, and no superintendent, boss or clerk will be allowed to solicit money or make collections from the workmen for any church, society or association." Employees must have permission to be absent from duty.

A Spring Stretcher for Use in a Mine Car

The company employs four mine inspectors, one of them acting as chief. It is the duty of these men to visit each and every mine, and thoroughly inspect it at least once every 60 days, reporting the result of his inspection in writing to the general superintendent. When an accident does occur in or about the mine, the chief mine inspector of the company promptly visits the scene of the accident, gathers all the data he can relative thereto, and makes a sketch of the surroundings.

Immediately this sketch is put into permanent form, blueprinted and sent to each mine with a circular letter giving a full account of the accident, and making suggestions for preventing a similar one. This circular and plan is discussed at a meeting of the local officials at each and every plant and methods are devised for preventing similar accidents at their mines.

The Weekly Council

Once each week the superintendents of every mine and their subordinates meet and discuss mine conditions and

*Assistant chief engineer H. C. Frick Coke Co. Scottdale, Penn.

Note—Abstract from paper entitled "Welfare, H. C. Frick Coke Co." read before the winter meeting of the Coal Mining Institute of America

operations generally, and especially matters pertaining to the protection of the lives and health of the employees, and the care and safety of the property. The discussions at these meetings are reported to the general superintendent each week. Then there are general meetings at stated intervals held at the main offices; these are attended by the superintendents of all the plants, and the heads of departments.

There is a separate and distinct plan for the future working of each mine. This plan provides a layout which will assure the best results. Specifications are written for each mine, stating where and how the mining is to be done. These are signed by the company's chief engineer, mine inspector, division engineer, superintendent and mine foreman, to show that they are all familiar with the plan for working each mine.

Projections are made for the workings far in advance of the actual work, and the haulage and ventilating problems planned so that when the mine is developed the best systems are in use.

The officials of the company periodically make a detailed inspection of each and every mine, insuring that their instructions, and the best methods are actually followed at all mines.

The Committee of Safety

In addition to these precautions there is appointed at each mine a committee known as a "Safety Committee." It is composed of three or four men chosen from the various occupations in and about the mine, and it is their duty to inspect periodically the working places, roadways, ventilation and any other things which in their opinion might be the cause of an accident.

They report their findings in writing to the superintendent of the mine, who forwards the same to the general office. These suggestions are immediately acted upon, and any and all dangers, should there be any reported, are removed as quickly as possible. Thus there is a frequent check on the general condition of the mine, and a stimulus to mine officials to keep everything in first-class condition.

All "new" or "green" men are conducted to and from their work underground, and this is continued as long as it is necessary to acquaint them with the traveling way to and from the surface. Should an employee not return from the mine in due time, after the day's work is done, a search is at once made for him.

Reports are made daily by the firebosses, shotfirers and mine foreman. These reports eventually get in the general superintendent's office, so that he is in close touch with existing conditions in detail.

Central Stations for First-aid and Rescue

This company established the first rescue and first-aid station in the bituminous-coal fields of the United States, aside from those which were established by the government. Three stations are now maintained, one at Leisenring No. 1, one at Buffington, and one at Hecla No. 2. They are fully equipped with the best apparatus and accessories obtainable.

There are 36 trained corps of five men each which practice quarterly, and twice that number of men are fully trained and qualified in both rescue and first-aid work. A certificate is issued to each man on completion of the course, and a card is given him which is his credential, permitting him to use the oxygen helmet at the time of an accident.

The company has spent $20,000 on this work in one year, about one-half of which went as wages to the men who attended practice. Before a man is allowed to practice rescue work, he must possess a doctor's certificate showing that he is physically fit to train and perform the labor incident to that work. Every corps elects its own captain or leader, and consequently a man is chosen in whom they have confidence. Printed regulations for rescue-corps men are freely circulated.

Local First-aid Stations

To supplement these rescue stations, pulmotors or resuscitating apparatus are kept at many of the mines throughout the region. By their prompt application a number of employees have been resuscitated after severe electrical shocks and similar accidents.

There are 180 first-aid teams fully organized and qualified to render first aid to the injured. For the purpose of increasing proficiency, local contests are held from time to time. Much interest is manifested by these first-aid men, and in the miners' contest held by the Ninth International Red Cross Conference, in Washington, D. C., the team from Phillips mine won first prize, a silver loving cup.

Emergency hospitals fully equipped have been provided at a number of the larger mines, and the company is contemplating erecting one at each of its operating mines. Underground, in close proximity to the various working sections, can be found first-aid rooms, in which are stored stretchers, blankets and such accessories as may be needed immediately in case of accident. Hospital wagons are used at some of the mines. A device having springs and straps to be applied to the ordinary mine wagon is on hand at each mine. On this the stretcher can be placed and the injured conveyed to the shaft bottom or the surface, without the least shock due to transportation.

(*To be continued in an early issue*)

A Traveling Hospital

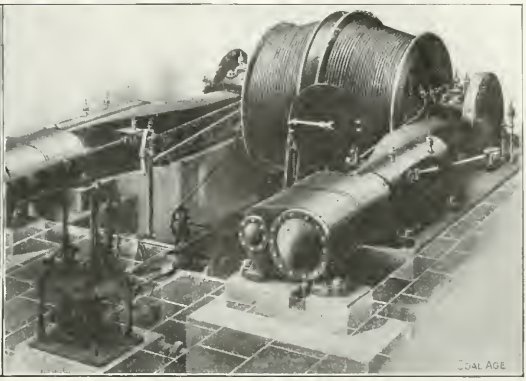
In addition to the elaborate provisions for rescue and first-aid work now in force in the anthracite-coal mines, the Lehigh Valley Coal Co. is just putting into service a mine-rescue car which can be rushed at a moment's notice to any colliery in case of accident. This car consists of a remodelled passenger car equipped with oxygen-breathing apparatus and every kind of first-aid equipment.

It has six complete Draeger oxygen-helmet outfits, by means of which the wearer can breathe for two hours in a gas-filled chamber, with the necessary auxiliary equipment, resuscitating apparatus consisting of pulmotors, stretchers, blankets, splints, antiseptic cotton and provisions for setting up a small commissary in the field.

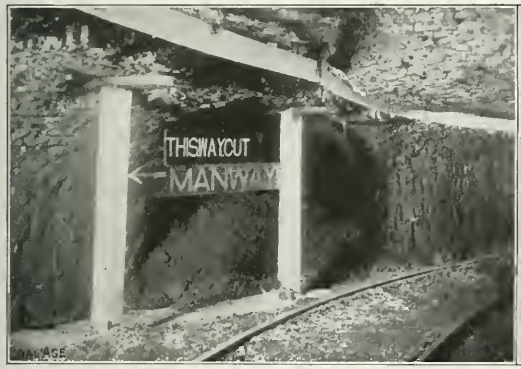
It will be used as a hospital and ambulance car combined, and rushed on call by special train service to any colliery where an accident has occurred, and will be manned by a crew of thoroughly trained helmet men. As there is already a corps in every mine, specially trained in first-aid work and a small hospital with similar first-aid facilities at the foot of all the working shafts, this additional service will complete the provisions for the comfort and safety of the injured mine workers.

Safety Provisions of H. C. Frick Coke Co.

Steel Doors to Drop over Shaft Mouth in Case of Fire



All Hoists Are Provided with Overwind Devices



Trolley-wire Protection and Sign Pointing the Way Out

Stile over Rope Sheaves to Protect Traveling Men

Fireproof Overcast of Concrete with Steel and Tile Roof

All Man Trips Are Secured with Double Safety Chains

...ions for Mine Safety

By J. V. Rhodes*

...ally arise from persons stepping be... n ...k-back rails at the tipple. Safety ... be placed at this point, so that employees ... their feet caught and possibly mashed by the ... he dump.

...hts should be provided at all switches on ha... ...e roads, and the throws for partings should be put on the opposite side from the trolley wire, to keep brakemen from coming in contact with the charged wire.

No motormen should be permitted to make flying switches, as such a practice is dangerous and is prohibited on all first-class railroads. A practice which is dangerous with heavy equipment on a good rail is even more to be feared with light cars on a mine track underground, where in case of a derailment there is no opportunity for escape. The pushing of trips of cars, either loaded or empty, is also very dangerous and should be prohibited.

On delivering empty cars to miners, the driver should ride inside the car at the brake end, and should see that the wagon is properly provided with a "dead block" to keep it from running away from the face. In some cases the miners depend upon the brake to hold the car, and when they start to load coal, the brake is knocked loose by a lump and the car may run on the miner or in the opposite direction, causing an accident either to some employee or to property.

I would recommend that the assistant mine foreman, when hiring a new miner, put the brake on and then pick up a shovel and throw some coal into the car so that it will knock the brake loose. This will show the miner the danger arising from relying upon the brake. Mere explanation may fail to produce the required result, as the miner may not understand what the foreman is endeavoring to tell him.

Many people fail to understand the importance of keeping cars in good condition. One wagon which does not run truly on the track, or which has some other defect, is apt to derail a whole trip and seriously cripple or kill the motorman or brakeman. It is also important that all the bolts on the car shall be thoroughly tightened and the ends cut off flush with the top of the bolt. Otherwise the clothes of men on traveling ways may be caught by passing motor trips.

*Mine foreman, No. 2 plant, U. S. Coal & Coke Co., Gary, W. Va.

Note—Abstract from a paper read at the "Safety Boosting" banquet of the U. S. Coal & Coke Co., Jan. 4.

The Canteen at the Coal Camp

In view of the discouraging results arising from the privately owned saloon in mining towns, the Sunnyside Coal Co. has taken a leaf from the past history of the army and established a canteen at Sunnyside, Colo.

W. P. Oakes, vice-president of the corporation, makes the following statement relative to this novel attempt to meet the situation:

"One of the acknowledged handicaps in every mining camp is the character of the saloons maintained there. These bar rooms are generally of a low order; the liquor sold in them is the vilest of the vile, and trouble of one sort or another is always impending. It is useless to argue against the existence of a saloon of one sort or another in or about a mining-camp. If the men cannot get their beer, or whatever they want to drink, they will buy it from bootleggers, who are even less scrupulous than the owners of groggeries. Either they will get their liquid refreshment from this source, or they will go to some other camp where they can obtain it.

"We had our share of trouble because of the existence of a cheap saloon at our camp. Finally seeing that something drastic had to be done, I called some of the men together and we talked it over. The outcome was that we organized a social club and furnished a club house.

"The members appointed an experienced manager, fitted up their club with all necessary conveniences and comforts, ordered only the best brands of beers and liquors, and were ready for business. They decided at the outset that only bottled beer would be handled, and that all drinks would be served at just about a price which would pay running expenses.

"One of the first rules laid down was that the club bar should be open only from 4:30 to 10:30 p.m. This has been strictly enforced. This regulation has resulted in the men retiring early every night, being fresh for work the next day, and starting in with a clear head because drinking is discouraged in the evening, and the club is closed until after working hours the next day.

"To date the plan has worked to the satisfaction of the men and the company, and I believe the system will eventually be adopted in all the big camps in the state.

"The Sunnyside club is fitted with barber chairs and necessary tonsorial equipment, a pool table, several card tables for social games, in which gambling is barred, easy chairs, a library table and other attractive furnishings, including pictures."

Fatality Reduction in Anthracite Mines

The number of deaths from accidents in and about the mines of the anthracite region of Pennsylvania decreased from 699 in 1911 to 593 in 1912, according to the annual report of the Department of Mines. This is an improvement of approximately 15.2 per cent. The actual improvement will not be ascertained till it is possible to obtain the number of days worked. It must be remembered, moreover, that one of the two largest mine disasters which have occurred in the anthracite region of Pennsylvania happened in 1911, so that comparisons with that year are misleading.

The number of fatal accidents per 1000 employees decreased from 4.03 in 1911 to 2.86 in 1912. The production of coal per fatal accident rose from 130,067 tons in 1911 to 136,902 tons in 1912. The number of fatal accidents per million tons produced decreased, therefore, from 7.69 to 7.42.

FATALITY TABLE OF ANTHRACITE MINES

Yearly Average	Employees	Fatalities	Fatalities per 1000 Employees	Output per Fatal Accident	Fatalities per million tons
1869-1879	55,953	225	4 02	93,288	10 72
1879-1889	97,716	311	3 18	122,572	8 16
1889-1899	137,790	434	3 15	121,185	8 23
1899-1909	160,167	549	3 42	130,256	7 68
1912.	175,964	593	2 86	136,902	7 42

This is a gratifying result to the anthracite operators who have spent much money, time and thought in securing safety.

DISCUSSION BY READERS

Post Timbering at the Working Face

Letter No. 2—It would be useless to attempt to be original in the discussion of such a subject as mine timbering; but I have in mind a suggestion that I believe, if carried out, would have a greater tendency to reduce accidents from falls of roof and coal than can possibly result from the closest vigilance of mine officials.

In Great Britain and on the Continent, the mining laws specify clearly what is called the maximum distance that mine timbers may be set apart and the distance such timbers may be set from the face of the coal. Any violation of this law on the part of the miner, if discovered, is followed by prosecution. It is needless to say that this kind of legislation has had the effect of greatly reducing the rate of accidents from this cause. If good legislation and the enforcement of such laws have been good for Great Britain and Germany, surely it would be worth while to try the effect of the same in this country.

Information on which to base such legislation could be best obtained from the mine inspectors who have good opportunities to know the nature of the various seams in their districts. I believe it would be possible for the mine inspectors, in most mining districts, to determine what should be considered a maximum distance apart for setting post timbers and the maximum distance such timbers should stand from the face of the coal, for different depths of seam and for different kinds of roof, leaving, perhaps, to the mine inspector of the district, the particular classification of the mine in this respect.

Having settled upon the details of such a classification of mines and the maximum distance of timbers apart, for the several conditions, it would be up to the chief mine inspector in each state to urge suitable legislation that would enable the mine inspectors to enforce compliance with such requirements, in their districts. A good law is the first requisite and this should be followed with a thorough discipline in the mine, without which it is impossible to secure the greatest efficiency, safety and economy in mining.

Another suggestion is in regard to the size of timbers sent into the mine, for use in certain places. The ordinary miner does not give any attention to the diameter of the posts that are sent in to him. To most miners, a post is a post, and its length is of the first importance; the diameter concerns him less. I have seen props taken into a mine that were 10 ft. long and only 4 in. in diameter at the small end. Every miner should know that a prop of this kind is out of proportion and totally inadequate to support any reasonable amount of weight.

In post timber, some specified diameter should be determined by those who have the matter in charge. It is also important that all miners should be required to have suitable tools for setting timbers; and, as a further precaution, every miner should be required to demonstrate his method of testing roof and setting a mine post

I have tried to make these suggestions [illegible]d such as I believe should form a basis for our work [illegible]educing the number of accidents from falls of roof and coal.

WILLIAM CROOKS,
Mine Foreman.

Quinton, Ala.

Letter No. 3—The question of timbering at the working face is one that needs careful thought and study. In the first place, the work of timbering should not be planned for the present only but also for the future. What is the working face today will soon be left behind for a road or haulway, and the weight on the timbers will not be less but greater, if anything, as the face is advanced. The timbering, good or bad, will affect the expense of keeping the place open and maintaining the road in good, safe condition.

Mine timbers should be set so that they will conform to the rules and regulations of the mine, and in such a manner and where they will do the most good. In my opinion and experience as a miner, however, there can be no set rule for the placing of props. This is particularly true in the anthracite region.

To avoid accidents due to falls of roof and coal, it is necessary to consider carefully the condition of the roof, having regard to whether it is a hard or soft stone, or a slate or bony roof; as the size of the timbers needed will vary accordingly, from 6 to 12 or 16 in.; although such heavy timbers are seldom sent to the face.

In most anthracite mines, no timber less than 10 in. in diameter should be used. In general, the strata have been very much disturbed and broken. The nature and condition of the roof play a large part and, in fact, are the chief factors to be considered, in timbering. Study the roof and consider whether a large or small prop is needed. Many times a small prop is stood where a large one would be better; and, again, a large one is used where a smaller one would answer the purpose. Props should be stood so that they will give the necessary support and take the weight properly.

The strength of mine timber is important and largely determines its value. The best timber is needed and should be used, as the weight it is required to support cannot always be estimated and varies with different kinds of roof. When the character of the roof and overlying strata are known the style of timbering best adapted to the conditions can be determined; but without that knowledge one is mostly playing a game of chance.

Timbers should be set as soon as possible after a slant slab or other condition that requires special attention has been discovered. Observing this rule carefully will prevent many accidents that occur from falls of roof at the face. A good plan is to always protect the timber supporting the roof, by leaving some coal around the props that will prevent them from being knocked out by the flying coal when a shot is fired. It is always more dangerous to reset a prop that has been once stood and then knocked out, under a bad roof.

The wedging of a post is important. The wedge should cover the whole top of the post and not just a few inches. Proper wedging is necessary to give the post greater resisting power against flying coal to avoid, as far as possible, its being knocked out when a shot is fired.

The life of post timber differs with the kind of wood and the manner and time it is cut, as well as the conditions to which it is subjected in the mine. Props cut when the sap is out of them will last longer than the same timber cut when it is green.

There are good reasons why miners should stand their own timber. This practice will make each miner, to a large degree, responsible for his own safety. If a miner does not understand the roof where he is working, he should be instructed by someone who is competent to instruct him. In many cases, it would be better to take down a bad piece of roof than to attempt to prop it up and hold it in place. There would be fewer accidents at the working face if this was done.

A MINER.

Scranton, Penn.

Posting a Drawslate

Some time since, notice was sent by the bituminous-mine inspectors to the different superintendents, mine foremen, assistant mine foremen and firebosses, in their several districts, describing in detail the manner suggested for the posting of drawslate (COAL AGE, Vol. 2, p. 258). I would like to draw special attention to a dangerous feature and one that is often overlooked in posting roof slate, at the face of a room. I refer to the possible existence of a clay vein or spar, or a slip in the slate, at the back end of the cut, which is, as yet, hidden from sight, so that it is not detected.

Having this matter in mind, I prepared, a while ago, the following instructions, which were sent to the several mines in my district, asking for the kindly aid and cooperation of all the general superintendents and superintendents in the district, to assist in reducing accidents at the working face, by again directing all mine officials in their charge to urge that every precaution be taken by the workmen to avoid danger from this cause.

In sending out this notice, I was anxious to urge that it is not sufficient for the mine foreman, assistant foreman or fireboss to draw attention to the notice as posted and think that his responsibility ends when he has told the men to set the needed posts. It is important that he should see that his orders are carried out to the letter, as this is the only way to reduce the number of accidents from falls of roof and coal.

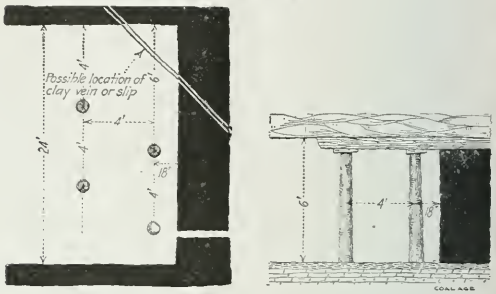
The reduction of fatal accidents during 1912 has been largely due to the carrying out of Art. 4, Sec. 10, and Art. 5, Sec. 3, of the new bituminous-mine law (1911). I wish to express my satisfaction in the generous assistance the operators have given their mine foremen, aiding them to carry out this part of the law. I feel that what remains to be done is to impress upon all mine officials the absolute necessity of seeing that their instructions *are carried out or enforced*.

In this connection, also, I want to call attention to the fact that all coal should be spragged while being undermined, especially in pillar and stump workings, in accordance with Art. 4, Sec. 9. I would also refer to the high percentage of accidents by mine cars and draw attention to the need of widening all old entries where hauling is done, as required by the law, Art. 4, Sec. 8; and where electricity is used I would urge that due attention be given to paragraphs 40 and 41, of Art. 11. In asking this coöperation of the mine officials in the district, I desire to express my satisfaction in the work they have already done in this direction, and my confidence in them that it will still be carried vigorously forward.

CHARLES P. MCGREGOR,
State Mine Inspector, 7th Bit. Dist.

Carnegie, Penn.

Following is a copy of the instructions:



SHOWING POSSIBLE LOCATION OF SLIP IN ROOF SLATE

INSTRUCTIONS TO MACHINE LOADERS AND MINERS AS TO POSTING DRAWSLATE WHILE LOADING OUT A CUT OF COAL.

To Mine Foreman of.....Mine.

.....

The common method of posting along the front of the slate is not safe, as there may be a false slip, clay vein, or spar, at back end of cut of coal, which will throw the posts and slate forward. In order to avoid this, as far as possible, the mine foreman, assistant mine foreman and fireboss should each instruct the men under their charge to put from four to five posts at a point halfway back or near the face of coal, under all slate, in the form of a triangle, the mine foreman to use his own judgment as to the distance these posts should be set apart, as shown on blue print. It would be a good thing to insist on the machine cutters putting a piece of pit rail about 8 or 10 ft. from the rib or pillar, under the coal, as a sprag, which would keep the coal from settling down and allowing the drawslate to sag. All projecting drawslate, both in rooms and entries, to be taken down, also on haulage and travelingways.

The writer would urge the manager, general superintendent, mine superintendent, mine foreman, assistant mine foreman and firebosses to give this matter their most careful consideration. I feel certain that the number of fatal and nonfatal accidents can be reduced.

The mine foreman is referred to Art. 20, Sec. 1, Rule 1 of the mining laws, which reads as follows: "The mine foreman shall attend to his duties in the mine and carry out all the instructions set forth in this act and see that the regulations prescribed for each class of workmen under his charge are carried out in the strictest manner possible." Post this up in a conspicuous place at mine, as provided for in Art. 10, Sec. 12, of the mining laws.

CHAS. P. MCGREGOR,
State Mine Inspector, 19th Penn. District.

Engineers Meeting

The New York section of the American Institute of Mining Engineers will hold its next meeting at the Engineering Societies' Building, 29 West Thirty-ninth St., New York City, on Friday, Mar. 21, at 8:30 p.m. G. S. Rice, chief mining engineer of the U. S. Bureau of Mines, will present a paper on "Notes on European Mining Practice, especially the Methods of the Hydraulic Filling or Flushing of Mines."

Taxation of Coal Lands

Your editorial on the Tax Valuation of Coal Property, Coal Age, Feb. 15, 1913, p. 267, advocating a royalty basis of valuation, was evidently written without considering in full the present laws of the state of Pennsylvania. The assessment of lands for taxation in Pennsylvania is made under the Acts of the Legislature of 1841 and 1842, under which all properties must be assessed at the actual value and at such rates and prices as the property would bring at a bona fide sale, after due notice."

In the long, tax litigation that has taken place over the 1907 anthracite assessment, in the Pennsylvania courts, the matter has been five times brought to the Supreme Court on appeal, and the decisions made in these cases must be followed in making any legal assessment. The question of valuation on a royalty basis was brought up in two of these appeals, and the Pennsylvania Supreme Court says, referring to such a royalty basis, (Penn. Supreme Court Report No. 299, page 470):

> Its market value is its fair selling value for cash, not payable as royalty strung out through a long series of years, but payable at the time or as soon thereafter as the value could be determined. Such a method does not make allowance in undeveloped territory for the length of time coal may lie in the ground unmined, undeveloped and unprofitable. It is impossible to reduce to a scientific basis and to mathematical precision the elements of value entering into the present selling price of a tract of coal land. The question is not what earning power coal lands may develop in the future, but what they are actually worth in the market at present.

Further, in the opinion of Judge Fuller, President Judge of Luzerne County, Pennsylvania, No. 614, October term, 1907, sustained by the Supreme Court, it is stated, page 21,

> The law does not sanction a valuation upon coal in place specifically determined by the royalties which it may yield or its availability for market.

Under these decisions, which form the law of the state, it is necessary to assess coal land at its sale value not on a royalty basis, nor on the foot-acre basis, as was previously done; for, in Pennsylvania Supreme Court Report No. 229, page 465, Reading appeal, the Court says,

> * * * * that the foot-acre rule for ascertaining valuation of coal lands of the appellant for the purpose of taxation is not the proper measure of their value * * * *.

Further, it may be pointed out that, under the Pennsylvania law, assessment on similar properties must be equal and, if not so made, may be equalized by the County commissioners. On a royalty basis, the time of mining would be the deciding factor in the value of any property. Calculating the present value on a six-per cent. basis, less the taxes, which must be paid as an annuity and which amount to about 2¼ per cent. of the assessed valuation in Luzerne County at the present time, coal land of a value of $100 per acre if mined now, would be reduced in value to about $42 per acre if it were not to be mined for ten years, or to $11 per acre if standing idle twenty years, and beyond 23 yr., 8 mos. such lands would have a present minus value amounting, at thirty years, to minus $20 per acre, and at forty years, to minus $40 per acre.

Then, on a royalty basis, two adjacent and similar tracts, one opened and in operation and to be mined out in ten years; and the other not to be opened for thirty years, would show radically different values though containing similar amounts of coal of identical value in the market; and further, a mere extension of ownership to include the reserved with the opened tract would change the value of the reserved tract from zero to a very large cash value, which is certainly neither legal under the state laws, nor apparently just to the communities involved.

It seems to me that all taxation of coal or other minerals in the ground is logically wrong. The coal has no value until it has been mined and prepared for market.* The amount of mineral, its availability, and the duration and cost of working are all undetermined and undeterminable factors, which, used as a basis for assessment only lead to dissatisfaction and litigation. The proper method of taxation of all minerals would be a tax on the value of each year's output, at the rate assessed for that particular year, including taxation of surface improvements and machinery the value of which is readily ascertainable, but not including any valuation for mine openings, which are incidental to the mining of the mineral and which on its exhaustion are no longer of any value.

Thus, a colliery producing 1,000,000 tons of anthracite in 1912, with a value at the breaker of $2,500,000, should pay taxes in 1913, at the regular rate for that year, on a valuation of $2,500,000, regardless of the area of coal land tributary to such a colliery. This method is clearly unlawful under the present Pennsylvania law, and would require special legislation to put it in force. However, such a system if legalized would possess the advantage of doing away with all uncertainty and litigation as to the assessed valuations, and would result in the payment of taxes in greatest amount, at the times and in the localities of greatest production and consequent greatest population and greatest need for money; and, by concentrating taxation on the land being most actively worked and relieving reserve land from its present almost insupportable burdens not only of taxation but of litigation, it would tend to the conservation of the unreplaceable coal resources of the community by encouraging the complete mining of lands once opened, including all workable beds large or small, rather than the opening of the best beds on all lands, to obtain immediate earnings even at the cost of injury or destruction to interstratified, smaller and less profitable beds.

R. V. Norris,
Consulting Engineer.

Wilkes-Barre, Penn.

[The arguments of Mr. Norris are familiar to us, as are also the Supreme Court decisions. The main question is concerned with the methods of determining actual present value. How does a competent well informed engineer arrive at such value? Naturally, by the method suggested in our editorial, which is the method used by such authorities as Joseph H. Harris, and the late W. A. Lathrop in determining the value of coal lands as the security for issues of bonds, etc. *The statement that coal has no value till mined and prepared for market does not agree with the Supreme Court decisions quoted.

If no common-sense method of valuing property exists under present judicial interpretation of the laws, is it not time to devise such a method, and if necessary to revise the laws for that purpose? We would like to hear from other engineers who have ideas in this matter.—Editor.]

INQUIRIES OF GENERAL INTEREST

Blowing vs. Exhausting in Fan Ventilation

Will you kindly inform me whether there is any difference in the pressure that a fan will produce at a given mine when blowing or exhausting, under the same conditions and at the same speed.

For example, suppose a reversible fan, at a certain mine, produces 60,000 cu.ft. of air at a given speed, under a water gage of one inch; and suppose it is desired to reverse the air current by shifting the doors in the fan drift so as to make the fan blow the air into the mine instead of exhausting the same from the mine. For the same quantity of air in circulation, will there be any difference in the water gage and, if so, why?

J. A. McD.

Reserve Mines, C. B., Nova Scotia.

For the same quantity of air in circulation in the mine, there will be no change in the ventilating pressure or water gage, unless there are natural or secondary air columns in the mine that act for or against the circulation, or some other obstruction exists that makes the flow of air in one direction easier than the flow in the opposite direction. Either of these conditions would change the observed water gage, for the same circulation of air.

A secondary air column might easily exist in a shaft mine or in a seam of steep inclination, owing to the heat radiated from steam pipes in the shaft or slope. This air column would act to assist the general circulation when such shaft or slope was the upcast, but would oppose the circulation when the air current was changed so as to make the same shaft or slope the downcast. Without knowing these conditions it would be impossible to state what change of pressure would take place when the fan was reversed.

In this connection, it is necessary to remember that it is the resistance of the mine airways, including the shafts, both downcast and upcast, that produces the ventilating pressure or water gage. Without this resistance there would be no pressure, but the power of the fan would be wholly exerted to produce a high velocity of the air current. There are still other conditions affecting this question besides those we have mentioned.

When the fan is exhausting, it is filled with the mine air, which may be warmer or colder than the outside air and may contain gases that are lighter or heavier than pure air. When the fan is working on heavier air, a greater power is required to produce the same speed of revolution of the fan and, *vice versa*, when the fan is filled with lighter air, a less power is required to produce the same speed. It may be stated that the power applied to the fan shaft varies as the *square* of the efficiency of the fan, the *fourth power* of the speed and the *square* of the density of the air passing through the fan; and *inversely* as the resistance of the mine, the latter being measured by the product of the unit pressure and the sectional area of the fan drift. It is readily seen from this statement and the foregoing explanation that the question of how the reversing of the air current in a mine will affect the water gage, cannot be determined, except with a full knowledge of the conditions.

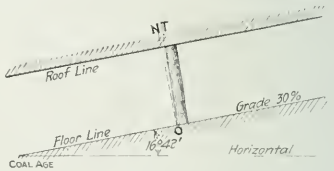
Setting Post Timber in an Inclined Seam

How much pitch should be given to a post in a seam having an inclination of 18 deg.? Explain the manner of setting a post in an inclined seam. What is the purpose of the cap-piece above the post?

A MINER.

Crosby, Wyo.

When setting a post in an inclined seam, the post must be *underset;* that is to say, it must be inclined up the pitch a slight angle from the normal, as shown in the accompanying figure. The angle *NOT* at which the post



SHOWING HOW A POST SHOULD BE SET IN AN INCLINED SEAM

is inclined up the pitch, will vary from 1 to 9 deg., according to the amount of inclination of the seam. The purpose of undersetting a post, in an inclined seam, is to prevent its being loosened by the slipping of the roof downhill, as the coal is extracted. It is evident from the figure that any movement of the roof, in a direction down the pitch, will tend to tighten the post when it is thus underset.

When setting a post in an inclined seam, a slight foothold is first cut in the floor of the seam sufficient to hold the foot of the post in place while setting. The small end of the post is then placed over this foothold with the large end up the pitch. In this position, the head of the post is raised, the cap-piece being inserted between the top of the post and the roof. Both the head of the post and the cap are then driven forward from the upper side, until the post assumes its proper position.

The purpose of the cap-piece is twofold: First, the cap-piece serves to distribute the resistance of the post over a greater surface of the roof and tends to prevent the post from cutting into the roof as would otherwise often be the case. Second, the cap-piece should be of soft wood and of sufficient size to completely cover the head of the post. As the roof "weights," the head of the post is forced into the soft wood of the cap, which binds it together and prevents the "furring" of the post. By *furring* is meant the crushing over of the fibers, at the head of the post.

EXAMINATION QUESTIONS

Miscellaneous

Answered by Request

Ques.—What precaution would you take in a gaseous mine, where coal is cut by electric machines and what method of blasting the same would you adopt?

Ans.—The use of electric machines in gaseous mines is attended with danger and should only be permitted when the working face can be kept free from any accumulation of gas and an ample current of air continually sweeps the face of the coal. In a gaseous mine, it is better to use some other type of machine for undercutting the coal. If electric machines are used, every precaution must be taken to prevent sparking or short-circuiting of the electric current, as well as to maintain an ample ventilating current sufficient to carry off the gases as they are generated.

In blasting down the coal, after the face has been undercut, care should be taken to avoid heavy shots and to see that the coal is not cracked or broken in the vicinity of the shot. The fine machine cuttings must be cleaned up and removed and the place carefully tested for gas before a shot is fired. Permissible powder should be used in blasting. If the mine is dusty, the working face should be thoroughly sprinkled, and also the road and ribs for a distance of about 20 yd. from the face.

Ques.—Give the composition of monobel powder and state what gases are generated when this powder is exploded.

Ans.—Monobel is a permissible powder of the ammonium-nitrate class, containing nitroglycerin. The principal constituents of the powder are nitroglycerin, wood pulp, ammonium nitrate and moisture. The proportions of these constituents are such as to produce complete combustion. The gases produced are carbon dioxide, nitrogen and water vapor.

Ques.—At the same temperature and pressure, which is the heavier, dry air or the same volume of air fully saturated with moisture?

Ans.—At the same temperature and pressure, dry air is heavier than air saturated with moisture, volume for volume. The reason for this is that the water vapor or moisture occupying a portion of the space is lighter than the air that it displaces. The specific gravity of water vapor is 0.6235.

Ques.—(a) With a barometric pressure of 30 in. and a temperature of 60 deg. F., what effect would be produced on a given volume of air if the barometer should fall to 29.5 in.? (b) What change in temperature would be required to maintain a constant volume of air, under this fall of barometer?

Ans.—(a) For a constant temperature, the volume of air or gas varies inversely as the barometric pressure; in other words, the *volume* ratio is equal to the *inverse pressure ratio* or *barometer ratio*. For example,

$$\frac{V_2}{V_1} = \frac{B_1}{B_2} = \frac{30}{29.5} = 1.017, \text{ nearly}$$

Therefore, the temperature remaining the same, a fall of barometer from 30 to 29.5 in. expands the air volume 1.017 times; or, 10,000 cu.ft. of air would then become 10,170 cu.ft.

(b) For a constant volume, the absolute temperature varies as the barometer; or, in other words, the *absolute-temperature ratio* is equal to the *barometer ratio*. In this case, calling x the temperature required to maintain the volume of air constant when the barometer falls from 30 to 29.5 in., we have

$$\frac{460 + x}{460 + 60}; \text{ or } \frac{460 + x}{520} = \frac{29.5}{30} = 0.9833$$

$$460 + x = 0.9833 \times 520 = 511.3$$

$$x = 511.3 - 460 = 51.3^\circ \text{ F.}$$

Therefore, if the temperature falls from 60 to 51.3 deg. F, when the barometer falls from 30 to 29.5 in., the volume of air will remain unchanged.

Ques.—What determines the number of posts that must be set in a room 24 ft. wide?

Ans.—The number of posts that must be set at the face of a room will depend on the character of the roof and floor, the depth of the seam below the surface and, to some extent, on the thickness of the seam. Assuming a 5-ft. seam and timbers 5 ft. long and 5 in. in diameter at the small end, the end area of each post would be $0.7854 \times 5^2 = 19.635$ sq.in. Then, taking the safe crushing strength of the timber as, say, 3500 lb. per sq.in., and the load each post will carry without crushing is

$$\frac{19.635 \times 3500}{2000} = 34.36, \text{ say } 35 \text{ tons}$$

Under a fair roof, the height of the loose material resting on the props may be taken as one-half of the width of the opening. Then taking the weight of the roof material as 160 lb. per cu.ft., the pressure per square foot resting on the props is

$$\frac{24 \times 160}{2} = 1920 \text{ } lb., \text{ say } 1 \text{ ton}$$

In this case, therefore, each post will safely support 35 sq.ft. of roof; or the posts may be set $\sqrt{35}$ = say, 6 ft. apart. This is what may be called the maximum distance apart of the posts, under the conditions assumed. With a frail roof, the timbers must be set closer together.

Ques.—Find the inclination of a seam of coal outcropping on a level surface. A vertical borehole is sunk at a point 500 ft. from the line of outcrop and penetrates the seam at a depth of 350 ft. below the surface.

Ans.—The tangent of the angle of inclination of the seam or the tangent of the angle the seam makes with the horizontal plane is equal to the depth of the hole divided by the horizontal distance from the bore hole to the outcrop of the seam as measured on the surface. Thus, in this case,

$$\tan A = \frac{350}{500} = 0.7$$

The angle of inclination, as found in the table of tangents is, therefore, 35 deg.

COAL AND COKE NEWS

Washington, D. C.

Investigations which have been ordered by the Interstate Commerce Commission during the past few weeks have developed, it is now understood, a condition which, it is believed, can be corrected only through a searching inquiry and orders issued as a result thereof. The case in question relates to the use of private cars in a way that tends to produce abuse and to give what amounts to rebates to those who are disposed to avail themselves of the opportunities in this regard that are offered under the situation said to be in existence today.

In order to get at the facts in the matter, inquiries have been sent out to a large number of concerns throughout the United States that the commission may ascertain, if possible, whether these concerns have shared in any degree in the supposed profits of the private car system. Among those who are understood to have made serious complaints to the commission within the recent past, are many coal-mine owners who assert that they have been unable to get the facilities they desire, and that, as a result, they have had to witness advantages given to others who are not especially entitled to them and whose preference over the complainants has resulted in decided damage to the latter.

The private-car question has formed the basis of a good many inquiries and hearings before the commission for some time past, and there has apparently been no way of correcting the abuses said to have sprung up, under existing laws. Mr. Marble, the newly appointed member of the commission, is particularly close to the private car situation, as he has devoted himself largely to the study of the conditions growing out of the widespread use of the cars in question.

Commissioner McCord has been given general authority over this investigation and has designated George P. Boyle as chief examiner to collect the information and direct the work of special examiners. In communicating with the public, the commission says officially: "It is the desire of the commission that all shippers or associations interested in this investigation communicate to it not later than Mar. 31 such information as may be in their possession and which they consider pertinent to the inquiry."

It is stated that in all probably about 1200 private car companies exist, and the series of questions has been mailed to them, preceded by a statement setting forth that it is the intention of the Commission to hold hearings at various places throughout the country and informing the recipients that the answers sent in will be used as the basis of the hearings.

It is believed that one important phase of the answers to the interrogatories will be found in the question whether in the judgment of the shippers and the car companies a carrier ought to own enough equipment to take care of all of the commodities of every kind originating on its line and which it is likely to be asked to handle.

Judging from present appearances, the investigation is likely to be protracted for a good many months. Much of it will probably be carried on in the mining regions.

Proposed Rate Advances

Definite plans have been made, according to information received here by the domestic interests, to urge upon President Wilson's administration what is considered by railway men the necessity of an advance in the rates on bulk commodities generally and on coal and a few others in particular.

The roads are feeling keenly the movement for the increase of wages which, they assert, has put them in position to suffer severely unless they are enabled to raise their rates in a corresponding degree. Up to date, as is well known, the attitude of the Interstate Commerce Commission has been hostile to any advance in rates, and proposed increases have been almost uniformly turned down on the ground that they were not required and were not in harmony with the policy enunciated in the so called "advanced rate decisions" of a couple of years ago.

The action of the administration in appointing Franklin K. Lane as its Secretary of the Interior and in nominating John H. Marble, who has been in general sympathy with the policy of Mr. Lane as his successor, is not considered to show much sympathy with the plan to advance charges on the roads. Nevertheless, the railroad men are preparing to present their case in a strong and effective manner in order that Mr. Wilson himself may be persuaded to take a definite attitude regarding it.

It is felt that, while the powers of the administration with respect to rates are far smaller than they were at the opening of the Taft administration, owing to the transfer of so much power to the commission, the point of view of the President would be exceptionally influential with the commission as the policy to be followed on rates has always been considered a semipolitical, if not a wholly political, issue.

PENNSYLVANIA

Anthracite

Wilkes-Barre—No. 4 colliery of the Kingston Coal Co. was totally destroyed by a fire which broke out in a tower over the engine house. The loss to the company will amount to $100,000, which is partially covered by insurance. More than 2000 men and boys will be thrown out of employment for a time at least. The cause of the fire is supposed to have been a crossed wire in the tower of the breaker.

Hazleton—The Government mine-rescue car which has been stationed at the collieries of the Hazleton district for the past seven weeks has been removed to Wilkes-Barre.

Plymouth—According to the decision of the officials of the Avondale colliery of the D., L. & W. Coal Co. that colliery will probably be closed down for some time. The company is having trouble with its men over the prices paid for setting timber.

Bituminous

Adrian—The large company store of the Jefferson & Clearfield Co. has been totally destroyed by fire. The building was a three-story structure, with a warehouse annex.

Harrisburg—Governor Tener has named the members of the mine-examining board for the bituminous district for the next four years. The board consists of A. W. Callaway, Indiana; Robert Morris, Greensburg; H. C. Drum, Coal Center; R. M. Pollock, Star Junction, and C. B. Maxwell, Morrisdale. All appointments have been confirmed.

California—William Matthews and son were seriously injured by a fall of slate in the Vesta Coal Co.'s mine at California.

Altoona—Mine-rescue car No. 6, in charge of Mine Foreman D. D. Davis, has left Cardiff and is now located at Vintondale.

Du Bois—Superintendent John H. Fulford, of the Eriton shaft, announced, Mar. 6, that that operation would close down for the purpose of repairing the pan on the tipple.

Mr. Fulford stated that it would require three weeks to repair the work, and that the mines would be idle all of that time. He stated that in the 40 hours that have been worked at the shaft since the men resumed work under the new system, the company has lost 257 tons of coal, which is the chief cause for stopping work at this time.

It is planned to raise the rear of the pan so that it will clean itself.

WEST VIRGINIA

Wheeling—Seventy-five miners at the mine of the Fairpoint Coal & Coke Co. are out on strike. Subdistrict officials are investigating the trouble with a view to an early settlement.

Moundsville—The jury has granted a judgment of $6000 in favor of the widow of one of the eight men who lost their lives in the Panama disaster last July. This case is the first of the eight to be tried. Incompetency on the part of the fireboss was alleged.

INDIANA

Princeton—The Jackson coal mine at Fort Branch has been closed down by the state inspectors. The inspectors insist that black powder shall not be used in the mine, while the company declares they see no reason for a change, since the mining law does not prohibit it. The trouble is the outcome of a recent accident in which two shotfirers were killed and the mine partly wrecked. It is probable that the owners

of the mine will bring action to restrain the state mine inspector from enforcing this order.

KANSAS

Pittsburg—Two hundred miners employed at the mine No. 14 of the Fleming Coal Co. have been ordered to remove their coal and tools from the mine by the district mine officials. The men say they quit work because the operators refused to raise the wages of the mine motormen according to an alleged agreement.

Coal has been struck in Grant Township on the land which has been optioned by the Misouri, Kansas & Texas Ry. Co. The seam is 10 in. thick and lies at a depth of 84 ft.

NORTH DAKOTA

Makoti—A 6-ft. bed of high-grade coal is said to have been discovered on the B. Rosenberg farm by well diggers. It is believed that the fuel is of the highest quality ever found in the state. It is extremely hard and apparently not of the ordinary lignite type.

FOREIGN NEWS

Hobart, Tasmania—The bodies of 18 miners were brought to the surface of the North Mount Lyell mine Mar. 1, after a search which has lasted nearly five months. Forty-five bodies have now been recovered, and a further search has been abandoned. A fierce fire, started by the explosion in which the men were killed last October, has made it unsafe to explore the mine further.

PERSONALS

F. R. Lyon has been appointed general manager of the Consolidation Coal Co. Mr. Lyon will be in charge of the operations in all the coalfields of the company.

Daniel C. McAlpine, formerly superintendent for the Brewer Coal Co., at Brewer, Okla., has taken the position of superintendent for the Folson Morris Coal Co., at Lehigh, Okla.

John Markle, for over thirty years a prominent factor in the anthracite mining industry, is about to retire to private life, and his brother, Alvin Markle, will assume charge of the Markle mining interests on Apr. 1.

H. M. Wilson, engineer in charge of the government experiment station at Pittsburgh, has been made chairman of the executive committee of the American Mine Safety Association. This organization has been formed to work for a reduction in the number of deaths in the mines and quarries through the country.

Fred R. W. Thomas, formerly superintendent of mines for the Northern Pacific Ry. Co., at Roslyn and Cle-Elum, Wash., was recently promoted to take charge of the company's mines in King County, where the mining conditions are much more complex. His headquarters are at Ravensdale on the main line of the Northern Pacific, about 30 miles from Seattle.

Herman Bacharach, until recently located at 722 Lewis Block, Pittsburgh, Penn., has moved into larger quarters at 1009 Hartje Building. He has enlarged the number of his specialties in scientific and industrial instruments. Besides indicating and recording steam and gas apparatus, he has taken up some new lines of instruments. Among others, smoke and dust recorders, specific gravity meters for gas and liquid, carbon dioxide recorders and engine indicators with automatic efficiency reckoner, etc.

RECENT COAL AND COKE PATENTS

Ore Dock. M. Toltz, St. Paul, Minn. 1,050,357, Jan. 14, 1913. Filed Apr. 21, 1911. Serial No. 622,498.

Conveyer. C. W. Hunt, New York, N. Y. 1,048,834, Dec. 31, 1912. Filed Dec. 30, 1910. Serial No. 600,007.

Stoker. D. F. Crawford, Pittsburgh, Penn. 1,050,054, Jan. 7, 1913. Filed May 8, 1909. Serial No. 494,894.

Coal Chute. F. H. Dudley, Lincoln, Neb. 1,049,464, Jan. 7, 1913. Filed July 15, 1912. Serial No. 709,610.

Miner's Squib. J. R. Powell. Plymouth, Penn. 1,050,390. Jan. 14, 1913. Filed Mar. 7, 1912. Serial No. 682,154.

Coal Drill. W. H. Clarkson, Edwards Station, Ill. 1,049,454. Jan. 7, 1913. Filed Mar. 16, 1908. Serial No. 421,342.

Centrifugal Pump. R. H. Dixon, Newark, N. J. 1,050,523. Jan. 14, 1913. Filed Dec. 20, 1911. Serial No. 666,977

Mechanical Stoker. D. F. Hervey, Logansport, Ind. 1,049,357, Jan. 7, 1913. Filed Mar. 25, 1912. Serial No. 686,185.

Furnace Grate. T. Dawson, Livingston Manor, N. Y. 1,050,619, Jan. 14, 1913. Filed Dec. 12, 1911. Serial No. 665,290.

System of Handling Coal. W. E. Hamilton, Columous, Ohio. 1,050,272, Jan. 14, 1913. Filed Nov. 27, 1911. Serial No. 662,639.

Mechanical Stoker. W. Seaton, Jr., New York, N. Y. 1,048,356, Dec. 24, 1912. Filed June 27, 1905. Serial No. 267,174.

Exhaust Valve for Steam Engines. H. O. Hem, Kansas City, Mo. 1,050,537, Jan. 14, 1913. Filed Feb. 12, 1912. Serial No. 677,153.

Valve Gear for Steam Engines. J. Davidson, Pendleton, Eng. 1,050,618, Jan. 14, 1913. Filed May 20, 1911. Serial No. 628,372.

Coke Oven Door. T. J. Mitchell & J. A. McCreary. Uniontown, Penn. 1,050,677, Jan. 14, 1913. Filed July 18, 1911. Serial No. 710,304.

Device for Propping Mines. F. Nellen. Essen-on-the-Ruhr, Germany. 1,049,135, Dec. 31, 1912. Filed July 29, 1908. Serial No. 445,964.

Handle Fastening for Picks and Other Tools. E. L. Ray, Agency, Iowa. 1,048,096, Dec. 24, 1912. Filed Mar. 12, 1912. Serial No. 683,281.

System of Feeding Treated Water to Boilers. J. H. Cooper, Paola, Kan. 1,050,616, Jan. 14, 1913. Filed Mar. 13, 1911. Serial No. 614,198.

Centrifugal Pump. J. A. Yeatman, assignor to United Iron Works, Oakland, Calif. 1,050,588, Jan. 14, 1913. Filed Dec. 26, 1911. Serial No. 667,758.

Valve Gear. T. Hall, assignor to Ridgway Dynamo & Engine Co., Ridgway, Penn. 1,050,213, Jan. 14, 1913. Filed Dec. 8, 1912. Serial No. 531,938.

Gas Producer. W. B. Chapman, assignor to Chapman Engineering Co., New York, N. Y. 1,049,994, Jan. 7, 1913. Filed Mar. 5, 1910. Serial No. 547,514.

Stoker. H. E. Stover, assignor to Baldwin Locomotive Works, Philadelphia, Penn. 1,048,756, Dec. 31, 1912. Filed May 21, 1912. Serial No. 698,680.

System for Utilizing Waste Heat from Furnaces for Heating Boilers. J. W. and Herman Hegeler, Danville, Ill. 1,050,134, Jan. 14, 1913. Filed Jan. 25, 1912. Serial No. 673,428.

Apparatus for Watering Coke in Coke Ovens. C. E. Taylor, Pittsburgh, Penn., and A. C. Wolfe, Alicia, Penn. 1,049,006, Dec. 31, 1912. Filed Oct. 11, 1911. Serial No. 654,152.

Coke Oven Steam Generator. J. H. Morgan, assignor to Titlow Waste Heat Power Co., Uniontown, Penn. 1,050,679, Jan. 14, 1913. Filed July 28, 1909. Serial No. 510,091.

Apparatus for Removing Ashes from Gas Producers. W. H. Bradley, assignor to Duff Patents Co., Pittsburgh, Penn. 1,049,561, Jan. 7, 1913. Filed Feb. 8, 1912. Serial No. 676,461.

Endless Movable Grate for Furnaces. F. Girtanner, assignor to Laclede-Christy Clay Products Co., St. Louis, Mo. 1,050,531, Jan. 14, 1913. Filed July 8, 1911. Serial No. 637,464.

Shield for Detonators which are used in Shot-firing in Mines of all kinds and in Quarries. A. Price and W. Pryse, both of Treorky, Pontypridd, Eng. 1,049,143, Dec. 31, 1912. Filed Dec. 12, 1911. Serial No. 665,343.

CONSTRUCTION NEWS

Scalp Level, Penn.—The Scalp Level Coal Mining Co. is erecting an extensive tipple east of Rummel.

Tamaqua, Penn.—Work on a shaft to be 750 ft. deep and requiring one year's time to complete was started recently by the Lehigh Coal & Navigation Co. at No. 11 colliery.

Shenandoah, Penn.—Work was commenced Mar. 1, on the construction of a colliery to prepare for market the coal which will be mined from the recently discovered coal beds in Locust Mountain.

Wheeling, W. Va.—Work has been started on general repairs of the machinery which operates the cables at the Big Bull coal mine. A new 150-hp. boiler is being installed and the work will be completed about the middle of the week.

Baltimore, Md.—The Alabama & New Orleans Transporta-

tion Co. is having built at its shipyard 16 self-propelling barges of 1000 tons each, to cost altogether $416,000. One barge is ready for launching and the others will be ready at the rate of about one every six weeks.

Little Rock, Ark.—Electric mining machines have been installed in Central Mine No. 4 and are declared to be an unqualified success. It is said by their use the output of coal is made 80 per cent. lump and the quantity of explosives used and the danger therefrom is reduced one half.

Ashland, Penn.—The G. B. Markle Co. is completing a fine wash house for the employees at No. 5 Highland, which will be ready for use in a few days. The building was formerly the old elctric-light station, the interior of which has been remodeled and fitted with all modern conveniences.

Connellsville, Penn.—Charles Pore and H. N. Odbert, of Monessen, said to represent Pittsburgh and Charleroi capitalists, are putting a force of men to work opening a mine to develop a tract of 540 acres of coal at Rogers Mill, in the Indian Creek valley. It is reported a coke plant will be constructed.

Fairpoint, Ohio—The Provident Coal Co. is planning to construct another mammoth reservoir which will furnish water for the use of the new mine of the company at Fairpoint. It is not known whether the reservoir will be constructed this year or not. The cost of construction is estimated at about $30,000.

Peoria, Ill.—The Newsam Bros. are sinking a shaft on the Frank Bateman farm, one mile south of Glasford. They expect to have a greater output of coal than that afforded by their mine at Kingston, and hope to be able to hoist coal by the latter part of the summer. One hundred and seventy-five men will be employed.

Huntington, W. Va.—Thirty miles of railroad is to be built by the Chesapeake & Ohio Ry. Co., near Beaver Creek, Ky. The work will be begun Apr. 1. A number of capitalists owning valuable coal and timber lands adjacent to the Beaver Creek territory, are preparing to begin work at once on building tipples and locating mine openings.

Scranton, Penn.—It is estimated that the Laurel line will be able to reclaim approximately from fifteen to twenty thousand tons of coal out of the basin of the old Roaring Brook boom that it owns along its right-of-way and preparations have been made to double the capacity of its pumping plant. The addition to the plant will probably commence operations Apr. 1.

Pottsville, Penn.—The Reading Co. is developing plans for greatly adding to the output of coal within the next few years. Many new openings will be made. The largest proposition which is now in hand is the sinking of a four-compartment shaft at the Reliance Colliery at Beaverdale. This will probably be dropped to a depth of 620 ft.

Pittsburgh, Penn.—The Pennsylvania R.R. is arranging to enlarge the coaling stations along its lines, especially at larger terminals. In the improvement contemplated the Pennsylvania will probably carry out the new plan adopted by the Wabash. This road has erected at different points along its territory modern steel structures, which store about 300,000 tons of coal, which are arranged so that they can deliver the coal to the engine either on the main tract or on passing tracts.

Brownsville, Penn.—The plant of the Luzerne Coke & Coal Co. is expected to be in operation by May 1. When completed it will consist of 35 ovens and in addition it is expected to mine about 400 tons of coal per day for shipment. The Belle Vernon plant is now in full operation with a battery of 32 ovens. The W. Moreland Co. plant of the concern, heretofore known as the Marion Coke & Coal Co., has increased in size by 40 ovens.

NEW INCORPORATIONS

McKeesport, Penn.—The Meyers Coal Co.; capital stock, $5000.

Pineville, Ky.—The Pineville Coal Mining Co. ;to develop coal land; capital stock, $50,000.

Harrisburg, Penn.—The Hudson Coal Co. has increased its capital stock from $2,500,000 to $3,500,000.

Harrisburg, Penn.—The Locust Mountain Coal Co. has increased its capital stock from $10,000 to $350,000.

Dallas, Tex.—The McKay Lignite Mining Co.; capital stock, $7500. Incorporators: J. C. McKay, H. C. McKay and F. P. McKay.

Hartlesville, Tex.—The Interstate Oil & Gas Co.; capital stock, $100,000. ncorporators: A. H. Garges, John Melcher, C. S. Whitlow.

Charleston, W. Va.—The Claybrook Coal Mining Co.; to mine coal; capital stock, $100,000. Incorporators: J. E. Chilton, S. Hess and T. S. Clark.

Hamilton, Mont.—The Darby Coal Mining Co.; to engage in mining. Incorporators: R. B. Nicholson, D. D. Nicholson, Thomas Padden and W. R. Gibford.

Little Rock, Ark.—A number of Pine Bluff capitalists have organized a company for developing the coal and clay resources of the county; capital stock, $1,000,000.

Wheeling, W. Va.—The Warewood Coal Co.; to mine coal; capital stock, $25,000. Incorporators: Johnson C. McKinley, Harry D. Wells, M. B. Marther and John C. Beury.

Louisville, Ky.—The Tennessee Jellico Coal Corporation has increased its capital stock from $300,000 to $400,000 for the purpose of developing a large tract of coal land at Hazard, Ky.

Chicago, Ill.—The Harkes Coal Co.; to mine and sell coal and clay and their products; capital stock, $6000. Incorporators: Arthur Conno, Thomas J. Dunney and Christopher Whalen.

East St. Louis, Ill.—The Southern Coal, Coke & Mining Co.; to mine coal and manufacture coke; capital stock, $1,000,000. Incorporators: W. K. Kavanaugh, James Y. Lockwood and John B. Kennard.

Kingston, N. Y.—The Silver Bell Mining Co.; acquire mining rights of all kinds and to develop mineral lands; capital stock, $1,000,000. Incorporators: Walter H. Clark, John M. Lester, Guillermo M. Bingham.

Cumberland, Md.—The Proctor Slate Mfg. Co.; to quarry and mine for slate and all byproducts; capital stock, $1,200,000. Incorporators: Theodore Thimmel, G. Harry Bevard, M. C. Alwine Roberts, H. Rea Engle, D. H. Silver and W. J. Maloney.

INDUSTRIAL NEWS

Canton, Ill.—Star Mine No. 2 has shut down indefinitely owing to the poor market for coal.

Lethbridge, Alta.—The city contemplates purchase of 240 additional acres for an industrial site and another municipal coal mine.

Hickton Station, Penn.—J. H. Sanford Coal Co. will soon install a 13-ton electric mining locomotive recently ordered from the General Electric Co.

Pottsville, Penn.—The Gilberton colliery has resumed operations. The colliery has been idle since Feb. 25, when the waters of Mahanoy Creek broke into the workings.

Johnson City, Tenn.—The auditor's department of the Clinchfield Coal Corporation has been removed to Dante, Va., where the mines and headquarters of the company are located.

Pittsburgh, Penn.—Reports are heard of the formation of a company whose purpose will be to install retort coke ovens in the region surrounding Oakmont, to utilize the coal of the twin Freeport seams.

Georgetown, Ill.—The Bunsen Coal Co. will place a 13-ton electric locomotive in service in connection with its colliery at Georgetown. The order for the machine has been placed with the General Electric Co.

Pittsburgh, Penn.—The Pittsburgh Coal Co. will shortly install in its power plants, nineteen 150-kw., two-unit, three-bearing, synchronous motor-generator sets recently ordered from the General Electric Co.

Pottsville, Penn.—The anthracite region is again handicapped by a shortage of cars. So pronounced is this deficiency that collieries in the Shenandoah district have reduced their working day to seven hours.

Fairmont, W. Va.—The Consolidation Coal Co. will add to the equipment of its mines at Jenkins, Ky., four 10-ton and four 6-ton electric mining locomotives. The machines have been ordered from the General Electric Co.

Carrolltown, Penn.—No. 33 Mine, the biggest of the Pennsylvania Coal & Coke Corporation, at Patton, was closed on Wednesday of last week, because, it is said, of a fault in the coal. Between 300 and 400 men were employed there.

Ashland, Penn.—The Midvalley collieries Nos. 1 and 2 of the Midvalley Coal Co. are tied up by a strike which was caused by the alleged refusal of the company to discharge nonunion workmen. About 900 men and boys are idle.

Green Bay, Wis.—The C. Reiss Coal Co. closed a deal by which it becomes owner of the Waukegan Coal & Dock Co., at Waukegan, Ill. The new property has the capacity of 150,000 tons of coal, and is equipped with three loading towers.

Scranton, Penn.—The Reading company is developing plans which will add greatly to its output of coal within the next few years. The contemplated improvements consist of many new openings, besides the breaking in of a tract of virgin territory.

Russellville, Ark.—The store at the Russelville anthracite mines, which has been closed since the mines shut down two years ago, is to be reopened. The mining property is being put in shape for operation again, and will start work early in March.

Greensburg, Penn.—Rockwell Marietta, of Connellsville, purchased for the Marietta-Connellsville Coke Co. 225 acres of coal land in the Ligonier Valley from Judge John B. Steele, of Greensburg. The consideration was in the neighborhood of $200 per acre.

McAlester, Okla.—Osage mine No. 8 at Krebs and No. 7 at Richville have been shut down by the operators, and the miners have removed their tools from the pit. The mild weather has caused a falling off of orders, which has resulted in the shutdown.

Wilkes-Barre, Penn.—The Lehigh Valley Coal Co. is pumping the water out of the old Tomhicken Colliery, which has been idle for years. The company intends to retimber the workings and resume operations, as considerable unmined coal remains in the colliery.

Birmingham, Ala.—The Maryland Coal & Coke Co. will equip its plant at Sipsey, Ala., with two 150-kw. generators, 18 motors, ranging from 6.75 to 40 hp., switchboard and three 7-ton electric locomotives. All the equipment will be supplied by the General Electric Co.

Philadelphia, Penn.—The Berwind-White Coal Mining Co. will add to the electrical equipment in its collieries at Windber, Penn., a 400-hp. two-unit two-bearing motor frequency changer set and switchboard apparatus, which has been ordered from the General Electric Co.

Du Pont, Ill.—It is generally understood that the new Du Pont Coal Co. will combine the Central Coal & Iron Co., Caldwell Coal Co., Duncan Coal Co., Wickliffe Coal Co., Broadway Coal Co., and others on the Illinois Central and Louisville & Nashville railways in Kentucky.

Scranton, Penn.—Five collieries have been shut down temporarily by the Delaware, Lackawanna & Western R.R. Co. These are the Sloan and Central shafts of the Avondale, the Dodge, the Diamond and the Pyne. It is understood that operations have been discontinued because of the need for repairs.

Big Stone Gap, Va.—The Stonega Coke & Coal Co. is arranging to install a 200-kw. generator and switchboard in its power plant, and will add to its mine equipment six 4-ton and two 13-ton electric mining locomotives. The order for all this new apparatus has been placed with the General Electric Co.

Russelville, Ark.—The Southern Anthracite Coal Co. mines closed the season's run Saturday, and will shut down for a short time to make necessary repairs and clean up for the coming season. It is reported that the mines will start again not later than Mar. 15. They have had practically a 12-months' run.

Connellsville, Penn.—The No. 4 mine of the Vesta Coal Co., a subsidiary of the Jones & Laughlin Steel Co., has during the past 10½ years produced 13,337,599 tons of coal. The mine employs 1050 men inside. The property originally covered four square miles. The mined-out area would make a tunnel 6 ft. wide and 1263 miles long.

Connellsville, Penn.—Further development of the Indian Creek valley coal field is to be undertaken shortly near Rogers Mill. Preparations are under way for opening a mine on a tract of 540 acres. Charles Pore, of Monessen, who, with H. N. Odbert, of that place some time ago purchased the tract, is on the ground employing men for the initial work.

Bluefield, W. Va.—The U. S. Coal & Coke Co. has inaugurated an educational department for its employees. The principal subjects treated in the instruction are arithmetic and the properties of gases. So far there has been considerable interest manifested by the employees, and it is understood that the meetings are largely attended. The school is open to all.

New Bethlehem, Penn.—It is rumored that the Pennsylvania R.R. has an option on the Buffalo & Susquehanna R.R., and that there is a probability of its taking that road over in the near future. The B. & S. road has been in the hands of a receiver for several years. The purpose of its construction was to tap some of the best mining territory in the soft-coal region.

Charleston, S. C.—The action of the directors of the Carolina, Clinchfield & Ohio in approving plans for the construction of large coal piers at Charleston has been warmly indorsed by business interests. By improved machinery, vessels of 8000 tons will be loaded with coal in four or five hours. Much double-tracking has been done over the Coast Line road entering Charleston.

Morgantown, W. Va.—A deal for the sale of 500 acres of coal in Union district was consummated Mar. 2. The sale included two tracts, one of 201 acres, the other of 250 acres. The surface and the Pittsburg, Sewickley, and other beds of coal were sold to W. H. Seymour, of Pittsburgh. The price was $200 an acre. It is said that the purchaser expects to develop it without delay.

Columbus, Ohio—Attorney E. D. Howard is negotiating for a tract of 12,000 acres of coal land in Lawrence County for interests here. A 30-day option on the tract known as the McGugin coal and iron fields has been authorized by Judge Corn. The price mentioned in the option is $200,000. It is understood that a new mining company is to be organized here to operate the property.

Terre Haute, Ind.—The Grant Coal Mining Co. of Vigo County executed to the Continental & Commercial Trust & Savings Bank, of Chicago, Ill., a mortgage on its holdings in this county for $100,000, to cover a bond issue of 100 gold bonds of the par value of $1000 each. The bonds are to bring 6 per cent. interest, and the money so realized is to be used in improving the property of the company.

Hutchinson, Kan.—The Columbus Coal Co. has leased about 800 acres southwest and west of here, with the guarantee that work will begin on prospecting within 90 days, and that if coal is found, that shafts will be sunk at once. That the fuel will be discovered in paying quantities is almost a foregone conclusion as prospects were made there several years ago, and it was declared then that good deposits existed.

Grafton, W. Va.—Unless unforeseen difficulties arise it is practically certain that the coal holdings of Col. J. M. Guffey will soon be taken up by the Morgan interests. The tract lies in Preston, Barbour and Taylor Counties, and comprises something like 100,000 acres. The price is said to exceed $100 an acre. It is understood that the deal will be closed in anticipation that the New York Central will push the completion of its line from Fairmont to Belington.

Red Bank, Penn.—In a few days active work will start on the Pennsylvania R.R. tunnel at the junction of Red Bank Creek and the Allegheny River. This tunnel cuts off several miles of a bend, and was to have been constructed many decades ago, when the road was built. East Brady parties, however, paid part of the construction cost of diverting the railroad several miles. The tunnel is half a mile through and will save several miles between Pittsburgh and Buffalo.

Scranton, Penn.—Producing a million tons of coal without a fatal accident is the record to which the Lackawanna coal officials are pointing on behalf of the National Colliery, at Scranton. The last fatal accident at this place was in the fall of 1910. The inside foreman at the National is John Owens, and the outside foreman is Fred Peters. The Manville Colliery, of the same company, has had a perfect record for the past two years, but is not so large a colliery as the National.

Pottsville, Penn.—The increase of the capital stock of the Delaware & Hudson Coal Co. from $2,500,000 to $3,500,000, and the increase of capital stock of the Locust Mountain Coal Co. from $10,000 to $550,000, are indications that the former company will develop the coal lands in Schuylkill Valley soon. The Locust Mountain Co. came into possession recently of rich coal lands north of Shenandoah belonging to the Girard estate, which will be opened during the year and great producing facilities will be established.

Pottsville, Penn.—The Philadelphia & Reading Coal & Iron Co. has arranged for installing considerable electrical equipment, consisting of a 150-kw., two-unit, three-bearing, motor-generator set, switchboard, and an 8-ton, 48-in. gage electric mining locomotive in the Suffolk Colliery near St. Nicholas, Penn.; a 600-kv.a. generator with 30-kw. exciter, 20-kw. motor-generator set and switchboards in the Bear Valley Colliery, near Shamokin, Penn.; a 600-kv.a. generator with 30-kw. exciter and switchboard in the Locust Gap Colliery; a 100-hp. induction motor and controller in the Mahanoy Colliery; a 600-kv.a. generator with 30-kw exciter and switchboard in the Pine Knob Colliery, near Minersville, Penn.; and a 375 kv.a. generator, 20-kw. exciter and switchboard in the Silver Creek Colliery near Pigila, Penn. All this various apparatus has been recently ordered from the General Electric Co.

COAL TRADE REVIEWS

GENERAL REVIEW

Orders for hard coal are so scarce that companies have finally been forced to curtail production. Such a condition at this period of the year has never been known to exist in the recent history of the industry, and it is even more remarkable in view of the fact that there was a shortage of over 6,000,000 tons in last year's production. The individuals are making every effort to sell at the April discount, but with only indifferent success. The movement now is restricted almost entirely to the steam grades, in which there is some little activity particularly on pea, which is the strongest of any size. Indications are that considerable winter coal will be carried over into April, and there is not a very favorable feeling over the outlook for that month.

The attempt of the Eastern bituminous operators to gain some control over the market is apparently meeting with partial success. It is obvious that production is being restricted, while accumulations are slowly disappearing, and if this continues the weak points in the market will be eliminated shortly. The movement is light, although steady, and only on specific orders, while the general tone is firmer and concessions less frequent. It is noticeable that contracts for the new year are generally for a larger tonnage.

Shipments in the Pittsburgh district are almost entirely on contract, but are quite heavy. It is evident that the consumers are accumulating as much of a surplus as possible before the higher contract prices go into effect. The market is not particularly good, and operators are now looking forward to the opening of navigation on the Lakes, which will be somewhat earlier than usual according to present indications. In Buffalo and vicinity the railroads have not yet caught up, and there is considerable coal on track. Some colder weather caused a slight temporary increase in the demand, but dealers generally are well stocked and new sales are limited.

There has been a small increase in the demand in Ohio, as the result of the colder weather, but the trade is by no means active; however, this change in conditions served to check the rapid decline. Operations are fairly good ,contracts are being closed, at a slight advance, and the producers are looking forward to a heavy Lake business. The smokeless operators in the West Virginia fields are said to have agreed to suspend operations for one week, in order to work off surplus tonnages; dumping at the piers continues relatively slow. There have been some vigorous protests at the advance in retail prices in the Southern market, but the trade has been active as a result of the recent cold snap.

There are no new features in the Middle Western market, and operators are concentrating their attention on the new contracts. There has been a curtailment of shipments in Chicago, which has resuted in an increased demand, but dealers are holding off buying, believing they have enough to carry them over into the summer. The St. Louis trade is still badly demoralized, and some operators are going into bankruptcy.

BOSTON, MASS.

There is a firmer tone to Pocahontas and New River. Most of the agencies are holding to the $2.85 price and concessions are less frequent. The accumulation at the Hampton Roads piers seems materially reduced and delivered prices at this end are up somewhat from a week ago. It is early for any restriction to be effective but if that said to have been determined upon last week, is carried out it is likely that soft places will disappear for the next month or two. That prices will be firm throughout the summer at a range from 15@35c. higher than last year seems too much to expect. Coal is to plentiful and there are too many shippers to permit such a general advance in an off year; $2.70 is still more nearly the actual price for spot coal.

Georges Creek is in rather short supply and orders have to be taken up in turn. The price for next season has not yet been announced but it is likely the f.o.b. basis at Baltimore will closely follow the Hampton Roads price. The Pennsylvania grades continue on about the same range. Clearfields are in light demand and, with other grades, are coming down only on orders. Prices are still from 5@10c. higher than the summer basis last year.

The all-rail movement is fairly steady but with only a light volume of coal running. Contract business is being closed slowly; buyers generally are showing only a lukewarm interest. Water freights are firm at 95c.@$1 for large vessels, Hampton Roads to Boston. Tonnage is in fair demand.

Anthracite is marking time, pending the first of April. Orders are being filed for spring shipment and a normal season is looked for. March so far has been good for coal-burning and stocks are going to be low when April shipments start coming in. Representatives of the independent operators are making desperate efforts to move March coal at April prices but so far they have had little success. Shipments for March are confined almost entirely to sizes like pea and broken on which the price does not change. There was some apprehension over spring ,orders calling for large proportions of stove but they turn out to be well assorted as to sizes.

Current wholesale prices are about as follows:

Clearfields, f.o.b. mine	$1.25@ 1.50
Clearfields, f.o.b. Philadelphia	2.50@ 2.75
Clearfields, f.o.b. New York	2.80@ 3.10
Cambrias, Somersets, f.o.b. mines	1.30@ 1.60
Cambrias, Somersets, f.o.b. Philadelphia	2.55@ 2.85
Pocahontas, New River, f.o.b. Hampton Roads	2.70@ 2.85
Pocahontas, New River, on cars Boston	3.85@ 4.00
Pocahontas, New River, on cars Providence	3.75@ 3.85

NEW YORK

Bituminous—The soft-coal market is comparatively firm on the better grades, which are in sufficient demand to make it necessary for consumers to await their turn in having orders filled. The off-grades are not so active, and as a rule are rather hard to move. There is still little or nothing doing in contracting, and operators are not showing any disposition to recede from their avowed intention of obtaining higher prices for the new year's business. The demand on current contracts is quite heavy, it being evident that consumers intend taking all the tonnage they can accommodate before these expire.

Stocks of soft coal at tide are about normal. Mines as a rule are working fairly good, and while there has been a slight shortage of equipment on the Pennsylvania R.R., the New York Central has been furnishing a full supply. Quotations are probably somewhat easier, and small lots of the lower grades can no doubt be picked up at less than $2.60. However, operators continue holding the nominal market at last week's level as follows: West Virginia steam, $2.60@2.65; fair grades, Pennsylvanias, $2.65@2.70; good grades of Pennsylvanias, $2.75@2.80; best Miller, Pennsylvania, $3.05@3.15; Georges Creek, $3.25@3.30.

Anthracite—The condition of the hard-coal market is such that nearly all companies have been forced to suspend operations because of the insufficiency of orders. This is probably the first time in the recent history of the industry that the operators have been forced to restrict their output so early in the season; it is a rather remarkable condition in view of the fact that production last year was over six million tons less than in 1911.

Of course, grades of all kinds are now accumulating in storage with the exception of the steam sizes, which still continue in fairly good demand, particularly pea, which is the strongest grade in the market. The large companies are still adhering rigidly to their circular, but individuals are readily quoting at the April discount, and even lower; individuals are also being forced to close down, and they are not making any further shipments on consignment. There is a feeling on the part of some of the conservative members of the trade, that if there is not a better buying movement, and a more pronounced disposition on the part of the consumers to stock, conditions this year will be a repetition of last year.

The market has shown slight fluctuations during the week, and is now quotable on about the following basis:

		Individual	
	Circular	Lehigh	Scranton
Broken	$5.00	$4.50 @ $4.75	$4.50 @ $4.75
Egg	5.25	4.55 @ 5.20	4.60 @ 5.25
Stove	5.25	4.95 @ 5.20	4.95 @ 5.25
Chestnut	5.50	4.70 @ 5.45	5.00 @ 5.50
Pea	3.50	3.45 @ 3.55	3.50 @ 3.60
Buckwheat	2.75	2.00 @ 2.45	2.50 @ 2.75
Rice	2.25	1.80 @ 1.95	2.25 @ 2.35
Barley	1.75	1.25 @ 1.70	1.55 @ 1.80

PHILADELPHIA, PENN.

The element of curtailment has been introduced into the anthracite coal situation and the time has passed when the current output can be disposed of at the ruling circular prices; this does not refer to the quotations made by the individuals, which are hard to keep track of during the present period of inactivity. Half time is now the rule with many of the important companies, and a large proportion of the coal mined is going into stock.

The retail trade is in no sense active. The occasional cold snaps cause a monetary liveliness, but stagnation is likely to mark this branch of the trade until Apr. 1. There is no report of any of the dealers reducing their prices, which might be possible, considering that many of them are taking advantage of the low offerings by the individual operators. Perhaps they regard this as a recompense for some of the premium coal bought during the strenuous times a couple of months ago.

Stocks are not dwindling to the extent that the dealers would like, and if the present weather conditions continue, there are good prospects that some of them will carry over considerable coal into April, for which they have paid top-notch prices. Some of them are even complaining of premium coal still on hands, and their only salvation is to secure bargain coal now to mix with it, and get out with as little loss as possible. As a matter of fact, there does not seem to be an altogether favorable feeling as regards April business.

The bituminous market seems to have reached a process of elimination. Good coals are being offered at low prices, and as a consequence, inferior grades cannot find any outlet at all. Everything seems to be uncertain, and while contracts are being talked over, nothing definite seems to take place. Buyers are prospecting, looking to get the best for their money, and shippers indicate that they will expect anywhere from 10c. to 15c. advance over the figures prevailing last year.

PITTSBURGH, PENN.

Bituminous—Mines are running at slightly greater output than formerly, and shipments are heavy, with a good car supply. There has been no difficulty as to the labor supply for some time. Operators notice a strong tendency on the part of many consumers having contracts expiring Apr. 1, to take extra tonnages at this time in order to create a surplus, in view of the fact that prices are on a higher level than those of expiring contracts. While it is claimed efforts are being made to prevent such accumulations, and to restrict shipments to actual needs, it is doubtful whether these efforts are made with any energy. The market has not been particularly good and the average operator is probably satisfied to obtain shipping instructions, irrespective of whether or not the consumer is trying to "beat the market." Prompt coal is bringing approximately contract prices, with slack at $1@1.05, or a premium of 10 to 15c. a ton. Regular prices remain: Slack, 90c.; nut and slack, $1.05; nut, $1.25; mine-run, $1.30; ¾-in., $1.40; 1¼-in., $1.55, per ton at mine, Pittsburgh district.

Connellsville Coke—The market has been dull as to both prompt and contract. Strictly standard grades of coke are well held, but grades slightly off in sulphur or ash are offered at concessions, down to $2.15 or $2.20 for prompt furnace, such coke being better than much that was freely taken during the famine which suddenly terminated nearly two months ago. There have been no serious negotiations on contract furnace coke. Prices for standard grades, which are partly nominal, can be quoted as follows: Prompt furnace, $2.50; contract furnace, $2.50; prompt foundry, $3 @3.50; contract foundry, $3@3.25, per ton at ovens.

BALTIMORE, MD.

Failing to get relief from the continued open-weather conditions, the local trade is now looking to the future expansion of business to force the large industries to enter the market. This is the only hope the trade has for any real profitable business. Many of the largest consumers, expecting severe weather in January and February, stocked up heavily, and because of the mild weather, the depletion of this supply was slow, and not a few of them have remained completely out of the market for the first two months of the year. There are now rumors that the concerns are about to the end of supplies, and will again be in the market shortly. There are also reports to the effect that there are inquiries for American coal on the part of English operators, who claim that they can find markets for the local product, among foreign consumers who prefer American, to English, coal.

While the date for the opening of the lakes has not yet been set, it is believed that it will be earlier this year, on account of the mild winter. The movement of coal from the West Virginia and Pennsylvania mining districts is increasing each year, and Western business always proves highly profitable to the trade. A few eastern contracts were closed during the week, but many consumers prefer to wait until the latter part of the month.

Practically the only fuel moving at this time, is on under contract. There is little or no spot business in sight. The week brought about no change in prices and the low grades are still being marketed around $1. Vessel rates continue easy, owing to prevailing good sailing weather. Train movements are all that could be desired, although there is still some complaint about a lack of cars. The local coke market remains firm, and there appears to be a fairly good demand for the product.

BUFFALO, N. Y.

There has been plenty of winter lately, but it has come too late to help the coal trade. There has been some return of the demand and if March continues wintry, which is doubtful, the situation will be farly good. The amount of both anthracite or bituminous sold lately, has been much less as the consumer appears to have had a large amount bought that had not been delivered.

On account of the uncertainty of the demand, the jobbers have not known how to take the market. Sometimes it would look as if prices were going to smash and then there would be an increased firmness; at present the word is that contract prices will be better than they were last year. There are more dealers staying out of the contract market this year than usual and if they continue to hold aloof there will be an added solidity to everything on that account. There will also be a further effort to shut down if coal again drops down to cost, as some who did that last summer made a paying venture of it.

There is report of considerable bituminous on track at various points, as the railroads have not entirely caught up with bituminous, though there are no more reports of embargoes. Allegheny Valley operators now say there is no shortage of cars at the mines and everything is progressing smoothly. From that it must be taken as a certainty that the consumption of bituminous is heavy, for the output is probably larger now than it has been in a long time.

In spite of all this the bituminous trade is rather quiet and there is some cheap coal on the market. Prices are fairly steady and may go lower before long, but at present are quotable as follows: $2.80 for Pittsburgh select lump, $2.65 for three-quarter, $2.55 for mine-run and $2.15 for slack, with Reynoldsville and Allegheny Valley 15 to 25c. lower, chiefly on account of the difference in freight rates. Coke still sags a little, the best Connellsville foundry being quoted at $5.15.

There is a small spurt in anthracite on account of some final heavy winter weather, but it is now too late for any great activity. Besides the local dealers as a rule had bought heavily and are taking advantage of the severe turn, but they will see their stocks run pretty low before they buy much more. It sometimes happens that March and even April are good coal-burning months, but they cannot be depended upon for it.

COLUMBUS, OHIO

While the colder weather during the past week caused a small increase in domestic business, the coal trade in Ohio has been anything but active. It is between seasons and everyone is apparently waiting for the Lake trade to open. Orders from retailers are slightly larger and more numerous and this had the effect of bracing up what was a rapidly declining market. Prices have not reached lower levels than prevailed a week ago excepting in fine coal which is weak.

Steam business is fairly active although some decline is noted in the tonnage. The falling off is not sufficient, however, to demoralize the trade to any great extent and prices are about as strong as formerly for mine-run. Iron and steel concerns are not quiet as good purchasers as they have been during the past few months. Other lines of industry apparently buy as much as formerly. There is no movement among factories to stock up and many plants will purchase their fuel supply on the open market. Many of the contracts will be renewed at a slightly higher figure than prevailed the previous year.

Indications are bright for an active Lake demand. Reports from the Northwest indicate the consumption of most of the dock coal and as a result the movement will be large. It is expected that bottoms will be chartered earlier than usual. Plans are being laid for some development work in Ohio during the coming season. The greater part will be in the eastern Ohio district where there are thousands of acres of coal which has not been touched.

Operations in Ohio fields during the past week have been

fairly active. Operators from the Hocking Valley district report about 75 per cent. of normal and the same percentage is reported from the Pomeroy Bend district. In Eastern Ohio the output has been fairly large and the production is estimated at about 70 per cent. This section is busy renewing fuel contracts which expire about Apr. 1. In the strictly domestic sections, the output has been below 50 per cent. of the average.

Quotations in the Ohio fields are as follows:

	Hocking	Pittsburgh	Pomeroy	Kanawha
Domestic lump	$1.50	.....	$1.50	$1.45
3-inch	1.35	$1.20	1 35	1.30
Nut	1.30	.....	1.30	.....
Mine-run	1.15	1.05	1.15	1.15
Nut, pea and slack	0.85	.....	0 85	0.85
Coarse slack	0 75	0.85	0 75	0.75

CLEVELAND, OHIO

Ohio carriers still hold an iron-clad embargo restricting the routing of coal via the Detroit & Toledo Shoreline Railroad, when destined to points on the Grand Trunk. Conditions at Toledo are acute and transportation people report an accumulation of 700 cars at that point. Many shippers have diverted their coal to the Ann Arbor and other Western connections to avoid the blockade.

Lake shippers have already started to load Lake coal at the mines and several large companies in the Youghiogheny district are forwarding Lake fuel to Cleveland via the Erie R.R. This coal will be loaded abroad vessels for forwarding via the Great Lakes at the opening of navigation. It has just been announced that the loading charge on fuel coal for coal carrying vessels will be reduced from 11c. to 8c. per ton. This change will be effective on all coal loaded on and after Apr. 15. Three hundred and fifty thousand tons of coal has been contracted for shipment via the Lakes at rates previously mentioned.

HAMPTON ROADS, VA.

There has been comparatively slow dumping and heavy accumulations of coal during the past week, with prices remaining at the same low level, around $2.60 per gross ton f.o.b. There are approximately 5000 loaded cars at the three terminals or on nearby sidings and this, notwithstanding lighter loading at the mines. It is said that a curtailment for a week during the current month was agreed upon by the smokeless coal operators, but this has not been effective so far. What looks more promising, is the expected arrival of heavy vessel tonnage which, with the light loading, should aid materially in reducing the surplus stocks at the piers.

Movement of coal by the Norfolk & Western and Virginian Railways continues good, but the Chesapeake & Ohio is still badly congested and the tieup is especially bad at Richmond, where tidewater trains are being seriously delayed going through the yards.

It is said, on good authority, that the tidewater coal of the McKell Coal & Coke Co., some 500,000 tons annually, which has been handled by the Chesapeake & Ohio Coal & Coke Co. for a number of years, will, after Apr. 1, be sold by the Geo. E. Warren Co., of Boston. It has already been announced that the C. G. Blake Co. will handle the McKell inland coal.

BIRMINGHAM, ALA.

The weather seems to have made a final effort to aid the retail dealers as winter of a severe nature has been prevailing during the current week. Although it is usually spring by this time, the cold wave in March has partially offset the unusually mild winter. Some additional protests are being made by retailers because of the 25c. increase in Cahaba domestic prices and many of them are slow in placing orders for their requirements.

All Alabama mines are working at a high production rate, and unless interfered with by car shortages or adverse business conditions the output for this year should be well above the 1912 figures, which were approximately 17 million short tons. The coke market is somewhat weaker, due possibly to the gradual decline which has been taking place in the local pig-iron market for the past several weeks.

LOUISVILLE, KY.

In contracting, it is interesting to note that the Southern Ry., which, with the Louisville & Nashville, is taking a good deal of coal from company mines just now, recently made an arrangement with the Middlesboro operators by which it will take washed 4-in. round for steam purposes at $1 a ton, whereas the prices for straight run-of-mine, unwashed, have been 95c. a ton. Naturally, this has been a source of considerable satisfaction among these operators who have installed washing equipment, as it enables them to dispose of this grade at a profit, and get a higher average price for their coal than on mine-run basis. The railroad is said to have found that it gets better results from the smaller coal, owing to the quantity of impurities found in the mine-run.

Price for even the better grades of block and lump are uncertain, running from a maximum of $2 down to $1.60 or $1.75 as the lower levels at which sales are being made. The market on screenings is easier at present, the better grades of nut and slack selling around 75c., and 50 to 60c. for second grades from the Eastern field. Western Kentucky nut, pea and slack is being handled also at 60 to 75c., with domestic nut at about $1 and lump $1.25 to $1.35. A shortage in steam coal is looked for soon, however, on account of the condition of the domestic market.

INDIANAPOLIS, IND.

The coal situation here presents no new features. The operators are concerning themselves chiefly in making new contracts over the next season and say they are asking what have been their standard prices.

Retailers are busy disposing of the coal they contracted for in the fall, with as little loss as possible. The daily newspapers have been carrying front-page articles, pointing out that consumers got no benefit from the mild winter: the price of coal has been as high this winter as it ever was, but the papers do not intimate that dealers have made any fortunes because such is the case. It is generally understood that the only thing that saved them from losses is that there was no price cutting in an effort to stimulate business.

A feature of the retail trade this season has been the larger sales of soft coals, especially Indiana's, caused by the difficulty in getting anthracite and coke in the earlier part of the winter and their unusually high price. Mine prices remain unchanged, with the mines running three and four days a week.

DETROIT, MICH.

It is believed that many large steam contracts will be signed shortly and that the open-market buying this year will be fully as large if not larger than 1912. As to the domestic outlook, the cold weather of February, coupled with the fact that March has started in rather threatening, has started cleaning out the stock of high-priced coal, so that one may look for spring buying on the part of the retailers to a satisfactory extent. The operators in this branch predict also that higher prices will be obtained for this kind of fuel.

CHICAGO

Notwithstanding the fact that there has been no material increase in the consumption of domestic coal, the wholesale demand has shown improvement during the week. This is attributed to the curtailment of shipments and to retail dealers having disposed of their storage supply. The steam market also showed some improvement as far as its technical position is concerned. The continued accumulation of egg and nut coal has resulted in its being moved into the domestic or steam trade, although the former met with a limited market and as a result was substituted for steam lump, mine-run, or even screenings. In consequence of the Chicago dealers curtailing their buying for the last two weeks, believing they had sufficient Western domestic coal to last through the season, many have been obliged to make unusually large inroads on their storage piles while fresh supplies were being withheld.

Prevailing prices in Chicago are:

	Springfield	Franklin Co.	Clinton	W. Va.
Domestic lump	$2.07@2.22	$2 45@2.55	$2.27	
Egg		2 45@2.55		$3.95
Steam lump	1.92@1 97		2 17	
Mine-run	1.87@1.92	2.20@2.30	1 97	3 30
Screenings	1.57@1 62	1.90@1.95	1.67	

Coke—Connellsville and Wise County, $5.75@6; byproduct, egg, stove and nut, $5.50; gas house, $5.50.

MINNEAPOLIS—ST. PAUL

About all the hard coal there is at the Head of the Lakes is a little egg size. Nut, stove and pea have been cleaned up for some time. Early this year wholesalers began ordering direct from Pennsylvania mines, but arrivals are slow. There is considerable pressure for the prepared sizes of hard coal; householders are ordering their second installments and find they cannot get what they want.

The situation on hard coal in the country is peculiar. Last fall many dealers ordered more coal than they actually needed and had to throw some on the ground, having their storage bins full. While in other towns, dealers did not get enough, and are now clamoring for shipments, and are even willing to pay premium prices.

Dock prices are holding firm at circular. Quotations on Illinois and smokeless coal are uncertain and buyers in most cases set the price. Some Smokeless from the east has been known to have sold on the basis of less than a dollar at the mines

ST. LOUIS, MO.

Continued spring weather and the action of the operators in producing and selling coal below cost, is keeping the market in the same condition that has prevailed for the past four or five weeks. There is absolutely no change and nothing to indicate that there will be any change.

As was to be expected, a few of the producers have reached their limit and have sought refuge under the bankruptcy laws, and it will not be surprising to have a few more follow suit. Several St. Louis offices have also been ordered to close up in order to curtail expenses.

Anthracite and coke, such as is coming in, are a drug on the market. A small volume of smokeless is moving in, but there is practically no demand. The circular on other coals is:

	Carterville and Franklin Co.	Big Muddy	Mt. Olive	Standard
2-in. lump				$0 85 @ 0.90
3-in. lump			$1 25	
6-in. lump	$1 20 @ 1 25		1.35	1.10
Lump and egg	1 25	$2 25		
No. 1 nut	1 10 @ 1.15			
Screenings	0.90 @ 0.95			0.65
Mine-run	1 05 @ 1 15			0.85
No. 1 washed nut	1 40 @ 1 50			
No. 2 washed nut	1 35 @ 1.45			
No. 3 washed nut	1 25 @ 1.30			
No. 4 washed nut	1 15 @ 1.20			
No. 5 washed nut	1.00 @ 1 05			

OGDEN, UTAH

All during the month of February the mines have been long on slack and nut coal. The slack can be handled by unloading at the mines, but none of the operators have had the courage to unload the nut as it would, no doubt, be a total loss; however, the operators are face to face with a large over-production of this grade of coal. A little latter in the spring and during the summer months there will be a fair demand for this, but at present it is a drag on the market. The operators are endeavoring to hold the market price on all grades, but there is a tendency to weaken in several localities, especially on slack and nut coal.

The Colorado operators have announced their spring quotations for April and May shipments to the Nebraska market, as follows, f.o.b. mines: Lump, $2.25; nut, $1.75. Wyoming and Utah quotations remain unchanged, except nut coal, which has been selling below circular, due to the surplus.

PORTLAND, ORE.

It is expected that consideraole development work will be done this summer in the mines at Coos Bay, Ore., and in Washington; in the former district because of the fact that Coos Bay will have railroad facilities by the end of the summer, upon the completion of the Southern Pacific line from Eugene to Marshfield. It is said that there is little probability of much coal, if any, being imported here next summer and fall from Australia, on account of the high rates on vessels. Tonnage is fully as scarce now as last year and importations here were light

PRODUCTION AND TRANSPORTATION STATISTICS

ANTHRACITE SHIPMENTS

The following is comparative statement of the anthracite shipments for February and the first two months, of the years 1912-13, in long tons:

	February		2 Months	
	1913	1912	1913	1912
Phila. & Reading	1,165,449	1,202,536	2,422,581	2,389,070
Lehigh Valley	1,062,129	1,083,925	2,237,280	2,104,372
Cent. R. R. N. J.	761,070	785,000	1,574,437	1,545,035
Del. Lack. & West	763,571	782,699	1,685,670	1,574,397
Del. & Hudson	567,371	572,021	1,220,548	1,139,300
Pennsylvania	491,062	523,539	1,067,614	1,066,358
Erie	655,919	710,263	1,373,154	1,393,108
Ont. & Western	207,598	215,985	429,304	428,024
Total	5,674,169	5,875,968	12,010,588	11,639,664

ANTHRACITE STOCKS AT TIDE

Stocks at tidewater Mar. 1, were 484,270 tons, as compared with 375,566 tons on Feb. 1.

THE CAR SITUATION

American Ry. Association reports surpluses and shortages of coal equipment for two weeks ended Mar. 1 as follows:

	Surplus	Shortage	Surplus or Shortage
New England Lines	33	110	77
N. Y.; New Jersey, Del.; Maryland; Eastern Penn	1,196	1939	733
Ohio; Indiana; Michigan; Western Pennsylvania	4,240	134	**4,106**
West Virginia, Virginia, North & South Carolina	952	560	**392**
Kentucky, Tenn.; Miss.; Alabama, Georgia, Florida	1,561	382	**1,179**
Iowa, Illinois, Wis., Minn.; North & South Dakota	3,163	193	**2,970**
Montana, Wyoming, Nebraska	623	82	**541**
Kansas, Colorado, Missouri, Arkansas, Oklahoma	2,645	13	**2,632**
Texas, Louisiana, New Mexico	477	0	**477**
Oregon, Idaho, California, Arizona	3,149	30	**3,119**
Totals	18,039	3355	**14,681**
Greatest surplus in 1912 (Apr. 25)	94,692	2,144	**92,5064**
Greatest shortage in 1912 (Oct. 10)	6,491	14,897	**8,48**

FOREIGN MARKETS

GREAT BRITAIN

Feb. 28—Tonnage continues in heavy supply, and great activity prevails at the various docks. The inquiry for March delivery is brisk, and sellers are holding firm. Small coals particularly are scarce and dear.

Today's quotations are approximately as follows:

Best Welsh steam	$4.56@4.62	Best Monmouthshires	$4.14@4 20
Best seconds	4.38@4 50	Seconds	3.84@4.08
Seconds	4 26@4 38	Best Cardiff smalls	3.84@3 96
Best dry coals	4 38@4.44	Seconds	3.72@3.84

The prices for Cardiff coals are f.o.b. Cardiff, Penarth or Barry, while those for Monmouthshire descriptions are f.o.b. Newport; both exclusive of wharfage, and for cash in 30 days—less 2½%.

FRENCH IMPORTS AND EXPORTS

The following is a comparative statement of the French imports and exports for 1911 and 1912:

Imports	Coal		Coke		Briquettes	
From	1911	1912	1911	1912	1911	1912
Great Britain	9,099,345	9,022,411	211,909	122,797	482,655	426,124
Belgium	3,910,825	3,506,767	790,957	664,230	1,787,853	2,299,093
Germany	2,994,208	3,182,160	189,391	218,381	49,005	63,748
Other countries	227,319	255,430	86,982	117,336	49,005	63,748
Totals	16,231,787	15,966,768	1,189,239	1,122,744	2,319,513	2,788,965

Exports	1910	1911	1912
Coal	1,278,698	1,336,014	1,911,697
Coke	168,977	184,522	217,577
Briquettes	131,457	114,467	191,69

COAL SECURITIES

The following table gives the range of various active coal securities and dividends paid during the week ending March 8:

Stocks	Week's Range—High	Low	Last	Year's Range—High	Low
American Coal Products	87	87	87	87	87
American Coal Products Pref	101	101	101	109¼	109¼
Colorado Fuel & Iron	35½	32½	32½	41½	31
Colorado Fuel & Iron Pref			155	155	150
Consolidation Coal of Maryland	102¼	102¼	102¼	102¼	102¼
Island Creek Coal Pref	86	85	85		
Lehigh Valley Coal Sales	210	204	204		
Pittsburgh Coal	22	21	21	24¾	19¾
Pittsburgh Coal Pref	89½	87	89¼	95	84
Pond Creek	23½	22	23½	28¼	22
Reading	159¼	153¾	154¼	168¾	153¾
Reading 1st Pref	90	90	90	91¼	89½
Reading 2nd Pref	90¼	90	90	93	87¾
Virginia Iron, Coal & Coke	51	51	51	54	44¼

Bonds	Closing Bid	Asked	Week's Range or Last Sale		Year's Range	
Colo. F. & I. gen. 5s f g	98	99	99	99	98	99¼
Colo. F. & I. gen. 6s			107¼	June '12		
Col. Ind. 1st & coll. 5s, gu	81	Sale	81	82	81	85
Cons. Ind. Coal Mc. 1st 5s			85	June '11		
Cons. Coal 1st and ref. 5s		94	93	Oct '12		
Gr. Riv. Coal & C. 1st g 6s	96	102¾	102¾	Apr '06		
K. & H. C. & C. 1st s f g 5s			98	Jan '13	98	98
Pocah. Con. Coll. 1st s f 5s	87¾	88	87¾	Feb '13	87¾	87¾
St. L. Rky. Mt. & Pac. 1st 5s	76	77½	76¼	Feb '13	76¼	80
Tenn. Coal gen. 5s	101	101¼	100¼	100¼	100¼	103
Birm. Div. 1st consol. 6s	101	102¾	102¼	Feb. '13	102¼	105
Tenn. Div. 1st g 6s	101	103¼	102	Feb. '13	102	102
Cah. C. M. Co. 1st g 6s			110	Jan '09		
Utah Fuel 1st g 5s						
Victor Fuel 1st s f 5s			79¾	Feb. '13	79¾	79¾
Va. I. Coal & Coke 1st g 5s	96	Sale	96	97½	96	98

No Important Dividends were announced during the week.

INDEX OF COAL LITERATURE

The following is a list of abbreviations used below:
A.E.G.-Ztg. = A.E.G.-Zeitung.
Am. Lab. Legis. Rev. = American Labor Legislation Revue.
Ann. Mines = Annales des Mines.
Ann. Mines Belgique = Annales des Mines de Belgique.
Austral. Min. Stand. = Australian Mining Standard.
Berg-Huttenmann. Rdsch. = Berg- und Huttenmännische Rundschau.
Bull. Am. Inst. Min. Eng. = Bulletin American Institute of Mining Engineers.
Can. Eng. = Canadian Engineer.
Can. Min. Jl. = Canadian Mining Journal.
Chem. Eng. = Chemical Engineer.
Coll. Guard. = Colliery Guardian.
Comp.-Air Mag. = Compressed Air Magazine.
Compt. Rendus Acad. Sc. = Comptes Rendus de l'Académie des Sciences.
El. Eng. = Electrical Engineering.
El. Jl. = Electrical Journal.
El. Kraftbetr. = Electrische Kraftbetriebe und Bahnen.
Eng. Contract. = Engineering Contractor.
Eng. Min. Jl. = Engineering and Mining Journal.
Eng. News = Engineering News.
Fördertechnik = Die Fördertechnik.
Geol. Mag. = Geological Magazine.
Handel und Ind. = Handel und Industrie.
Int. Mar. Eng. = International Marine Engineering.
Inst. Min. Metal = Institute of Mining and Metallurgy.
Jit. Volkswirt = Internationaler Volkswirt.
Iron Coal Trades Rev. = Iron and Coal Trades Review.
Jl. Soc. Chem. Ind. = Journal of the Society of Chemical Industry.
Jl. Ind. Engin. Chem. = Journal of Industrial and Engineering Chemistry.
Jl. Royal Soc. Arts = Journal of the Royal Society of Arts.
Jl. S. Afr. Inst. Eng. = Journal of the South African Institute of Engineers.
Kohle Erz = Kohle und Erz.
Lumière El. = Lumière Electrique.
Min. Eng. = Mining Engineer.
Mines Minerals = Mines and Minerals.
Min. Sc. Press = Mining and Scientific Press.
Min. World Eng. Rec. = Mining World and Engineering Record.
Mon. Ind. Gaz. = Moniteur de l'Industrie du Gaz et de l'Electricité.
Montan. Rdsch. = Montanistische Rundschau.
Oesterr. Z. Berg- Huttenwes. = Oesterreichische Zeitschrift für Berg und Hüttenwesen.
Portefeuille Econ. Machines = Portefeuille économique des machines.
Proc. Acad. Pol. Sc. N. Y. = Proceedings of Academy of Political Science, New York.
Proc. Am. Inst. El. Eng. = Proceedings of American Institute of Electrical Engineers.
Proc. S. Wales Inst. Eng. = Proceedings of South Wales Institute of Engineers.
Rev. Noire = Revue Noire.
Rev. Univ. Mines = Revue Universelle des Mines.
Saarbrucker Berg. Kal. = Saarbrucker Bergmanns Kalendar.
S. Afr. Min. Jl. = South African Mining Journal.
Soz.-Technik = Sozial-Technik.
Stahl Eisen = Stahl und Eisen.
Stein-Braunkohle = Stein und Braunkohle.
Tech. Rdsch. = Technische Rundschau.
Techn. Wirtsch. = Technik und Wirtschaft.
Tekn. Tidskrift = Teknisk Tidskrift.
Trans. Min. Inst. Scot. = Transactions of Mining Institute of Scotland.
Trans. Inst. Min. Eng. = Transactions of the Institute of Mining Engineers.
Trans. Manchester Geol. Min. Soc. = Transactions of the Manchester Geological and Mining Society.
Ung. Mont. Ind. = Ungarische Montanindustrie und Handelszeitung.
Z. Dampfkessel-Betr. = Zeitschrift für Dampfkessel und Maschinenbetrieb.
Z. El. Mach. = Zeitschrift für Elektrotechnik und Maschinenbau.

Note: We shall be glad to obtain for readers, where possible, copies of the papers referred to.

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Mine Supports in Germany. "Min. Min." vol. 33. 5, p. 240-2, 16 fig. (Timber, steel and concrete rails, pipes and angle iron.)

Insect Damage to Mine Props and Its Prevention. T. E. Snyder. "Min. Eng. World," vol. 37, 23. p. 1043.

VII—WINDING AND HAULAGE

Three-Phase Hoists at Bantjes Con. Mines, Transvaal. J. Askew. "Min. Eng. World." vol. 37. 22, p. 993-5, 2 fig. 2 tab.

New Arrangement in Mine Hoisting. H. K. English. "Coal Age." Vol. 2, 23, p. 791-2, 2 fig. (The electric hoist employing herringbone gears is placed on the ground, the operator is in the scale house and can watch the discharge of the car, but no signals are dispensed with.)

Cage Fence Gates. W. G. Peasegood. "Colliery Guard." Vol. 104, 2712. p. 1245. (The gates cannot be opened inward into the shaft.)

Skip Accidents on the East Rand. Suggestions for Safety Catch Inventors. S. African Min. Jl. 1912, p. 38. 50c.

Requirements for a Model Mine Track. McIntyre, J. B. "Coal Tr. Bull." Oct. 15, p. 35.

VIII—SIGNALING

Modern Practice in Mine Telephony. G. Brown. "Coal Age," vol. 2, 23, p. 789-91. 6 fig.

IX—LIGHTING

Some Fundamental Principles of Safety Lamp Construction Wm. Clifford. "Coal & Coke Op." 1912, p. 276.

X—VENTILATION

C. F. & T. Co.'s Rockvale Mine, Fremont, Colo. J. B. Marks and G. Alley. "Coal Age," vol. 2, p. 744-6, 7 fig.

XI—MINE GASES, TESTING

A Portable Electric Instrument for the Detection of Combustible Gases and Vapors in Air. L. J. Steele. "Jl. Inst. El. Eng." vol. 49, 214. p. 289-96. 2 fig. 3 Ill. (The Philpp & Steel detector.)

XII—COAL DUST

Prevention of Coal Dust Explosions. S. Dean. "Coal Age," vol. 2, 22, p. 756-8. 5 fig. 2 tabl.

The Production of Coal Dust in Mines. T. J. Matthews. "Min. Eng." p. 182. (Reviews the various means of producing dust underground.) 15c.

Dust Explosions. Young C. M. "Mines Min." vol. 33, 5, p. 258-60. (The influence of the composition and fineness of dust, and the presence of gas on the liability of ignition.

Wet Mines Not Necessarily Safe from Coal Dust Explosions. S. Dean. "Mines Min." vol. 33, 5, p. 245-8. 6 fig. 3 tab.

The French Experiments Made with Coal Dust at Lievin. M. Rybak. (Die franzoesischen Versuche mit Kohlenstaub in Lievin.) "Oesterr. Z. Berg-Huettenwes." 1912. 8. p. 99-103; 9. p. 113-7 50c.

Humidifying Mine Air to Avoid Explosion. "Black Diamond." 1912. p. 15.

U. S. Bureau of Mines Type of Air Humidifier. "Black Diamond." 1912, p. 19. "Eng. World." 1912, p. 852.

XIII—EXPLOSIONS

Discussion of the Ignition of Coal Gas and Methane by Momentary Electric Arcs. W. M. Thornton. "Colliery Guard." vol. 104, 2712, p. 1242, 15c.

Official Report of the Mining Disaster at Lothringen. (Der amtliche Bericht ueber das Grubenunglueck auf Lothringen.) "Bergbau," 1912, 45, p. 629-31. 50c.

XIV—MINE FIRES

Experience with Gob Fires in Leicestershire. T. Stubbs. "Colliery Guard." vol. 104, 2711, p. 1192-4. 15c.

Mine Fires, a Preliminary Study. G. S. Rice. "U. S. Bureau of Mines." Tech. Paper No. 24. 51 p.

XV—RESCUE AND AMBULANCE

Mine Rescue Appliances. Dr. J. Cadman. "Colliery Guard." vol. 104, 2712, p. 1243-4. 2 fig. (Indicates a danger occurring in the use of an apparatus in which an injector is employed.) 15c.

On the Organization of Rescue Work in Mines. Josef Popper. (Ueber die Organisation des Rettungswesens im Bergbau.) "Montan. Rdsch." 1912, Special Number, p. 959. 30c.

XVI—DRAINAGE, PUMPING, ETC.

The Inundation of the Victoria and Habsburg Pits near Bruex, in February 1909. Wolfgang Kummer. (Die Inundation der Viktoria-und Habsburgschaechte bei Bruex in Februar, 1909.) "Montan Rdsch." 1912, 11, p. 521-6, 4 fig. 30c.

Turbo Compressors. Ernst Blau. (Turbokompressoren.) "Kohle-Erz." 1912, 37, p. 921-4. 50c.

XVII—PREPARATION

Improvements in Coal Preparation. A. J. Reef. "Coal Age," vol. 2, 24, p. 829-30, 4 fig. (Particular attention is given to defects in shaking screens and coal chutes of adjustable pitch, and the principal defects in other appliances.)

XVIII—BRIQUETTES

The Briquetting of Pit Coal with Addition of Napthaline. Grahn. Steinkohlenbrikettierung mit Napthalinzusatz "Gluckauf," 1912. 38. p. 1536-7. 2 fig. 75c.

Advantages of Driving Briquetting Presses by Steam. A. Eckardt. (Vorteile des Dampfantriebes von Brikettpressen.) "Braunkohle," vol. 11, 1912. 32. p. 507-9. 20c.

XIX—COKE OVENS

The Coking of Coals at Low Temperatures, with a Preliminary Study of the Byproducts. S. W. Parr and H. L. Olin. Univ. of Illinois, Eng. Experiment Station Bull. No. 60.

Automatic Indicating Devices at Coke Tar Plants, with Special Reference to Gas Metering. A. Thau. (Selbsttaetige Betriebsueberwachung auf Teer-Kokerien mit besonderer Berueecksichtigung der Gasabsaugung.) "Gluckauf," 1912, p. 1706-19, p. 1858-64. 75c.

Byproduct Coke Ovens. "Metall. Chem. Eng." vol. 10, 12, p. 806-11. 2 fig.

Coking Practice in the South Wales District. Greaves, R. H. G. "Foundry Tr. Jl." vol. 14. 130. p. 618-23. 3 fig. 3 tab.

The Coking of Coal at Low Temperatures. "Power," vol. 36. 19. p. 697. (Considers the possibility of modifying the composition of raw coal in order that a different type of fuel may be produced in coking.)

The Coking of Coal at Low Temperatures. S. W. Parr, and H. L. Olin. "Colliery Guard." vol. 104. 2708. p. 1039-42. 1 fig. 3 tab. 15c.

The Manufacture of Coke. F. E. Lucas. "Am. Inst. Min. Eng." Bull. 71. p. 1315-26. (Deals exclusively with the by-product oven and its economy of working.)

The Manufacture of Coke. W. H. Blauvelt. "Am. Inst. Min Eng." Bull. 71. p. 1299-1314. 1 fig. (The qualities of the by-product oven and some of its advantages over the beehive oven.)

Progress in Byproduct Coke Manufacture. F. E. Lucas and others. "Iron Age." vol. 90. 20. p. 1161-5. 5 fig.

Significance of the Counter Current. J. Verner. "Coal Age." vol. 2. 20. p. 677-9. 2 fig. (The flame of an explosion feeds on the rear of the dust column, so there must be fresh air behind the dust! The air is supplied by the return draft. The coke dust on the leeward side of projections is deposited also by the counter current.)

Electric Smelting in Norway. J. L. Vogt and others. "Min. Jl." vol. 99. 4031. p. 1145-7. (The employment of coke as a reduction material in electric iron smelting is considered to make a poorer and more sulphur-containig pig iron.) 25c.

XX—FUEL TESTING

Shortcomings of the B. T. U. System. G. D. C. Coal & Coke Op." 1912, p. 225.

Testing Texas Lump Lignite. Earnest, D. C. "Min. Min." Nov. p. 180.

Determining Coal Values, Chemical and Calorific. Bailey, E. G. "Min. Meth." Nov. p. 191.

Decomposition of Coal in Storage and Upon Exposure. (Ueber die Zersetzung von aufgestapelter Kohle.) "Kali Erz & Kohle," Oct. 25, p. 1072.

New Calorimetric Bomb, System Fery. (Nouvelle bombe calorimetrique "Ind. Nat." 1912, vol. 118. 2 sem. 1. p. 30-6. 2 fig. (Thermo-electric bomb.)

Determination of Heating Value of Solid Fuels by Calculation from the Proximate Analysis. H. H. Clark. "Progress Age." vol. 30, 22. p. 881, 3 tab. (Formula applied to anthracite, bituminous and lignite coal and coke.)

Spontaneous Combustion of Coal. S. F. Walker. "Gas World." vol. 57. 1480. p. 725-8. 5 fig. (Some methods of prevention are discussed.) 30c.

Coal Stacking and Coal Firing. H. Kendrick. "Gas World." vol. 57. 1481. p. 762-7. (Special consideration is given to gas works storage of coal in anticipation of strikes.) 30c.

XXI—STEAM ENGINES AND BOILERS

Selling Energy instead of Slack. "Coal Age," vol. 2, 23, p. 781-4, 9 fig. 1 tab. (Electric energy generated from slack and sold in nearby towns.)

Boiler Practice and Fuel Economy. Dales. J. H., "Eng. Rev." vol. 26. 5. p. 166-8. (The estimated preventable loss of fuel is 10%, which is valued at £8,000,000 per annum.)

How and Why Coal Smoke Is Injurious. B. C. Benner. "Metall. Chem. Eng." vol. 10. 11. p. 735-7. 3 fig. 3 tab. (Some specific instances from the town of Pittsburgh.)

Laws in Force in Europe against the Emission of Black Smoke. J. B. C. Kershaw. "Metall. Chem. Eng." vol. 10. 11. p. 756-9. (American laws differ greatly in various States, European laws have greater uniformity.)

Smoke Abatement as Related to Steam Railroads. W. A. Hoffman. "Boiler Maker." vol. 12, 11. p. 325-7. 5 fig.

XXII—ELECTRICITY

Electricity Applied to Coal Mining. J. T. Jennings. Coal Age," vol. 2, 23, p. 779-80.

Electrical Equipment of the Shelton Iron Steel & Coal Co.'s Works, Stoke-on-Trent. "Colliery Guard." vol. 104, 2711, p. 1187, 6 fig.

Application of Electric Power for Coal Mining. S. R. Stone. "Min. Eng. World," vol. 37, 24, p. 1085-8, 3 fig.

Emergency Treatments of Mine Electrical Troubles. E. Clemens. "Coal Age," vol. 2, 23, p. 783-5, 10 fig.

Central Stations Service in Mining Operations. E. T. Spence. "El. World." vol. 60. 5. p. 260-1. (Interest of the central station in the use of electricity, in coal mines within reach of its circuits; electric cutting of coal, haulage, draining and pumping, hoisting of coal, ventilating, lighting.)

A German Electrical Colliery Installation. J. B. Van Brussel. "Coal Age." vol. 2. 19. p. 635-7. 4 fig. 2 tab. (A typical plant of six unusually complete electrical plants which total 20,000 hp.; the important units are all duplicated.)

Mine No. 9 of the Penn. Coal and Coke Corp. R. D. Mainwaring. "Coal Age." vol. 2. 18. p. 600-3. 6 fig. (The electrical equipment is exceptionally complete and extensive, also a large amount of water is handled.)

Electrical Regulations in Belgian Coal Mines. "Coll. Guard." vol. 104, 2706. p. 939-40. 15c.

Underground Mine Switches. D. W. Jessup. "Eng. Min. Jl." vol. 94. 22. p. 1031-4. 17 fig.

The Wireless Motor in Mining. S. McMahon. "Coal Age." vol. 2. 20. p. 671-2.

Alternating Current Motors for Mines and Mills. S. R. Stone. "Min. Eng. World." vol. 37. 19. p. 839-43. 7 fig.

XXIII—SURFACE TRANSPORTATION

Mechanical Handling of Coal for British Locomotives. C. J. B. Cooke. "Colliery Guard." vol. 104, 2712, p. 1239-40. 1 fig. 15c.

An Electric Elevated Tramroad Installation. "Coal Age," vol. 2, 24, p. 831-2, 3 fig. (It employs no third rail nor overhead trolley, no cross-ties nor sleepers are used; the cars dump automatically in all weathers.)

Lake Docks May Determine Success at Panama. "Black Diamond," 1912, p. 18. (Coal handling methods at lake docks.)

Mechanical Handling of Coal for British Locomotives. J. C. B. Cooke. "Inst. Civ. Eng." No. 2. 27. Nov. 1912. p. 1-5.

The Adair Face Conveyor. "Coll. Guard." vol. 104, 2708, p. 1035-6. 11 fig. (A coal conveyor which is designed to take as little space as possible in a verticle direction when discharging.) 15c.

Gantry Coal Handling Crane. A. D. Williams. "Power." vol. 36. 20. p. 703-4.

The World's First Coal Port. M. Meredith. "Cassier's Mag." vol. 42. 5. p. 379-88. 9 fig. (The Bute Docks, Cardiff, of the Cardiff Railway Co.) 40c.

XXIV—SANITATION DISEASES

Compulsory Reporting by Physicians of Industrial Diseases. L. W. Hotch. "Am. Labor Legisl. Rev." vol. 2, p. 263-72.

Miners' Baths. W. B. Wilson. "Coal Age." vol. 2. 18. p. 619-20. 10. 656-8. 4 fig. (Notes upon provision made in different mines and the building constructions for from 650 to 1000 men.)

Miners' Baths. H. F. Bulman. "Coal Age." vol. 2. 18. p. 619-20. 6 fig. (Method of running the bath and some mechanical appliances for suspending clothes, the locked hoists being under owners' control.)

Town Planning on the South Yorkshire Coalfield. P. H. Boulnois. "Colliery Guard," vol. 104, 2709. p. 1092-3. 15c.

COAL AGE

Vol. 3 NEW YORK, MARCH 22, 1913 No. 12

A few years ago an ingenious advertising man popularized a poster that pictured a large hand with the fore-finger pointing straight at the passerby and underneath, in flaming red letters, was the word *YOU*.

It was so designed that no matter from what angle you viewed it, the finger seemed always to point at you.

This man realized that the average human being is prone to accept any statement as true, so long as it affects mankind in general, but if you hope to make the human being in question realize that you are talking to *him*, and for *him*, you must stop him long enough to get his mind off mankind in general.

If, after pondering over this statement for a moment, you are inclined to agree with it, you'll be in position to understand why it is that so much of the welfare work carried on around our mining camps seems to bear so little fruit.

Take the "safety first" campaign as an illustration: Just now it generally begins (and very often ends) with placards. Now a large part of the placards used are so worded that no one can dispute the truth of the statements and yet they fail to make each man realize that the message is intended primarily for *him*.

If we hark back to the old, old proverb that tells us to remember that a chain is no stronger than its weakest link, the necessity of the personal note as suggested by the advertising man's pointing forefinger becomes apparent

For example, *Mr. Superintendent*, you're one of the links! The next time you are inside the mine and decide that you will ride the haulage trip out, to save time, even though none of your men are allowed to ride, under penalty of discharge; think of that invisible but fearfully real finger pointing at *you* from a "Safety first" placard.

Mr. Mine Foreman, you're one of the links! When you are tempted to urge your motormen to make up time they have lost, even though it be contrary to speed rules; think of that haunting finger pointing at you.

Mr. Fireboss, you're one of the links! The next time you skip a room on your rounds, just because you are tired and know that it is safe; think of that ominous finger pointing your way.

Mr. Trackman, you're also one of the links! When you put two spikes in a rail that requires five, just because you are out of spikes and don't feel like going after more; think of that tell-tale finger pointing at you.

No need to get personal with you, *Mr. Miner*: every one knows that you must be careful and every one tells you so. Perhaps, however, if some of the bosses acted as if they understood, you might manifest interest enough to inquire from your neighbor as to just what all the fuss was about.

We are not attempting to take sides with the miner; we are simply trying to follow the example set by the advertising man—we want to get you, Mr. Superintendent and Mr. Mine Foreman and Mr. Fireboss and Mr. Trackman and Mr. every other man, into an argument with your thoughtless self.

Ralph Waldo Emerson, who knew a few things about human nature, *partially* covered the ground when he said: "If you would lift me, you must be on higher ground." We say partially because this isn't a case of lifting me; it's something far more difficult; its a case of lifting *you*.

MORAL: Don't forget that you and I and every other body must realize our individual responsibility if we would be linked in a chain of safety.

Scientific Principles in Use of Dynamite

Special Correspondence

SYNOPSIS—The use of explosives has been scientifically considered but no one seems desirous of using the results of the determinations. The writer shows that safety and efficiency both depend on the methods employed in the use of dynamite. The action of the detonator should be directed toward the main body of the charge and so arranged that the maximum shock will be at the end of the hole.

It is said that there is a right and a wrong way of performing even the most ordinary and commonplace act, and it is interesting to note that the unerring instinct of so many is to do it the wrong way, especially those people who "know it all." Any user of dynamite and every blaster will tell you that he knows all about dynamite and has been shooting holes ever since dynamite was invented, and some of them claim to have blasted with dynamite even before that time.

It is no exaggeration to say that there is hardly a line of manufactured articles which is used with such

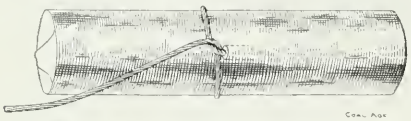


Fig. 1. A Method of Priming by Which Short-circuits and Misfires Result. Avoid Half Hitches

utter disregard of the manufacturer's directions as high explosives. Manufacturers print directions, which are placed in every box of dynamite; they distribute thousands of booklets and catalogs and issue carloads of warning cards of various descriptions indicating how their goods should be used. Notwithstanding all this, there is probably not more than one consumer in five hundred who thinks it necessary or desirable to follow these directions. He considers himself an expert on the subject and knows more than the manufacturer about the product.

There are two requisites which consumers fail to observe, and because of their neglect they get lessened efficiency from the dynamite; (1) they do not thaw the explosive correctly and (2) they fail to make the primer in the proper manner. The question of thawing will not be dealt with in this article. Correct priming involves two precautions: correctly locating the connecting medium, that is, fuse or electric fuse wire, and placing the detonator in the proper position in relation to the charge.

Beware of Sharp Bends in the Electric Fuse

Taking up electric blasting first, 99 out of 100 blasters insert the electric fuse in the side of the dynamite cartridge and take a half hitch with the wires around the cartridge, giving them a smart pull to tighten them, as in Fig. 1.

Of those who do not use this method, 99 out of 100 insert the detonator in the end of the dynamite cartridge, double it over, and stick the cartridge exploder end first into the borehole. The trouble with the half-hitch method is that it is liable to cause misfires by a short circuit, where the wires are pulled against each other at the hitch. Of course, if the current goes across this point, it will not fire the detonator.

Fig. 2. Wrong Method of Priming, Giving Greatest Intensity of Detonation near the Tamping

The detonator when stuck in the end of the cartridge and pointing out toward the mouth of the borehole, does not realize the full power of the explosive for the reason that the direction of the greatest detonating force of an electric fuse or blasting cap is out of the "business end,"

Fig. 3. A Well Planned Shot. The "Business End" of the Primer Faces Larger Part of Charge

that is the opposite end from that into which the fuse is put or from which the fuse wires protrude.

The Detonator Should Have the Open End Facing the Bulk of the Charge

When the primer is placed, as shown in Fig. 2, the dynamite at the point indicated by *A* gets the maximum strength of the explosion, and in actual practice it has been found that there is a liability of unexploded powder being found at *B*.

Fig. 3 shows the proper way of placing the detonator where only one is used in each hole.

Fig. 4 shows even a better method with two detonators,

Fig. 4. A Well Arranged Shot with Two Centers of Detonation and with Primers Rightly Located

one set not far from the tamping in the second cartridge and the other running to a cartridge in the end of the hole. Practically every particle of strength of the explosive is used and there is almost no chance for a misfire or of having unexploded dynamite in the débris.

Avoid the Possibility of Striking the Cartridge with Tamper

The few blasters who do not use either of the two methods of priming condemned above, open up one end

The shots here illustrated are for the most part arranged for vertical holes, as frequently appears in the text. In many cases, it will be seen that the holes, being in soft material, have been enlarged at the ends by untamped shots. The principles enuntiated apply equally to all forms of dynamite shooting.—Editor.

of the paper wrapper and stick the blasting cap or electric fuse in the end and either tie or crimp the paper down to hold the detonator in place. Once this is loaded in the hole, it makes an ideal blast, as the detonator is in the center of the borehole and pointed towards the end. It has the disadvantages, however, of bending the fuse wire or fuse sharply when the tamping stick is pushed against it and of bringing the detonator itself nearly in contact with the tamping stick, and on this account is a little less safe than the method whereby the detonator is placed in the middle of the cartridge, as shown in Fig. 5.

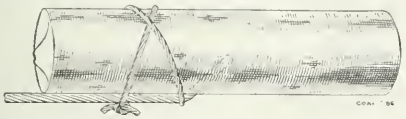


FIG. 5. TYING FUSE BY LOOP AROUND THE PERIPHERY OF THE CARTRIDGE KEEPS IT SECURELY IN PLACE

The fuse or fuse wires may be tied with a string to the cartridge, or the fuse wires may be laced through the cartridge (see Fig. 6), thus avoiding the wires crossing and so making a short circuit.

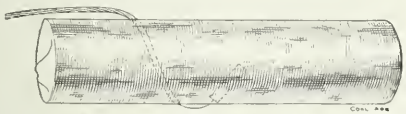


FIG. 6. A METHOD OF ARRANGING ELECTRIC FUSE WIRES SO THAT THERE IS NO RISK OF A SHORT-CIRCUIT

COMMON FUSE SHOULD BE RUN TO LAST CARTRIDGE, ELECTRIC FUSE TO LAST BUT ONE

Fuse, of course, should not be laced through dynamite cartridges, as it is liable to ignite them from its side spit, and for the same reason, charges fired with blasting cap and fuse should have the primer in the last cartridge loaded in the hole, especially in charges where the cartridges are slit or taken out of their paper wrappers. With electric exploders it is usually best to allow one cartridge to be above the primer, i.e., have the primer next to the last cartridge loaded in the hole so that in case of a misfire, if the tamping is to be removed, there

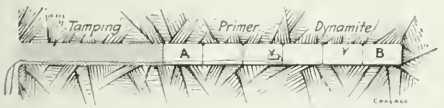


FIG. 7. PRIMER WITH ITS "BUSINESS END" FACING *A*, WILL DETONATE MORE VIOLENTLY THERE THAN AT *B*

is one cartridge between the tamping and the primer, which is the most dangerous point in the charge.

There are two reasons why better execution is obtained from the priming method shown in Fig. 3, than from that exemplified in Fig. 2. One reason is that the maximum effect of the detonator is at its "business end" in a hole loaded as shown thus.

With the primer in the middle (see Fig. 7) and an equal amount of dynamite at each end, the charge at *A* would explode with greater force than that at *B*, where it is most desired. With very sensitive explosives and those most dangerous to handle, this difference in the effect of the direction of the detonator would not be as noticeable as with more insensitive explosives, such as the gelatines and ammonia powders.

DYNAMITE DETONATION GAINS SPEED WITH TRAVEL UP TO A CERTAIN LIMIT

In a hole loaded like this, you will not get as much work out of the dynamite as if the primer were placed as in Fig. 3, because the power of an explosive depends on two things—the volume of gas liberated and the quickness with which this is done. It takes a certain well-defined distance in the dynamite for its detonation to pick up its full speed, just as it takes a certain time for a railroad train to get under way.

It takes about a foot, sometimes more for modern, safe, insensitive dynamites to reach their maximum speed of propagation. This is not theory; it has been positively and accurately determined by firing charges with different explosives in a tube, through which wires are passed at intervals, which are connected electrically with an instrument called a chronograph. In this way, it has been determined that a detonating wave will travel

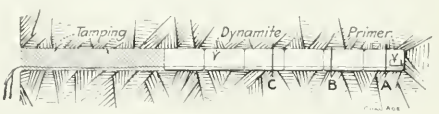


FIG. 8. A GOOD SHOT WIRED TO SHOW THAT DETONATION TIME IS SHORTER FROM *B* TO *C* THAN FROM *A* TO *B*

through dynamite quite slowly, comparatively speaking, for the first 6 or 8 in., and about a foot from the place where the detonator was located it acquires its full velocity and goes on at that speed for the rest of the distance.

It has been often observed in firing horizontal shots in a comparatively shallow hole, say 10 or 12 in. deep, that after the blast the rock shows a perfectly smooth surface up at the top, where the detonator was located, and for 6 in. from that point, but after that and at the bottom of the hole, the rock is burned and shattered. In Fig. 8 if wires are placed across the charge at equal distances at the points indicated by *A*, *B* and *C*, it will be found that it takes much longer for wire *B* to break after *A* has broken than it does for *C* to break after *B* has broken.

This point has been proven on a large scale in practical quarry work by priming half the holes in a uniform ledge of 28 holes as shown in Fig. 2—the detonator being at the top and pointing towards the mouth of the hole. The other holes were loaded as shown in Fig. 3, with the detonator at the top and pointing toward the bulk of the charge. The ledge in which the detonator pointed outward was thrown off to within 2 ft. of the bottom of the hole. There the rock was broken in places but was not thrown out. In the other half of the ledge where the detonator pointed towards the bulk of the charge, the rock was thrown off clear and clean and nearly 2 ft. below the bottom line of the hole, taking off about 30 per cent. more material than the same charge did with the detonator pointed the wrong way.

Naphthalene as a Briquette Binder

SYNOPSIS—Exhaustive experiments have been conducted by both the government and private individuals in the effort to obtain a substitute for pitch as a binder in briquetting. These have, in the main, been unproductive of results. The accompanying article describes the use of naphthalene for this purpose and it is said to give satisfaction when used as a partial substitute.

A new method of mixing naphthalene with briquettes as a substance for part of the pitch binder is described in *Glückhauf*, Essen, Germany, Sept. 21, and Oct. 26, 1912, by Mine Assessor Grahn, instructor at the Bochum Mining School. We translate in abstract as follows:

The binder generally used for briquetting coal is pitch, the price of which is therefore an important consideration. It is quite an expensive binder and if, at a cost of $10 per ton, 7 per cent. by weight is added to the briquettes, this means an item of 70c. per ton of the product. Search has been made for a cheaper substance with which to replace some at least of the pitch. An important material for this purpose is naphthalene.

The Buss-Fohr System

There has been introduced in Germany the Buss-Fohr patent system for briquetting coal, lignite, peat, etc., using superheated steam and naphthalene. This apparatus is successfully operated in Kray, Germany, at the Bonifacius mine of the Gelsengirchener Bergswerks-A. G.; it is shown in the accompanying figures.

Crude naphthalene is first led into an iron pressure tank in the briquette factory cellar and there melted by steam. It is then forced, by compressed air, through a sieve filter, and into a reservoir above the mixer, the reservoir being likewise heated by steam coils. Formerly the naphthalene simply flowed from this reservoir into the mixer, but it was found that on mixing with the fine coal it formed into lumps which adhered to the briquetting press.

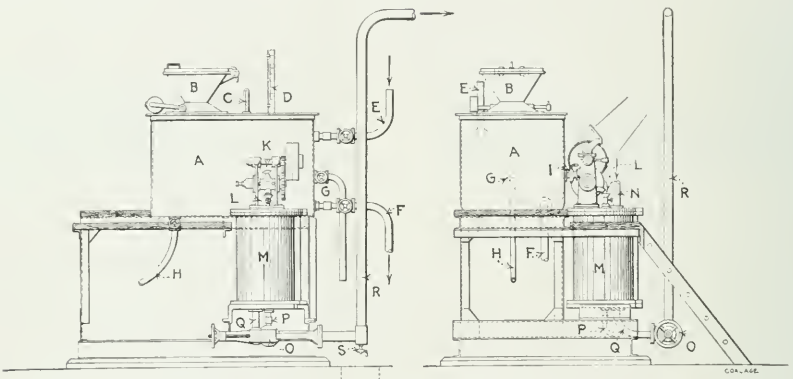
This difficulty has been remedied by introducing a spraying nozzle or injector in the top of the mixer. The liquid naphthalene is now blown by steam and thus distributed as evenly as possible upon the fine coal, which is kneaded by a stirring device in the mixer. Into the mixer is led superheated steam at about 660 deg. F., which keeps the temperature at about 480 deg. In contrast to the Schüring apparatus, to be described later, the naphthalene is not vaporized until it reaches the mixer.

The Importance of Vaporizing.

It is important that all the naphthalene shall vaporize and be distributed in the gaseous state between the particles of coal. That it does effectually vaporize, and not remain in liquid form, is proved by the fact that when more steam is led into the mixer, or when same is at a considerably higher temperature than usual, naphalene in vapor form escapes above and precipitates outside of the mixer in white flakes. This visible deposit is a guide for regulating the temperature and quantity of steam supplied.

From the mixer, the pasty mass of fine coal, melted pitch and naphthalene is conveyed to the presses. At the Bonifacius mine two Tigler presses of new design are used for making large industrial briquettes weighing 22 lb. The average pitch consumption, without naphthalene, is 6 per cent. of the coal supplied, but this is reduced to 5 per cent. when replaced by about 2 per cent. of naphthalene. It is stated by the inventor, however, that the spray nozzle which has been mentioned, renders possible a further reduction in the pitch of about 1 per cent., for which is substituted 1 per cent. more of naphthalene. The results at the Bonifacius mine were attained in making briquettes of very fine coal of a sort requiring more pitch than some other kinds.

Briquettes, containing naphthalene, from this mine have proved satisfactory for marine use after more than two years storage. The manufacturers prefer the briquettes with naphthalene; they come from the press softer but harden on cooling.



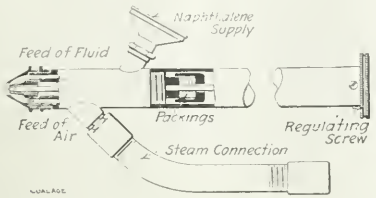
Schüring's Naphthalene Vaporizer for Briquetting

Schüring System

Another process it that of Schüring, also patented in Germany. The naphthalene, melted outside of the mixer, is next vaporized in a carburetor heated by superheated

steam and afterward forced into the material by superheated steam in the mixer. The apparatus is illustrated in the accompanying figures.

The naphthalene is first fed through a hopper *B* into a pot *A*, where, by means of live steam from the superheater coil *E*, it is heated to about 212 deg. F. and so melted. The cocks *G* and *H* allow the melting pot to

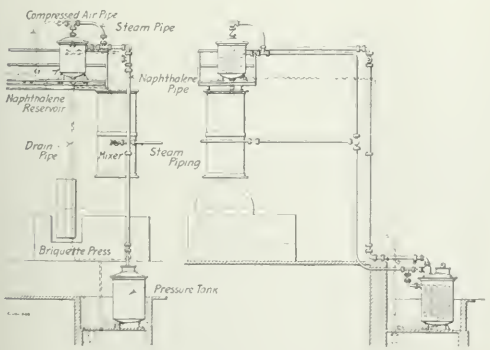


Nozzle for Spraying Naphthalene

be emptied of naphthalene and naphthalene sediment for cleaning. The condensed steam is led off through the pipe *F*.

In general, the melted naphthalene passes automatically through the outlet cock *I* into the measuring apparatus *K*, which is surrounded by a jacket that can be heated, and thence in definite quantities, through the feed funnel *L*, into the vaporizing coil in the heating cylinder *M*. Through the pipe *N*, superheated steam at perhaps 480 to 660 deg. F. enters the heating cylinder, surrounds the vaporizer coil and emerges through the pipe *Q* in order to serve the steam-jet apparatus or injector *O*.

The napthalene is vaporized in the heating cylinder and flows through the outlet connection *P* also to the injector *O*. Here the steam pressure should be at least four atmospheres absolute, with a temperature of 480 deg. The naphthalene, in a practically gaseous state, is blown through it and along the pipe *R* to the steam kneader or mixer. A drainage cock *S* permits the re-



Front and Side View of Buss-Fohr System

moval of any condensed naphthalene that may have collected. It must always be opened when the entire apparatus ceases operation.

The thermometer *C* and a pyrometer are provided for observing the temperatures of melting pot and vaporizer respectively. A float gage *D* shows the level of the naphthalene in the melting pot.

Some Practical Applications

The coal, together with the required proportion of the pitch binder, is heated in the ordinary manner. It is then well impregnated by passing the naphthalene and steam mixture through it from the bottom to top, yet so that no naphthalene vapor escapes at the upper end. The briquetting press is connected with the vapor mixer.

The Schüring system has been tried at the Blankenburg mine in the Dortmund Upper District. It was found there that by the addition of 3 per cent. naphthalene the percentage of pitch could be reduced from 6¼ or 6½ per cent. to 4½ or 5 per cent., while maintaining a satisfactory quality of the product; it was found impracticable to use over 3 per cent. naphthalene, as the briquettes stuck in the press and also showed less strength. The average quantity of pitch per ton of briquettes without naphthalene, as employed in the district, is said to be slightly larger than that at the Blankenburg mine, which will indicate a still greater possibility of saving.

While the percentages of saving in pitch, as here stated, are too rough and fragmentary for close comparisons, it is proper to point out a slight difference in the bases of computation, the percentage at the Bonifacius mine apparently being reckoned upon the weight of coal used and at the Blankenburg colliery upon the weight of briquettes produced.

A Large Coal Bill

The coal bill of a big trans-Atlantic liner is sufficiently great under ordinary circumstances, but when strike conditions prevail, with consequent high prices, the sum paid for sufficient fuel for a single voyage may amount almost to a small fortune.

The White Star liner "Olympic" for her last trip to this country was compelled to pay $5 per ton for her bunker coal, and had difficulty in securing enough to supply her needs at even this price. Her total expense for coal alone upon this voyage was $25,000.

Upon this trip the vessel carried 1586 passengers of all classes, and the expense for fuel for each passenger amounted in round numbers to $15.70, and as the voyage was completed in 5 days, 18 hours and 16 min., the coal bill amounted to very slightly over $3 per minute.

In reckoning fuel costs, all figures should be regarded as relative. Because one steamer burns a greater weight or value of coal than another, does not necessarily signify that her freight cost per ton-mile is any higher. It is probable that other vessels plying between the same ports at about the same time as the Olympic were compelled to pay equal rates per ton in order to fill their bunkers. It is doubtful, however, if any other steamer paid such an enormous sum for fuel enough for a single voyage.

The advantages of electric mine lights, as compared with ordinary mine lights, are:

(1) The absence of oil permits tilting at any angle without injury to the light, thus affording a good illumination for the examination of roofs. (2) Regular and constant radiance. (3) Safety in explosive gas unless the bulb is broken. (4) Light not extinguished by the presence of gas or by small blasts of air. (5) No loss of time from being accidentally extinguished. (7) Periodical examinations unnecessary. (8) No smoke. (9) No gauze being used. It cannot become heated by the tilting of the lamp with a consequent explosion of gas.

Mine Explosions Caused by Gas Wells

By A. W. Hesse*

SYNOPSIS—The writer shows that gas wells have been the cause of three severe explosions. The upward pressure of the gas at the coal may be greater than the downward pressure of the roof. It is easy, therefore, to see how leakage through crevices takes place. A mine separated from a well by 1500 ft. of unbroken strata caused a violent explosion in a mine just opened. A one-inch pipe inserted in the coal gave 17,600 cu.ft. of gas.

On Nov. 21, 1912, an explosion occurred in a small country coal mine located about three miles west of Shinnston, W. Va. Two small boys were killed and the father was fatally burned while attempting to rescue them. Later examination showed the cause to be the escape of gas from a well located about three or four hundred feet away. This well had been drilled to the gas about 6 years previously and about 1910 it was cleaned out and tubed; after which a casing head was placed so as to enclose the gas within the outside casings. In all probability no packers were placed at the bottom of the hole to prevent leakage around the casings.

Attention has been called to Judge Doty's decision against the Penn. Gas Coal Co., which corporation sought to restrain the Greensboro Gas Co. from drilling a well through their coal without fulfilling a previous agreement to protect their operations.[1]

Explosion at a Consolidation Mine

The explosion which occurred in two mines of The Consolidation Coal Co., in the Fairmount region in 1910, was proved to be directly caused by a capped gas well.[2]

This well was started with a 13-in. bit and drilled to a depth of about 246 ft., or about 82 ft. below the Pittsburgh coal seam. An 8¼-in. casing was then "run in" and a cement mixture poured around it, up to some point above the coal. The cover at this point is about 176 ft. thick. When the well reached the gas, a casing head was placed on the 8¼-in. casing. After standing for some time, the pressure reached about 850 lb. per sq.in.

The Downward Pressure of the Measures Compared with the Upward Pressure of the Gas

According to investigations made at Lehigh University a vertical column of coal-measure rock, 176 ft. high and one foot square, will produce, approximately, a compression of 13.3 tons net or about 185 lb. per sq.in. The gas pressure of the aforementioned well was over four and a half times this amount, and as most of the coal in this neighborhood was extracted, the chances for the leaking of the gas were highly favorable.

In June of 1911, the Hutchinson Coal Co. made an opening into the Pittsburgh coal, about 8 miles west of Clarksburg, on the Parkersburg branch of the Baltimore & Ohio R.R. After the entries had advanced about 80 ft. a gas explosion blew mine cars and tools out of the opening. Upon investigation, the odor of natural gas could be easily detected and a 1-in pipe inserted into the coal showed a pressure of two-tenths inch water gage or a flow of about 17,600 cu.ft. of gas per day. It is easy to imagine how large a quantity of gas must have been escaping from the entire face of the entry.

Explosion Caused by a Well 1500 Feet Away

A gas well about 450 ft. distant from this opening, and near the outcrop, was uncapped but this had no effect upon the flow of gas. Another well located about 1500 ft. south was then opened and the flow of gas immediately stopped. No indication of gas has since been found in this mine.

Any gas well of long standing may be considered a menace to coal operations, especially if the gas is confined in the outer casings. The reason follows, reference being made to the sands penetrated in this locality.

A well is drilled at the commencement with a 13- or 16-in. bit and goes to some point between the surface and the Dunkard Sand, depending on the location of water. Ten-inch casing is run in the hole to this depth; but no packer is placed on the bottom to prevent any possible escape of gas.

The hole may be drilled on down to the Big Lime and 8-in. casing run in to this point. It is probable that the driller will fail to place a packer on the bottom. The size of the bit and drill is then reduced and the hole extended down to the Big Injun Sand, where a sufficient quantity of gas to warrant immediate piping may be found. But we will suppose that a fair quantity is obtained. The 6-in. casing is immediately run in the hole and the packer placed in some rock just above the point where gas is found. This confines the gas to the 6-in. casing.

The driller continues down to the Thirty Foot, Fifty Foot, or the Fifth and Sixth Sands, depending on the gas indications and the location. Perhaps 5-in. casing is run in to some point below the Injun Sand to confine this gas between the 5- and 6-in. casings. Then if the flow of gas is not exceptional from the lower sand, 3-in tubing is run in to the gas-producing sand and the anchor packer placed in some solid rock above.

If Packers Deteriorate, the Casings Cease to Protect

Should this well stand for a number of years, there is little doubt but that the rubber on the various packers may deteriorate to such an extent as to allow the escape of gas around the bottom of the casings to which the packers are attached. It is difficult to say just where this gas will appear—on the surface or in the mine.

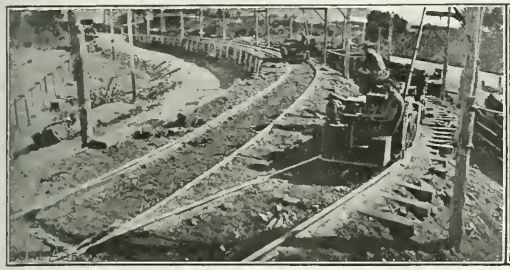
Therefore, a coal operator should know, and has the right to know, as much regarding the conditions and methods, of a well being drilled through the seam of coal he is working as the person, party or company drilling such a well. Otherwise, he is negligent and, unless he takes sufficient interest in his own property to call attention to these dangers, how can he expect the gas or oil man to care for his interests.

*Assistant chief engineer, Consolidation Coal Co., West Virginia division, Fairmont, W. Va.

[1] "Coal Trade Bulletin," Vol. XXVII, No. 6, Aug. 15, 1912.

[2] "Mines and Minerals," Vol. XXXII, No. 1, August, 1911.

SNAP SHOTS IN COAL MINING

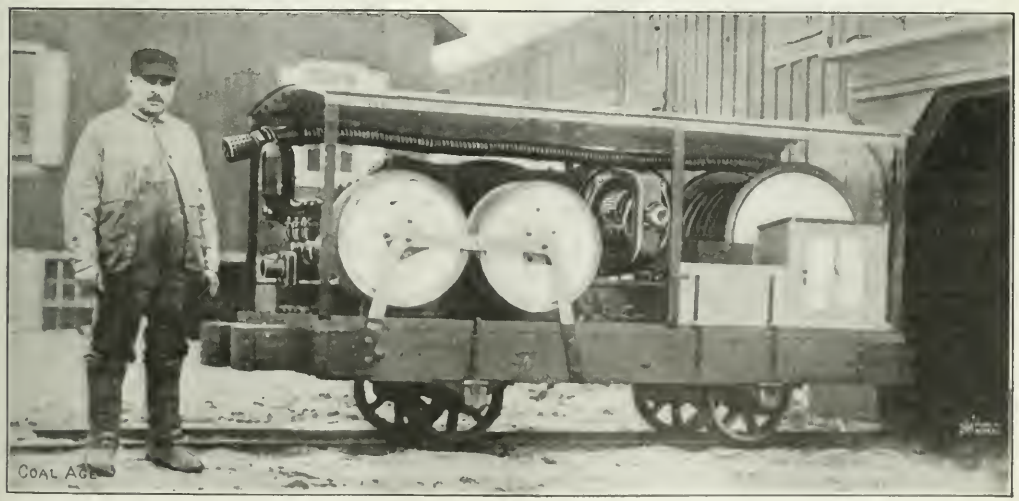


A 5-ton Motor Hauling Trip of Empties, Wyoming Coal Mining Co., Monarch, Wyo.

Tipple and Power House, Lansing Mine, the Lorain Coal & Dock Co., Lansing, Ohio.

Tipple at Mine of Forsythe Coal Co., Providence, Ky. Output 150 Tons per Day. Coal Shot from Solid

Miner's Houses, Kington Coal Co., White City, Ky. A Type of 3-room Miner's House Common in this Region



Portable Fire Outfit with a Triplex Pump, Driven by a General Electric Motor. Packer No. 5 Colliery, Lost Creek, Penn.

Original Impurities of Bering Coals

By W. R. Crane*

SYNOPSIS—Had the Bering field coals never been folded, faulted, pulverized, devolatilized and streaked with dikes and sills, they would still have been intensely interesting to economic geologists. Dr. Crane in this, the third of his series of papers, shows that the partings rise and wane incontinently, and that pyrite boulders are found of an abnormal size. Bituminous shale "horses" and "bells" of argillaceous material add to the risks of mining and to the difficulties experienced in preparing clean coal.

The coals of the Bering River field occur in Tertiary rocks, as do many other coals in Alaska. The beds are given a number of local names, but the enumeration of

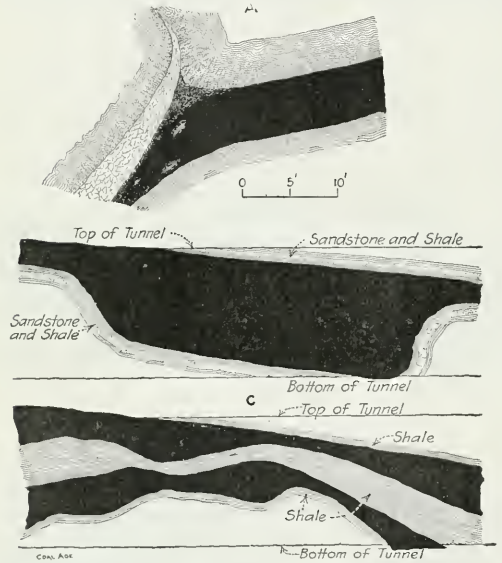


Fig. 1. Sections in Tunnel on Carbon Mountain, Showing Variations in Coal and Shale

these would be of no particular interest, and I therefore omit all reference to them.

How Upheaval, Erosion, Subsidence, Folding, Intrusion and Glaciation Have Modified the Coal

The geological history of this region is one of many and diversified changes; it has been subjected to periods of upheaval, alternating with periods of inactivity, during which time erosion acted, cutting out valleys which, at present, are filled with alluvium. Later, subsidence brought the land to practically its present position. Folding and faulting, accompanied by intrusions of igneous materials in the form of dikes and sills, were probably subsequent actions.

Glaciers have played no small part in the production of the present topography of the region and further have left behind in their retreat vast accumulations of débris, which are still choking the rivers and bays with silt. Bering River, which would otherwise have been of great assistance in the opening up and development of the coal field has, by such accumulations, been rendered unnavigable to all vessels except canoes and rowboats.

The condition of the rock strata is an index of the condition and character of the coals found associated with them. The folding and faulting observed in this region and the occurrence of igneous intrusions as dikes and sills, are evidence of extensive rock movements, and the coal beds being soft and friable have been disturbed even in undue proportion to what might possibly be expected from the conditions of the rock formations.

The character of the coal both physically and chemically has also undergone marked changes, as the whole

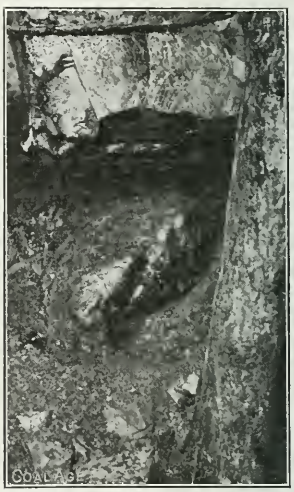


Fig. 2. A Nodule of Pyrite Occurring Close to the Top Rock

range from bituminous coal to anthracite is to be found in the limited area of this field. Reference has already been made on pages 212 and 298 to certain badly disturbed areas, and some sections were given showing the forms assumed.

The characters of the coal beds result from the conditions existing either (1) during formation or deposition, or (2) during subsequent periods. In this paper only the nature of the coal, as determined by the first conditions, will be discussed. In the first case may be considered such characters as, variations in thickness of deposit, occurrence of shale partings, nodules of shale, clay and pyrites, horses of shale (not clay veins) and bells, which occur in the deposits or extend into them from the top or bottom formations; in the second case, such occurrences as clay veins, igneous intrusions as dikes and sills, and a wide range of irregularities resulting from folding and faulting of the formations.

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Occasionally it is found extremely difficult to explain the occurrence of an irregularity without considering both causes as contributing to its formation. There will be occasion to refer to one or more such occurrences in connection with this discussion.

Interstratifications of Foreign Material

Probably the most common form of irregularity is the occurrence of foreign material interstratified with the coal. Few coals are free from such interstratifications or partings and those of this field are no exception to the rule. These partings, in some instances, vary greatly in thickness at points not far removed from each other, and they are often far from parallel with the coal beds. See Fig. 1. Further, both partings and coal may assume lenticular forms varying in width in a most surprising manner. Again a parting may become abnormally thick, assuming the form of a roll and wholly or in part pinching out the coal. It is not an easy matter to consider that such irregularities are produced alone by conditions affecting depositions of the coal and rock materials, but

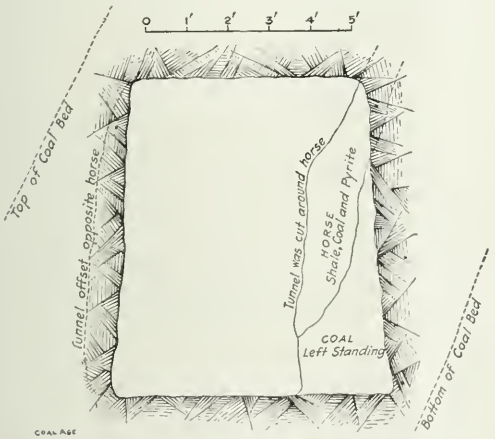

Fig. 3. Horse Next to Bottom Rock as Exposed in Tunnel, Showing How Latter Was Turned to Avoid Excavation of Waste Rock

when the lines of stratification conform with the irregularities, such a conclusion can hardly be denied. See Fig. 2, *B* and *C*.

Pyrite Occurs in Phenomenal Masses

Considerable pyrite, regularly termed "sulphur," occurs in the coal beds of certain portions of the field. Such occurrences are locally known, as nigger heads; they are nodules, oval or disk-like in form, and they vary in size from a fraction of an inch to several feet in diameter. In fact, in certain coal beds masses lenticular in form, have been observed to extend for 6 or 8 ft., forming in reality horses. They usually follow close to the top or bottom of the bed, although occasionally they protrude into it. See Fig. 2.

These nodules, having no connection or bond with either the coal or rock, present an element of danger which, in many cases, is formidable. Further, nodules of moderate size are apt to fall from the faces and ribs of coal and do considerable damage. In any case, large or small, they must be separated from the coal, the difficulty of handling increasing with the size.

Horses and Bells Make Mining Dangerous

Masses of clay and shale, so bituminous in character as to have every appearance of coal, not excepting the luster, are of frequent occurrence, often making an extremely treacherous top or even bad walls if the bed stands at a high angle, as is frequently the case. See Fig. 3. Aside from difficulties of support, much coal is often of necessity left around such masses or horses, the idea

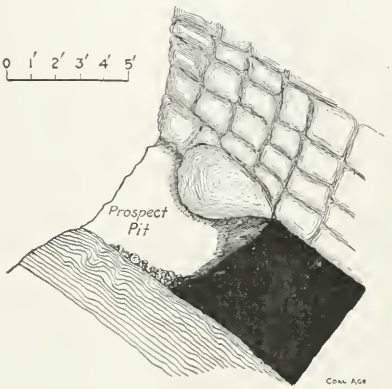

Fig. 4. Bell and Weathering of Shale Top Rock along Joint Planes

being to prevent their fall rather than go to the trouble and expense of removing them. Such irregularities are usually designated as "horses."

Large rounded masses of clay and shale occurring in the top formations of the coal beds and having practically no connection with them, are usually known as "bells." As a general rule they are of limited size, seldom exceeding 6 or 8 ft. in diameter, but occasionally they assume such proportions locally as to be in the nature of beds, and they may even pinch out the coal entirely. See Fig. 4.

The Deepest Borehole in the World?

Near Czuchow, in Silesia, according to *The Mining Journal*, a borehole has been sunk to a depth of 7349 ft., the time required for its completion being 982 days. The first 174 ft. were bored by auger, the next 1715 ft. by churn drill, and the rest by diamond drill. More than 700 carats of diamond were used up. The total cost of the bore was about $72,900. It was expected that the coal measure would be struck at 1920 ft. and the original diameter of the hole was made to accord with that assumption, but when that depth was exceeded, the hole had to be enlarged, thus much increasing the cost and the working time. Other deep boreholes have been sunk in Germany at from $4.35 to $5.80 per foot. The rods were constructed of Mannesmann tubes, the 6560 ft. running length of the tubes weighing 31,305 lb. At 1640-ft. depth, the temperature was 79 deg. F.; at 3280 ft., 104 deg. F.; at 1920 ft., 156 deg. F.; and at 7287 ft., 182.1 deg. Fahrenheit.

The Psychology of the Illegal Strike

By E. L. Cole

SYNOPSIS—A review of the recent "button" strikes in the anthracite-coal field. The author presents some thoughts and brings out a number of points not generally known to the public at large. According to his version the miners have repeatedly violated their agreement.

A survey of the industrial world reveals the fact that the labor unions are not rigidly adhering to their contract agreements signed by employers and their employees who are members of labor organizations. And this is true notwithstanding that it was organized labor that initiated the contract form of agreement in the hope that by means of periodical conferences between labor and capital, more amicable relations would thus be maintained, and the wasteful strikes relegated to oblivion. The labor organizations, alone, are guilty of violating the agreements that have been thus legally made. This illegal attitude on the part of organized labor is not confined to any particular industry or country. The dock laborers of England, the miners of Great Britain, the railway workers of France, and many others have in times past been found guilty of violating their contracts.

The numerous violations of the agreement entered into by the anthracite operators and the U. M. W. of A. has given much cause for comment in the press. The executive officers of the coal companies seem to be at a loss how to account for the irresponsible attitude of the miners, and more than one manager has despaired of being able to operate his collieries continuously.

Causes of the "Illegal Strikes"

An investigation of the causes of these "illegal" strikes brings to light a number of interesting points. Since the present contract between the anthracite operators and miners was signed, the U. M. W. of A. have posted at the collieries an alleged remark of G. F. Baer, who is reported to have said to the union officials: "When you succeed in enrolling the employees of our companies in your union, we will recognize your organization."

Furthermore, while the miners realize that they are now working under better conditions than have ever before been obtained, they are, nevertheless, far from being satisfied. At the recent district conventions, when the officers were interrogated by the radical element of the organization, as to why they did not insist on further concessions from the operators, they have replied that the concessions secured were all that could logically be expected in view of the numerical strength of the organization. This reply of the union officers shows that they believe that it is only necessary for the miners to join the union and whatsoever concessions they may desire at the termination of the present agreement will be theirs for the asking.

Here then we have the real reason for the so called "button" strikes. Most of the miners have been persuaded to join the U. M. W. of A. in hope that the next conference will find them not only numerically strong, but also with substantial resources with which to carry on the fight. One of the means employed to increase the membership of the miners union is the work of the "button committee" at each colliery. This committee is usually made up of aggressive union men; they do not mince words when engaged in seeking additional members, and in more than one instance men have refused to join, or to continue paying dues, because of the insolent and domineering attitude of its members. No one cares to do what is compulsory, and it may not be amiss to suggest that a more diplomatic course would result in less friction.

When the miners call a "button" strike they state that they are not on strike, but have simply stopped working with nonunion men, for whom they have secured an advance in wages. Therefore, they reason, it should be compulsory for these men to pay tribute to the U. M. W. of A. They further aver, that the responsibility for the stoppage of operations, should be laid at the door of these nonunion men. That this is illogical is readily apparent to any thinking man, and the organization will undoubtedly find their "illegal" strikes an obstacle in their path when they seek to secure further concessions.

The Radical Element

In justice to the national officers it must be said that they have placed themselves on record as being opposed to what they are pleased to term these "petty" strikes. No strike is "petty" that causes a loss of even one day's production of a product for which there is a ready market; and surely, a strike is not "petty" when a cessation of work causes a loss of hundreds of thousands of dollars in wages, and thousands of tons of coal. The men do not seem to realize that the permanent success of their organization rests on the strict adherence to the orders of their officers. Ever since President White has been in office a large number of miners have boldly disregarded his instructions, and their illegal acts have caused their executive officers considerable embarrassment.

Since the resumption of operations after the Tri-district Convention of May, there has been circulated through the coal fields, statements that boldly denounce the agreements. One radical magazine states that the men have been handed over to their employers, bound hand and foot, for four years; furthermore, the miners are advised that they are morally right in refusing to mine coal whenever they think that a stoppage of work will injure their employer financially. As the operators cannot recover any losses sustained, it can readily be seen that they are helpless, unless they should do the same as the miners and violate their agreements; it is only fair to say that they have so far scrupulously observed the letter and spirit of their contract.

The recent Panther Valley strike was probably the largest of the "button" strikes, in point of tonnage lost. It occurred while the Seventh District convention, of which the Panther Valley is a part, was held. Toward the close of the meeting, the men were addressed by James Mauer, of Reading, the lone Socialist member of the Pennsylvania Legislature, (but who has since been defeated in the recent election). The result of his fervent appeal to class-hatred was that within a few hours every colliery in the Panther Creek Valley was closed down and remained closed until the Conciliation Board found a way out of the difficulty.

Too often the officers are prone to pay undue attention to the enhancing of their personal fortunes within the organization, instead of discharging the duties for which they are well paid.

The Duty of the Mine Officials

There is strenuous work ahead for the officers of the U. M. W. of A. Theirs is the task of combating the schools of radical thought, both politically and industrially. On the other hand, should the work of the opponents of present-day organized labor be permitted to go unchallenged, we shall soon see two labor organizations in the coal fields. As a matter of fact, it is an open secret that representatives of the radical element among the miners, have recently succeeded in organizing more than one branch of their school of thought in the very heart of the anthracite field, and it is their boast that April, 1916, will find the U. M. W. of A. fighting for its life. They further contend that in the meantime they will so thoroughly inoculate the miners with their conception of the moral and statutory law that there will be an entirely new method of industrial warfare inaugurated.

It will be readily acknowledged that, through the U. M. W. of A., the coal miners of this country are better recompensed for their labor than ever before. All who have the well-being of the present-day society at heart should do all that can be done to keep organized labor on a high plane of honor so that its existence will result in a permanent industrial peace.

When the district officers of the U. M. W. of A. were recently interviewed, they averred that inasmuch as the "check off" is not in effect they cannot be held responsible for illegal strikes. They have said: "If we had the 'check off' and the miners should cease working without just cause, we would at once suspend the guilty locals and immediately end the strikes." The question arises: If all the miners could be suspended when the "check off" is in effect, why can't the union miners be suspended by their officers today? What answer will the miners' leaders make to the operators in 1916, should they be refused recognition because they have given such little evidence of their ability to control the miners?

The responsibility for the numerous illegal strikes rests squarely on the shoulders of the union officers. They have failed so far to maintain the production of coal, which is one of the foremost reasons they always advance when seeking recognition at the hands of the operators.

The usefulness of the U. M. W. of A. in the anthracite field will be limited unless there is a peaceful adherence to the legal and advantageous wage agreement entered into last May.

Guarding Coal Mines against Fuel Wells

SYNOPSIS—At its meeting on Mar. 11, the national fuel-well committee prepared an act to regulate the drilling of oil and gas wells through coal. The text of this measure is here given in full. The recommendations of the Bureau of Mines required that there should be two casings, the diameters of which varied 4 in., and that the drillhole should be 4 in. larger than the outer casing. The committee dispenses with this exterior pipe altogether and requires that the single casing which is retained shall have an internal diameter 6 in. less than that of the hole. The annular space between the casing and the walls of the hole may be filled with either cement mortar or puddled clay. The bureau's recommendation proposed only the latter. The thickness of the casing is not specified though this was a feature of the original draft.

An act to provide for the location, drilling, casing, protecting, operating, abandoning, plugging and filling of natural gas and petroleum wells, and for the protection and preservation of life and property, especially in and about coal mines in gas and oil regions, creating the office of chief inspector of natural gas and petroleum wells, and providing penalties for the violation of this act.

ARTICLE 1—Definitions

Section 1. Be it enacted, etc., that for the purposes of this act, the terms and definitions contained therein shall be as follows:

Well—A borehole drilled for the purpose of developing natural gas or petroleum, or a borehole producing natural gas or petroleum.

Well Operator—Any person, persons, firm, partnership, corporation, company, or association, who drills, operates or abandons, or purposes to drill, operate or abandon such well as hereinbefore defined.

Coal Operator—Any person, persons, firm, partnership, corporation, company, or association, owning, leasing or operating coal mines, or coal properties, but excluding coal stripping operations.

Plat—A map, drawing, or print, made in accordance with the provisions of this act, as hereinafter contained.

Casing—The pipe commonly used within wells drilled for natural gas and petroleum. The sizes of casing refer to nominal commercial dimensions.

Cement Mortar—Cement mortar shall consist of one part of portland cement and two parts clean sand, mixed with sufficient water.

Coal Bed—A workable bed or seam of coal that may be mined during the reasonable life of a well, proposed to be drilled through it.

Well Inspector—The chief inspector of natural gas and petroleum wells, or his duly authorized deputy.

ARTICLE 2—Location of Well

License—Section 1. When a location for a well has been made, the well operator shall make application in writing to the chief well inspector, for a license to drill, and send therewith a description and plat in duplicate of the proposed location.

Survey—Section 2. The location shall be determined by survey, and the description and plat shall give the courses and distances from two permanent points on the boundaries of the tract of land upon which the well is located, together with the name of the tract of land, names of adjoining tracts, township or district and county.

Copies of Plat—Section 3. The well operator shall send to the coal operator, if known, and to the state coal-mine inspector, a copy of the description and plat filed with the chief well inspector.

Verify Location—Section 4. Immediately on the receipt of the plat the coal operator shall verify the well location and mail, to the well operator, a plat showing the present and proposed mine workings under the tract of land on which the proposed well is located.

Time Limit of Complaint—Section 5. The license to drill shall issue immediately on the expiration of five days (excluding legal holidays) after the application and the plat of location have been received by the well inspector unless he makes or shall have received notice of complaint during that time.

Time Limit to Issue License—Section 6. If notice of complaint is made by or served on the well inspector within the said five days, then it shall be the duty of the well inspector to confer with the several interests, including the state mine inspector, coal operator, well operator, and where possible the owner of the land and of the royalty interest, and designate, within 10 days of the receipt of the application for license, a suitable location for the well, or if no well can

be drilled on the premises because of conditions hereinafter specified, refuse to issue a license to drill.

Resurvey—Section 7. If the well is relocated, a resurvey shall be made by the well operator, and corrected description and plat mailed as previously required.

Mine Plats—Section 8. Each coal operator shall furnish annually to the inspector a plat of all of his present and immediate projected mining operations within the state showing the location of all known wells. The coal operator shall also furnish, if requested, to any well operator, a plat of the mine under the leases or property owned or operated by the said well operator.

Distance from Buildings, Etc.—Section 9. No well shall be located within 300 ft. of a hoisting or air shaft, slope or drift into an artificially ventilated coal mine when not definitely abandoned or sealed, nor shall such well be located within 300 ft. of any mine shaft house, boiler house, engine house, power house, mine fan, or mine tipple, unless such structure has been abandoned.

Distance from Mine Ways—Section 10. No well shall be drilled within 15 ft. of any underground haulage way, traveling way, drainage way or air way.

Display of License—Section 11. It shall be the duty of the chief well inspector to issue the license in duplicate, and the well operator shall display at the location, one copy of the license properly protected from injury, and in such place and manner that it may be easily seen.

Duration of License—Section 12. The license shall expire at the end of one year from the date of issue unless drilling operations are actually in progress.

ARTICLE 3—Manner of Drilling and Protecting Well

Through Workable Beds—Section 1. Each well passing through a workable bed of coal shall be drilled, cased and protected in the manner hereinafter provided:

(a) Where the coal is in place.

A hole of a diameter 6 in. greater than the inside diameter of the outside casing to be put through the coal shall be drilled at least 30 ft. below the bottom of said coal bed.

Within this hole shall be placed the casing, and the space between the outside of said casing and the wall of the hole shall be filled with cement mortar, or puddled clay, to a height of at least 30 ft. above the top of said coal bed, to exclude water from the coal bed.

(b) Where the coal is removed and the mine excavation is inaccessible.

A hole of a diameter sufficiently large to permit the setting in of a liner 4 in. larger in diameter than the inside diameter of the casing to be put through the coal, shall be drilled at least 30 ft. below the bottom of said coal bed.

Within this hole shall be placed a liner 4 in. larger than the inside diameter of the said casing and extending from the bottom of said hole to at least 30 ft. above the mine roof.

A string of casing centrally guided by shoes or winged guides shall be placed within the said liner and the space between the liner and the casing shall be filled with cement mortar or puddled clay to the top of the liner.

To exclude water, the space between the said casing and the wall of the hole and immediately above the top of the liner, shall be filled for a distance of at least 10 ft. with cement mortar or puddled clay.

(c) Where the coal is removed and the mine excavation is accessible.

The method may be either as provided in the case of inaccessible mine excavations or as where the coal is in place, provided that if the latter method is chosen the well operator shall at his own expense provide a suitable retaining wall laid in cement mortar to retain the cement mortar or puddled clay about the casing. This wall shall extend from 2 ft. below the mine floor to the roof of the mine, and be of such size as to retain at least 2 in. of puddled clay or cement mortar about the said casing.

Affidavit as to Casing—Section 2. The well operator shall upon completion of the work of casing through a coal bed make an affidavit signed by two men having at least three years' experience in casing wells as to the method of casing and protecting the well; said affidavit to be filed with the chief well inspector

Vent—Section 3. Under any of the above provisions the work of casing and protecting from gas and water through the coal bed shall be completed before the well is drilled to a greater depth; and in the event of any well being productive of oil or gas, the space between the said outside casing and the next string of such other casing as may be left in, shall remain open, the top being provided with a suitable device to permit ventilation and at the same time to prevent dirt or débris from falling in, or being thrown in, or the ventilating opening from being readily closed.

ARTICLE 4—Abandonment of Well

Notice—Section 1. The well operator when he purposes to abandon any well, shall send a written notice of his intention to the chief well inspector, and the work of plugging the hole or pulling the casing shall not proceed until the well inspector is present to see that said plugging is done as prescribed by this act, except as hereinafter provided.

In Absence of Inspector—Section 2. In case the well inspector fails to be present within three days from receipt of notice, then the work may proceed provided that two men having experience of at least three years in the plugging of wells be present, and make affidavit in duplicate that the work was done in accordance with the provisions of this act, said affidavits to be filed with the chief well inspector, and made a record of his office.

Copy of License—Section 3. The well operator shall send to the chief well inspector with the notice of abandonment, a legally certified copy of the license to drill, provided the well was drilled under the provisions of this act.

Locating Old Wells—Section 4. If the well was drilled prior to the passage of this act, the well operator shall send to the chief well inspector, with the notice of abandonment, a description and plat showing the location of the well as herein provided for in the application for license to drill.

Method of Plugging—Section 5. Every well upon abandonment must be plugged and filled solidly and tightly from the bottom to the top as follows:

The hole must be filled with rock sediment, sand, clay, or other suitable material from the bottom of the well to a hard and firm stratum below the last string of casing set in above the producing oil or gas sands. When the well inspector declares that it is impracticable to fill the cavity in the lowest producing sand then he shall permit the well operator to place plugs at the top of the lowest producing sand and fill as hereafter specified.

In this firm, hard stratum three seasoned wood plugs of a diameter equal to the diameter of the hole, and each of a length of at least 3 ft., shall be driven into place. Above the third plug 10 ft. of clay must be placed and thoroughly tamped down so as to prevent the passage of oil, gas or water.

Immediately below the seat of each and every string of casing there shall be driven a seasoned wood plug as described, and all spaces between wood plugs shall be filled solidly and tightly with rock sediment, clay, sand or other suitable material as the casing is withdrawn length by length. All plugs shall be driven in place with proper drilling tools.

In the case of a well in which the outside casing has been cemented as herebefore provided, said outer casing may be cut off at a point not less than 50 ft. above the coal bed and removed, but in any event the hole shall be filled to the surface.

The location of the plugs herein provided for are made with reference to the relative positions of the workable coal beds and the gas and oil sands, for the purpose of preventing the passage of oil or gas into the workable coal beds and of water into the oil and gas sands, and if any well presents a variation in such relative positions of the said strata, such additional wood plugs as the well inspector may deem necessary shall be driven into place by the well operator.

Report of Plugging—Section 6. When the work of plugging and filling from bottom to top has been completed, the well operator, or his authorized agent, shall make a report in duplicate to the chief well inspector, upon forms to be furnished by the well inspector, showing the date of completion of the well, the depths to the coal beds, the names of, and depths to, all productive oil or gas measures, the total depth of the well, and the location and kind of all plugs and filling used, and the method followed in placing the same.

Section 7. If the well inspector has been present during the performance of this work, he also shall sign the report to the chief well inspector.

Section 8. If the well inspector has not been present, this report shall be joined in by two men employed on the work as provided for in this act.

Protection of Casing by Coal Operator—Section 9. When the coal is removed from around a well casing or liner, the coal operator shall protect the same from corrosion and mechanical injury by a wall of suitable material to retain 2 in. of cement mortar between the said wall and the said casing or liner; this protection shall extend from 2 ft. below the mine floor to the roof of the mine, except in the case of an abandoned well, which has been plugged and filled as prescribed in this act.

ARTICLE 5—Chief Inspector of Natural Gas and Petroleum Wells

Office—Section 1. There is hereby created the office of chief inspector of natural gas and petroleum wells.

Appointment—Section 2. A chief inspector of natural gas and petroleum wells shall be appointed by the governor, or by a commission provided for the purpose, from an eligible list of men who have passed a satisfactory examination showing their technical and practical fitness for the position.

Salary—Section 3. The salary and necessary travel expenses of the chief well inspector shall be borne by the state, and an office provided and equipped with suitable filing arrangements.

Bond—Section 4. The chief well inspector shall, before entering upon the discharge of his duties, give bond in the sum of $———— with approved sureties for the faithful discharge of his duties; and shall take oath that he will discharge his duties with impartiality and fidelity to the best of his knowledge and ability. But no person who is acting as manager or agent of any oil or gas company, or any coal company, or who is interested in operating any oil or gas well or any coal mine, shall at the same time act as chief well inspector under this Act.

Assistants—Section 5. The chief well inspector shall be authorized to appoint field and office assistants whose salaries and expenses shall be borne by the state.

Appeal—Section 6. An appeal from the decisions of any assistant may be made to the chief well inspector.

Duties—Section 7. It shall be the duty of the chief well inspector to carry out all of the provisions of this act, and keep a complete record and prepare for publication, a yearly report of the wells drilled in the state, together with their location, date of completion, depth, character of product, date of abandonment, and name of owner, and other information.

The well inspector shall receive and investigate all complaints as to injury, present or impending, due to lack of precaution on the part of any well operator or coal operator. If he finds the complaints against the coal operator, well founded, he shall lay the facts before the mine inspector.

In case of failure of the well operator to plug an abandoned well, in accordance with the provisions of this act, it shall be the duty of the well inspector to have the work performed by contract, and to assess the cost against the well operator.

If the well inspector discovers any well being drilled, operated or plugged, contrary to the requirements of this act, he shall order the workmen engaged upon such well to cease work at once, and shall not permit the work to be resumed until he is satisfied that the law is complied with.

The well inspector shall determine the sufficiency of plats for the purpose of accurately locating wells, and shall cause a new survey of such location in case the available plat and descriptions are unsatisfactory. This survey shall be paid for by the applicant unless it is shown that the original plat is correct in which case the cost of the new survey is to be borne by the state.

It shall be the duty of the chief well inspector to transmit to the proper county recorder, the duplicate of plats, descriptions, applications and reports sent to him by well operators, and these shall be recorded in a book kept specially for this purpose by the county recorder.

Height of Entry—Section 8. To enable the well inspector to perform the duties imposed upon him by this act, he shall have the right at all times to approach and examine any well in his district and with the authority of the state mine inspector, to enter any mine affected, and upon discovery of any violation of this act or upon being informed of such violation, he shall institute proceedings against the person or persons at fault, under the provisions of the law provided for such cases.

When a well is so located that it passes through a mine or near a mine, the well operator may appoint as his representative a mining engineer or other competent person experienced in mining operations, who shall, with the written permission of the chief or district state mine inspector have the right to enter the mine at such times as will not interfere with the operation of the mine.

ARTICLE 6—Miscellaneous

Penalties—Section 1. Any coal operator or well operator who neglects or refuses to comply with the provisions of this act, or who violates any of the provisions or requirements thereof, shall be deemed guilty of a misdemeanor, and shall, upon conviction thereof in the court of the county in which the misdemeanor was committed, be punished by a fine or imprisonment at the discretion of the Court.

Constitutionality—Section 2. Each section of this Act and every part thereof is hereby declared to be an independent section or part of a section and if any section or sub-section shall for any reason be held unconstitutional the validity of the remaining sub-section and sections shall not be affected thereby.

Repeal of Conflicting Legislation—Section 3. All acts or parts of acts inconsistent herewith are hereby repealed.

Coal Mining Institute of America

The Coal Mining Institute of America expects to make its summer visit to the anthracite-coal regions. The program is not yet completed, but it is roughly as follows: Members will leave the bituminous field from Pittsburgh at 8:50 p.m., Monday evening, June 16, special sleeping cars being attached. The train will take up passengers between Pittsburgh and Tyrone and will arrive at Wilkes-Barre at 8.59 on Tuesday morning, June 17. Those who desire to make the interesting trip during the day may leave Pittsburgh at 7:50 a.m. on Monday morning, and arrive at Wilkes-Barre at 7:50 p.m.

The meeting for organization purposes will be held in Wilkes-Barre at 10:30 a.m., June 17. Luncheon will be at 12 o'clock. In the afternoon, a trip will be made to near-by collieries, and in the evening, after the institute banquet, H. G. Davis, district superintendent of the Delaware, Lackawanna & Western R.R. Coal Department, will deliver a lecture on anthracite methods of mining and will detail the sociological work which has been done by the company. The address will be illustrated by stereoptican slides.

The following Wednesday, the 18th, the visitors will pass over the scenic Wilkes-Barre & Hazelton third-rail system to the latter town and view the anthracite strippings and collieries in that district. In the evening, the institute will invite the members of the local District Mining Institutes to meet them at Wilkes-Barre. Addresses will be delivered on soft-coal methods of mining and sociological work in the bituminous region, illustrated by the stereoptican and possibly moving pictures.

On Thursday, the 19th, a trip will be made to the anthracite collieries in the Wyoming Valley. From 3 to 5 o'clock a session will be held at Wilkes-Barre for a discussion on the impressions received while visiting the anthracite operations.

At 6:20 the train will leave Wilkes-Barre for Pittsburgh and other points in the bituminous-coal field. It may be added that the members are invited to bring their wives with them if they so desire. Several of the leading anthracite companies have, by their executives, expressed themselves much pleased to have an opportunity to show their hospitality to the members of the visiting institute.

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A Special Pump Number

Our issue of Apr. 5 will be devoted entirely to the question of pumping at coal-mining properties. The various problems encountered in actual practice will be discussed in detail, while several modern types of pumps will be described. All readers of COAL AGE are invited to send us photos and data concerning interesting pump installations with which they are familiar. Copy should be in our hands within a week.

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Entombed in a Kentucky Mine

It is reported that 130 miners were imprisoned Mar. 18 in a colliery at Basketts, Henderson County, Ky., by a cave-in, which clogged the mouth of the shaft. Though it is stated that the men had not escaped when the report arrived, it was said that there were no fatalities. It was expected that the men would soon be released by way of the air shaft.

CURRENT COAL LITERATURE

A Benzine Incandescent Safety Lamp

By Emmanuel Lemaire*

SYNOPSIS—M. Goulet has introduced a safety lamp which utilizes an incandescent mantle to intensify the light. The oil is vaporized and mixed with air in a carburetor resting on the top of the lamp. The illuminating power is from 1 to 3 cp.

Improvement of the illuminating power of safety lamps is a great desideratum. Imperfect light is prejudical to the safety of the miner, reduces his output and causes him to do poor work. To it is also attributed, in part at least, that occupational disease of the miner known as nystagmus.

It is true that there are many mining lamps which offer a high degree of security as regards gas, but their average illuminating power in practice is low and hardly reaches one unit Hefner[1]. Now that the question of safety is, in large part, solved, attention should be paid to improvement in lighting power.

A Light with a Mantle Which Gives 3.2 C.P.

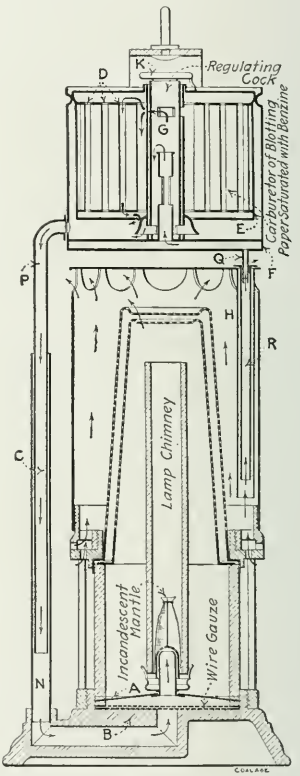
During the year 1910, a new lamp giving a better light than any of its predecessors was subjected to safety tests at the Belgian Experimental Station in Frameries. The inventor of this lamp, M. Goulet, applies the principle of incandescence, which has been so much developed since the appearance of the Auer mantle. Thus he has obtained a lighting power which may reach 3.5 Hefner units. The mantle is brought to incandescence by combustion of the mixture of air and benzine vapor obtained by using a carburetor.

As shown in the accompanying figure, the Goulet is in general arranged, like an ordinary safety lamp, with two gauzes and a bonnet. The oil reservoir, formed by the carburetor, instead of being below the burner, is on the top of the lamp above the bonnet. This position favors the flow of the combustible gas to the burner, since a mixture of air and benzine vapor has a density greater than that of air alone.

To Improve the Draft a Chimney Is Provided

The burner is a simple copper tube, the bottom being inserted in an immovable metal disk *A*, resting by asbestos washers on a copper socket base *B*, which closes the lamp at the bottom. It is connected with the carburetor on the outside by a tube *C* and a conduit in the base *B*. The two gauzes placed below the disc *A*, as well as the double gauze which closes the burner at the top, checks any return of flame toward the carburetor.

The lamp is supplied with a glass and a chimney. The former is cushioned on the disk *A* by an asbestos washer. An inside chimney covers the burner and the draft it occasions favors the circulation of the air in the carburetor. The metal fixture or guard which protects the outside chimney, surrounding the lower part



The Goulet Lamp with a Lamp Chimney, Incandescent Mantle and Carburetor

of the lamp, and which supports the bonnet, screws upon the base *B*.

The Benzine Is Not Free but Absorbed by Blotting Paper

An absorbent mass formed of blotting paper in layers, keeps the benzine in the carburetor quiet and is lodged in a sheet-metal cylindrical tank *E*, from the ends and side walls of which it is held free by supports. The mass is pierced with cylindrical vertical channels *D* for the passage of the air to the carburetor.

The tank *E* is placed within another cylinder *F*, which has a double bottom. The joint between the two,

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Note—Translated from the French by E. F. Buffet for Coal Age.

[1]One Hefner candle is nine-tenths of an international candle.—Editor.

completely closes the outer cylinder at the top, the inner tank extending only part of the way down to the bottom of the outer, forming a false bottom.

A cylindrical sheet-metal cock, set vertically in the center of the double bottom, passes through the carburetor and provides a way for regulating the admission of air to that vessel. It puts the inside of the carburetor in communication with the space between the two bottoms of cylinder *F*, a space into which air enters through the tube *H** placed inside the bonnet of the lamp. The aforesaid cock is composed of two tubes, one outside the other, the inner tube being movable. This inner tube turns with light friction in the former, and is manipulated by a knurled head *K*.

These two tubes are pierced near each end with two apertures diametrically opposite each other. The lower openings of the movable tube are placed at right angles to its upper openings and the rotation of the tube is limited to a half turn by two stops.

Regulation of Gas Mixture for Burner

The extreme positions of the movable tubes correspond respectively to a complete closing of the upper and lower apertures or to an uncovering of the lower openings with a closing of the upper apertures. The mean position is a complete uncovering of the upper openings with a closing of the lower ones.

For this position of the movable tube, the air enters tank *E* by the upper openings, becomes charged with benzine vapors by circulating around the absorbent mass and through the canals by which it is pierced, and passes to the burner by tube *C*. When the air enters by the upper openings, the proportion of benzine vapor contained in the gas reaches a maximum.

When the movable tube is turned to the extreme position, which gives the complete opening of the lower openings with closing of the upper, the air passes through these lower apertures into space comprised between the bottom of tank *E* and the double bottom of the cylindrical vessel *F*, and goes to the burner without coming in contact with the absorbent mass.

It merely mixes with the benzine vapors which issue from tank *E* through the space between the edge of the central orifice of the lower end of this cylinder and the cock. In this case the gas which reaches the burner is but feebly charged with benzine vapors.

Carburetion of Air Fed to Flame May Be Closely Adjusted

For other positions of the movable tube, the lower and upper apertures are partly uncovered. A portion of the air comes in contact with the absorbent mass and the rest of it goes directly to the burner. The degree of carburetion of the air varies with the amount of opening of the upper apertures and this carburetion is so regulated that the mantle is brought to maximum incandescence.

To extinguish the lamp, we simultaneously close the upper and lower openings in the cock. Nevertheless the benzine vapors produced in the carburetor continue to reach the burner, so that the extinction is not always complete, but in this case a light blow on the side of the lamp will extinguish it.

*The tube H is simply described as a tubulure; but from the illustration the tube is double.

The mixture which passes out of the carburetor contains a quantity of air too small to insure complete combustion; admission of supplementary air is therefore necessary. This enters the lamp through the double gauze which surmounts the lamp glass and reaches the burner by openings in the bottom of the ring, or fixture, which supports the chimney.

The Lamp Locking Mechanism

The outside tube *C*, which leads the combustible gas to the burner, is formed by two tubes, one sliding in the other. The outside tube *N* is soldered to the base *B* and the inside tube *P* to the carburetor. The open tube *H* through which the air enters the carburetor comprises an inside tube *Q* soldered to that tank and an outside tube *R* fixed to the inside of the bonnet.

When the carburetor is in place, the tubes *P* and *Q*, which engage in the tubes *N* and *R*, oppose the unscrewing of the fixture or guard which supports the bonnet, and in consequence the opening of the lamp. Thus, until the carburetor is removed, it is impossible to unscrew the lamp. The carburetor is held by a sort of yoke, the ends of which are attached to the bonnet at two diametrically opposite points. These ends engage in two eyes on the bonnet and are held by two magnetically controlled bolts. The yoke carries the hook for the suspension of the lamp.

Points of support fixed under the carburetor prevent it from resting directly upon the top of the bonnet, and thus keep it from becoming excessively heated.

The lighting power of a Goulet lamp has been found to be 3.2 Hefner units, after having been burned for a half hour and 1.25 Hefner units after nine hours of lighting. It is important that the mantle be well adapted to the burner, otherwise the lighting power is much less.

Lamp Showed Good Results in Gas Tests

The safety tests have given the following results:

The Goulet lamp resisted a current of air containing 8 per cent. of methane, and traveling at a speed of 15 m. (49.2 ft.) per sec. The gas mixture was caused to travel in 5 different directions, namely, horizontal, descending and rising at 45 deg., ascending and descending vertically.

The gauze became heated to redness when the air traveled at the following speeds and under the conditions specified.

8 m. (26.2 ft.) per sec. or 1575 ft. per min. in a horizontal current;

6 m. (19.7 ft.) per sec. or 1181 ft. per min. in a current descending at 45 deg.;

9 m. (29.5 ft.) per sec. or 1772 ft. per min. in a current rising at 45 deg.;

13 m. (42.7 ft.) per sec. or 2559 ft. per min. in a vertical ascending or descending current.

The outside chimney was broken at the speed of 14 m (45.9 ft.) per sec. or 2756 ft. per min. in a current descending at 45 deg.; it resisted in the other currents. The inside chimney was not broken in any of the tests, but several times it softened to a point of bending and even of closing partially or completely at the top.

The Carburetor Does Not Explode When Heated

When placed in an atmosphere at rest, the Goulet lamp becomes considerably heated. In order to make sure that an excessive heating of the lamp would not create

a dangerous pressure in the carburetor, the latter was heated directly by a bunsen burner so intensely that the solder was fused. This did not lead to an explosion of the carburetor; when the solder melted, the benzine vapors were simply ignited by contact with the bunsen flame. As has already been said, the opening in the base of the sheet-metal casing, which contains the absorbent blotter is larger than is needed to permit the regulating cock to pass through, thus the benzine vapor produced in the carburetor can always escape through the burner.

In the preceding experiment it was found that some benzine was condensed in the conduit at the base of the lamp. The presence in such a place of liquid benzine not retained by an absorbing substance, could not be otherwise than objectionable if the lamp were reversed. It seems, however, that there is no need of worrying about this cause of danger, since it has never been found that benzine vapors produced in the carburetor by normal heating of the lamp, even in an atmosphere at rest, become condensed in the conduit of the base.

When the tank with its absorbing substance is put into place immediately after having been dipped and before it has been allowed to drip, the benzine in excess falls into the base of the lamp. Although this benzine rapidly evaporates, it is better to wait a few moments before putting the tank in place after filling. The porous substance absorbs 65 grams of benzine (0.143 lb.).

No Risk of Back Firing of Carburetor

With a view to determining the degree of explosiveness of the gas produced in the carburetor, the gas was lighted several times as it issued from the burner. Although the wire gauzes, which are intended to prevent a return of flame, were removed, the fire was never transmitted as far as the carburetor.

The Goulet lamp seems to be reasonably safe in gas. It is an interesting attempt to improve the lighting power of mining lamps and for this reason it deserves notice. It is, however, too early as yet to judge of its practical availability in the mines.

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Gleanings from British Experience

Special Correspondence

SYNOPSIS—A digest of the worth-while coal news from the British Islands. The reports from the institutes illustrate the trend of the mining industry and the efforts put forth to increase safety.

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The English practice seems strongly in favor of the use of armored cables. The British electrical inspector of mines, Robert Nelson[1], advocates covering all insulating material with a grounded metallic cover, as a protection from leakage even when using low-pressure currents, by which he means those not exceeding 250 volts. That being his advice, we are somewhat surprised that he finds it necessary to add that those who fail to armor and ground cables carrying more than a medium pressure (over 650 volts) are inviting accident.

He points out that fuses and circuit breakers (or "maximum cutouts," as our British friends term the latter) are called into action only in the event of the strength of the electrical current exceeding a certain predetermined value, namely, that at which the fuse is set to melt or the circuit breaker to operate. The protection is, therefore, in no manner sensitive, and in a current so protected a mere overload may cause the current to be cut off.

Importance of Leakage Cutouts

On the other hand, leakage cutouts do not operate on an overload, temporary or permanent, so long as the flow of current is confined to the conductors. They only act when some portion of the current elects to leave the path provided for it and returns to the generator by some other way, possibly by the earth. When that occurs there is a "fault" on the circuit, and the balance which normally exists at every instant between the current which enters and that which leaves the conductors of a healthy circuit, is disturbed at every point. Leakage cutouts are operated by disturbances only; that is, they act only in case of a fault. A break in the line, caused possibly by the fall of a rock, puts the cutout into action and thus the sparking is immediately stopped.

Bare Signal Wires May Cause an Explosion

As Mr. Nelson recalled, an explosion in South Wales was attributed to bare signal wires. Men were engaged removing a fall when the electric bell was heard to ring, though there was nobody at the other end to operate it. There was a second ring, and almost at the same time an explosion occurred which burned five or six of the men. Those who investigated the accident agreed that something had brought the two bare wires into contact.

An extensive knowledge of the theory of electricity is not necessary to enable a colliery manager to take an active interest in the electrical plant under his charge. What he needs to learn is easy of attainment, but if soundly applied, he should be able to supervise the electrician effectively, to the advantage of that official and of the plant under his care, and in the interests of safety and efficiency.

Will the Byproduct Market Fail?

In a recent paper, J. E. Christopher[2] stated that in 1900 the world's output of sulphate of ammonia was under half a million tons. Now it is more than doubled, but the price has been well maintained. There is plenty of scope for the use of sulphate of ammonia, and the outlets for tar also appear promising, with the increased demand for use in surfacing roads.

The main outlet for benzol is for use in automobiles. Assuming an average yield of one gallon of automobile benzol per ton of coal, Mr. Christopher estimates the coke

[1]In an address before the North Staffordshire Institute of Mining and Mechanical Engineers.

[2]Paper read before the Manchester section of the Society of Chemical Industry.

works of Great Britain can turn out 19,000,000 gal. per annum, without overstocking the market, so that the field for the exploitation of benzol is extensive.

The production of gas for purposes of illumination as a byproduct of the coke industry has lately made considerable headway. In the period 1903-1910, the amount of gas produced in Germany in this way has increased from 13,350,000 cu.ft. to 1,472,000,000. It is not suggested that gas manufacture in coke ovens will ever displace the modern vertical retort, with its advantages of continuous carbonization; but an attempt has been made to show that coke-oven gas is nevertheless a valuable byproduct which cannot be overlooked.

Controllers for Hoisting Engines

James Black[3] recently stated that with the passing of the British Coal Mines Act, 1911, numerous controllers have been placed on the market, which prevent an excessive hoisting speed.

It is his opinion that the speed of an engine should be controlled throughout the whole length of the hoist, because: (1) Complete control is accompanied by no disadvantage whatever, as it can be adjusted to permit any margin above the normal hoisting speed, and consequently does not interfere in any way with the output of the shaft; (2) the controller will not come into operation at any point during the hoist unless the engine is running faster than the predetermined safe speed at that point; (3) the engine speed, and, therefore, also the speed of the cage when it comes into operation, is likely to be less with complete than with partial control. Controllers are also so constructed that they act instantly if the engine is started in the wrong direction.

Relics of Early Mining

Mines of the Glengarnock Iron & Steel Co., near Stevenston, in Ayrshire, date back to the 17th century. The coal was drawn from the working faces to the main roads by children, the coal being placed on small sledges to make the transference less difficult.

A part of one of these sleds is all which has survived from that remote time. The coal was reloaded at the main roads into creel-like baskets and carried by women up a staircase in the shaft to the surface.

Toward the end of the eighteenth century, the coal was hauled to the shaft landing on large sleds and hoisted to the surface probably by a horse gin. Simple methods for draining mines were also introduced and implements for this purpose have been discovered in the mine, including a wooden shovel, coal picks, a wooden bowl for ladling water and a number of tallies or pins similar to those used today by miners in Scotland for marking coal wagons before sending them to the surface. These relics are deposited in the Scottish National Museum, the gift of Robert Main, general manager of the iron company owning the mine.

Prime Mover of the Future

In his lecture on "Prime Movers," before the Greenock Philosophical Society, S. Z. de Ferranti declared that the electric motor, actuated by electricity from central power stations, is displacing all forms of small engines. He thinks it probable that in future small prime movers will be required only to propel cars and boats, and that all stationary power generators will be electric. Reciprocating engines will be used, no doubt, for a long time, but they can only be regarded as makeshifts, and as soon as an equally efficient machine for any particular purpose is developed, it will replace the reciprocating prime mover.

It is difficult to predict the form of the prime mover of the future, but in search of the highest economy, and with the limitations of temperature imposed by known materials, Mr. Ferranti is inclined to look to electricity, converting the energy of the fuel at low temperature and giving its power in rotary form, as the most likely eventual solution.

Peat Coke

The Peat Coke & Oil Syndicate, of Doncaster, in Yorkshire, is developing a new invention for treating special dried black peat and converting it into a hard foundry coke, byproducts being tar and tar liquor, from which can be distilled fuel and automobile oils. It is not claimed that all kinds of peat can be profitably utilized, but it is said that thousands of acres, containing millions of tons of peat, by this process can yield results satisfactory as a commercial undertaking.

The bottom or black layer of the peat is most suitable for the manufacture of coke. This is freed from an excess of moisture and subjected to a carbonizing process by which the byproducts are recovered, the residue being a soft, friable coke. Although peat coke contains a lower percentage of sulphur than other fuel, a difficulty hitherto has been to produce a coke from it hard and strong enough to hold up in the smelting furnace. This, it is said, has now been overcome, a hard, strong, clean coke being the result. Analysis by a German chemist, based on 1000 tons of air-dried peat, show that the following results can be obtained: Coke, 400 tons; tar, 40 tons; tar water, 400 tons. The tar can be further distilled, yielding 18 tons of crude oil, 2 tons of creosote oil, 2 tons of pitch, 8 tons of paraffin. The tar water will yield 4 tons sulphate of ammonia, 6 tons acetate of lime, 2 tons methylic alcohol. It is estimated there will be a profit of 90c. on every ton of prepared peat so treated.

A Hoisting Accident

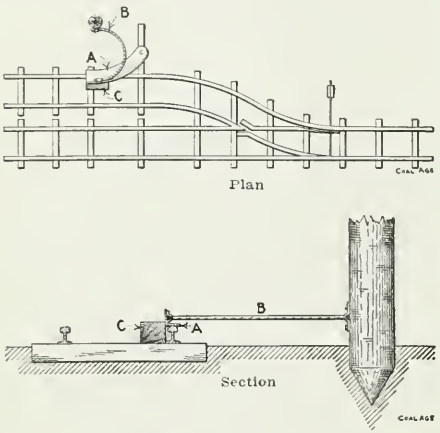
The *Colliery Guardian* says: "An accident in which 11 men were killed and four others injured, occurred on Feb. 7, at the Rufford shaft of the Bolsover Colliery Co., Rainworth, near Mansfield, close to the Nottinghamshire and Derbyshire line, England. A large barrel, containing about 900 gal. of water, fell a distance of 480 ft., and struck a platform in the shaft on which were 18 sinkers, who were engaged in tubbing. The barrel was being hoisted when the rope was overwound and thus broken. In falling, the barrel broke the scaffolding, and all the men, dead and living alike, were thrown into the water beneath them. The five survivors clung to the wreckage and were ultimately rescued.

The overwinding was caused in a peculiar way. While the engineman, Sidney Brown, was working the controlling levers, a horsecloth which had been placed beneath the roof of the engine house to keep out the rain, fell upon him, and at the same time some wooden laths used to support it dropped between the levers. Momentarily blinded by the canvas, Brown was unable to pull the laths from between the handles and to stop the hoisting engine.

[3]Paper read before the Scottish members of the National Association of Colliery Managers.

Automatic Car Latch for Siding

To prevent cars underground when run upon an incline from sliding back and doing mischief, there is installed in the Sterkrade mine, Oberhausen, Germany, a sort of latch or chock, which lets the car pass freely forward upon the incline, but bars its return.



An Automatic Car Latch

This device is shown in Figs. 1 and 2. The latch consists of an angle iron *A*, bent in a circular arc, pivoted beside one rail and resting upon it. A spring *B* made of old wire cable, presses this angle iron against a stop *C*, thus holding it in place. If a car runs forward on the track its wheels push the angle iron aside against the force of the spring. When the car has passed, the spring restores the angle iron to its position against the stop and thus blocks the rail.

Note—Translated from "Glückauf," Feb. 22, 1913.

Seventh Bituminous District (Penn.), 1912

The advance report of C. P. McGregor, mine inspector of the seventh bituminous district in Pennsylvania, for 1912, shows 30 mines in operation, 15 gaseous, 13 nongaseous and two new mines opened; total production of coal, 5,740,099 tons, of which the Pittsburgh Coal Co. produced nearly one-half, or 2,777,404 tons. The number of persons employed in the mines was 6402; the number of fatal accidents inside the mines, 15; nonfatal accidents, inside, 54; outside, two.

The death rate shows 426 persons employed inside the mines and 382,673 tons of coal produced, per fatal accident inside. The causes of fatal accidents showed the following percentages: Falls of roof, slate and coal, 40 per cent.; mine cars, 40 per cent.; electricity, 13.3 per cent.; drawing timber (one accident), 6.7 per cent. The causes of nonfatal accidents, inside the mines, showed the following percentages: Falls of roof, slate and coal, 70.38 per cent.; mine cars, 7.41 per cent.; explosions of gas and dust, 5.55 per cent.; blasting, 3.70 per cent.; machinery, 3.70 per cent.; electricity, 1.85 per cent.; miscellaneous, 7.41 per cent.

Waste

By Berton Braley

Written expressly for "Coal Age"

If only our fathers had faced
The problems we face in our mining,
If *they* were less given to waste,
We might be less prone to repining;
They worked with a carelessness vast
And they left us a burden unpleasant,
For the Waste of a bounteous past
Is the Coal of a close-fisted Present.

We are saving the culm which they lost,
We are working the gobs that they filled,
And we seek to recover the cost
Of the coal they left standing—or spilled;
For somehow they never caught on
To this item of sane information,
That the culm of the days that are gone
Is the Coal of a new generation.

Now they probably thought they were wise
And we think we are careful and tasteful,
Yet our sons, without doubt, will devise
New methods which make US seem wasteful;
For this we must learn—or we pay
In trouble and money and sorrow—
That the Waste of a Careless Today
Is the Coal of a Careful Tomorrow!

BY THE WAY

In skating over thin ice our safety is in our speed.

A single breaker may recede even though the tide is coming in.

Paint Creek miners are showing up fast on the initiative, but are lacking in control on the referendum.

The difference between landscape and landscape is small, but there is great difference between the beholders.

Never judge a coal camp by the mine whistle—some of them have to shut down the works when they blow.

The United States imported 32 million dollars worth of diamonds in 1912. However, we sold foreign countries 59 million dollars worth of "black diamonds"—so we got "ours."

Thespian talents are a failure when applied to coal mining, according to a suit recently filed in Chicago by Mrs. Richard Harding Davis (née Bessie McCoy), the well known actress. She and others of her company were induced to invest in an Indiana coal property for which they are said to have advanced the necessary funds to meet the last pay-roll before the concern became defunct.

A special cable to the New York Times states: "An official notice has been issued to the effect that six large spiders have been added to the Canal forces. They are to be used for spinning threads for use in the engineers' transits." It is said the new spider department is being double shifted, which speaks bad for the carelessness of the engineering corps in the matter of handling their instruments. Too bad to waste good money cabling the "discovery" of a new method long ago abandoned.

EDITORIALS

The Eight Hour Day

There are certain labor agitators at work at the present time to influence opinion and secure the passage, by the Legislature now in session, of a bill to reduce the time of labor for all minors, or persons under 21 years of age, from the present nine hours to eight hours a day.

This action is being promulgated under an assumed sympathy and consideration for the young who work underground. Such a purpose, at any other time, would be accepted as just and humane. Consideration for the young is a noble trait; but when such assumed consideration is clearly only a guise under which the work of mining coal is being performed at the present time in the anthracite mines of Pennsylvania, and upon which the price of labor, including monthly and shift rates, is based, the attempt appears in its true light.

The miners and their representatives must show as high a regard for their agreement with the operators, as consideration for the young. They should be reminded here of the old saying—"Consistency, thou art a jewel." Be honest, stand fast to the agreement, and when that expires it will be the proper time to show *consideration for the young,* which is made the pretext for the present action. It would, indeed, have been more honorable on the part of the miners, and their desire would have been received with greater favor by the general public, had they sought this as a concession from the operators, instead of attempting to force a bill through the Pennsylvania Assembly that practically abrogates the miners' agreement now in force.

Mining Legislation

It is reported that the so called Schaeffer bill that has been before the Pennsylvania Legislature during the present session, has passed the House by a practically unanimous vote and now goes to the Senate.

The bill provides that all persons holding certificates of competency to act as mine foremen are, by virtue of such certificate, eligible for election to the higher office of mine inspector, in the anthracite district.

The promoters of this bill made an unsuccessful attempt to have its provisions adopted and made a part of the new law recently codified and recommended by the Anthracite Code Commission. Its rejection by the commission, whose prolonged and careful study of anthracite conditions render their conclusions worthy of the utmost regard, makes it difficult to understand the action of the House in this matter.

The present anthracite mining law provides that all candidates for election to the office of mine inspector must pass an examination before the mine inspectors' examining board, which is differently constituted from the mine foremen's examining boards.

The office of state mine inspector is a higher and more responsible office than that of mine foreman; and the examination of candidates for the former has always been of a higher grade than that required to qualify for the latter position. The questions that are made the test of qualification for mine inspectors are not only more difficult, but many of them are of a widely different character, as required by the greater scope of the work.

It is not expected that the upper branch of the Legislature will lend themselves to endorsing the unwise and hasty action of the lower House. The bill passed by the House is a first step in the lowering of the present high standard of the work of the mine inspectors in Pennsylvania. It is an entering wedge to make men eligible for the high office of inspector, who possess only a limited knowledge of the theory and principles on which modern economical mining is based.

The work of mine inspection is one in which theory and practice go hand in hand. The one is as essential as the other. No man, however successful he may have proved as a mine foreman, can make an efficient inspector of mines unless he possesses a thorough knowledge of the theory and principles of mining that he can apply to all conditions.

It would be a miserable mistake to pass such a bill through the Pennsylvania Legislature, and virtually begin to tear down the work of the past twenty years in that state. Education is the recognized leading feature in every branch of industry today, and the examination of all candidates for positions of responsibility is the one sure means of securing the highest efficiency in office, and safeguarding hazardous occupations.

The Fuel Well Menace

The fuel-well committee has made its report, but the controversy relative to gas and oil wells in the coal regions is by no means settled. The discussion should continue till more is known relative to earth movements and about the placing of cement mortar or plastic clay in deep and narrow spaces and until careful investigation has confirmed or corrected current notions.

We regarded the suggestions of the Bureau of Mines as marking the minimum requirements of the mining profession. They should have been conceded in full without any abatement or quibbling. Unfortunately the committee undertook to increase the Bureau's concessions to the fuel industry; where the Bureau asked for two casings, the committee concedes but one; where an annular space of four inches was required around the inner casing, the committee reduces it to less than three.

We feel we must warn the fuel-well interests that the public will make unreasonable restrictions on their business in return for their unreason, if any accident occurs. The safest position for any industry to take is that which promises most safety for the public. The pendulum which is held out of perpendicularity on the right is apt to be destructive on the left if once let loose.

The exterior of the couplings in a line of 10-in. casing

exceeds the interior diameter by 1.3 in. so that the clear annular space around the single liner, which the committee provides, is only $2\frac{1}{3}$ in. instead of 3 in.

If the gage of the bit is reduced by wear, the hole will be narrowed and the clearance reduced. It will be contended that the driller will not permit such a reduction, that if he allows the hole to be reduced, it will be impossible to get the full sized bit in later. But as a matter of fact as the width of the hole is not to be tested by the entry of casing couplings of equal diameter, there is nothing to prevent the driller from reducing the size of the hole at will, except careful inspection, which is not likely to be exercised.

The contracted character of this annular space increases the probability of air being shut up in the filling material, whether the latter be of clay or of cement mortar. There is nothing to prevent the borehole caving in such a manner, before completion, that the cement or clay will be rendered incapable of implacement by bodies of broken stone made impermeable at their upper surfaces by bodies of clay.

We are sorry that the use of clay is merely an option, and are surprised that the person to whom that choice is left is not anywhere specified. If clay is desirable, caving of the walls of the hole will result in having masses of hard material which will prevent a lateral movement of the pipe to compensate for the motion of the measures. If concrete is desirable, any caving will replace concrete with clay. We are afraid there is little option provided; the failure to provide an outer casing assures the parties interested that the filling will be of a hybrid nature, partly caved, and partly filled material with some of the faults and few of the virtues of either.

It is regrettable that the committee's bill is more liberal to the oil-well interests than the decision of Judge Van Swearinger in the Greensboro Gas Co. case. He required two casings and a hole full 6 in. larger in diameter than the outer diameter of the inner casing.

Argue, contrive and use diplomacy as we will, the last word is never said till safety is secured.

A Good Suggestion

The following letter lends support to the arguments so often advanced by COAL AGE, that mining examining boards should give to candidates, in certain sessions of the examination, the privilege of the free use of such textbooks as they see fit to bring with them.

The best material in mining, the strongest and most practical men, are men whose minds have never been trained to remember formulas, constants and other data to be found in all mining handbooks.

It goes without saying that these *handbooks are the necessary tools of every intelligent mine official,* and of none more so than of mine foremen, firebosses and hoisting engineers, who are daily called upon to make calculations, many of which are impossible for anyone, other than a born mathematician, to make without a textbook containing the necessary formulas and data.

Some of our best colleges now allow the use of textbooks, in certain examinations, and this by students with trained minds. The reason for it is educators recognize that in the growing demands and the ever expanding spheres of knowledge much valuable time is lost in students attempting to memorize anything but the most commonly used rules and data. Few college men can extract cube root, today, without their table of logarithms. Why, then, ask practical hard-working men, compelled to pass competitive examinations in order to show their fitness for filling positions of responsibility, to sit in examination under conditions more arduous than those that govern in daily practice?

Here is the letter:

> Please find inclosed 3 units of the great and only "Long Green," for which you will please credit me with one (Great Sun) year's subscription to the Public Forum or that book of yours called "Coal Age." My time is up tonight. Am sorry I did not come across before, but the ghost did not walk till the 28th; so blame it on the company.
>
> Now say, Old Cotton, there is just one favor I would like to ask—could you find a little space to put in your book a few formulas, what you think I would need for the examination for mine foreman (anthracite) next month? I can work the problems all right if I can think of the formulas. I mean just a small space, so that a fellow could tuck it in his vest pocket to look at frequently and memorize. If you can do this I shall be much obliged, but if you can't, why it's all right anyway.
>
> The book is all O. K. Keep the good work going, and we will all get there—I don't know where, but we are on our way.

On another page of this issue will be found a brief outline of a plan we have had in contemplation for some time past. Its aim and purpose is twofold: (1) To simplify the calculation of mining problems and provide a practical Study Course for mining students and those preparing for examination. (2) To provide a handy reference book of formulas, data, rules and principles that are constantly needed by mining engineers, mine superintendents, foremen, firebosses, timbermen, trackmen and mine mechanics and electricians.

We hope this handbook, which will be published later as "The Coal Age Pocketbook," will simplify and advance the study of coal mining.

Photography in Coal Mining

Some of the larger coal companies having come to realize the importance of visual records in coal mining, have installed complete photographic apparatus at each of their plants.

In case of serious injury to any of their employees, corporations so equipped can immediately secure a view of the particular place where the accident happened so as to verify the engineer's report on the casualty. The plan of having a camera handy makes it easy to show the condition of anything when an explanation regarding it is desired.

In the case of one large company in the Middlewest, the railroad serving the mines asked the coal officials to fill a number of new cars, and load into each as much coal as could be piled on and carried safely to destination without wastage. The desire of the railroad company was to determine the exact capacity of the cars. After the latter were loaded to a safe height, photographs were taken and endorsed on the back with the gross, tare and net weight. It was thus possible for anyone to see exactly how the cars looked when loaded to capacity, and to judge whether they were suitably piled for safe carriage.

It is also a fact that photographs furnish the best means of conveying to anyone the general appearance of coal-company yards as to whether they are dirty or clean. They tell the story better than can be described in writing by an inspector.

DISCUSSION BY READERS

Post Timbering at the Working Face

Letter No. 4—In regard to timbering the working face in our mines, I do not believe it would be well to have a fixed law or system that would specify exactly how such timber should be set, as the conditions vary constantly. Neither do I think it advisable to have men appointed to visit the working places and timber the same, as this would mean much loss of time to the miners in waiting for the timbermen to reach their places. Every miner ought to be compelled to timber his own place and he should be responsible for keeping his place in safe condition.

In my opinion a law should be passed requiring that all post timber at the working face should have a certain minimum diameter, say 12 in. This would be a heavy timber to handle; but my reason for suggesting it is that a heavy timber will stand more of a blow and will not be knocked out so easily by a shot. Where light timber, say from 6 to 8 in. in diameter is used, the miner will often set up such a post under a stone that he should have taken down. Then, when he fires a blast the stick is knocked out by the flying coal, and when the miner goes back in the smoke he will probably be caught by the loose rock falling on him. The advantage gained, if the law required the use of heavy timber, would be that it would often be easier to take down the stone than to set the heavy timber, and greater safety would result.

When I started to mine coal 35 years ago, we were required to take down any loose rock that was liable to fall. At times we had to take down rock 6 ft. thick and we were allowed so much a ton for it. I believe some such regulation in the anthracite mines would greatly reduce the number of accidents from this cause.

Timber should be cut in the fall when the sap is in the roots. Such timber will not rot as quickly, in the mine, as green timber. To preserve timber, I think a thin solution of well-slacked lime is better than any solution of creosote or other chemical that has a bad odor, as the odor taints the air and is unpleasant to breathe.

When shooting under bad roof, the miner can often drill the hole so that the shot will not be apt to knock out the timber. A miner should be just as careful under a good roof, when the firehoss orders him to stand a prop, to attend to it at once, as delay is often fatal. I believe it would be better for the company to pay a miner for taking down a bad section of roof instead of attempting to prop the same.

THOMAS R. PIERCE, Miner.

Scranton, Penn.

Letter No. 5—The matter of timbering the working face should have first attention. The miner should set his posts before starting to load out his coal. Post timber should be set plumb with a heavy cap-piece over the post so as to cross any slips in the roof. The large end of the prop should be up. In my experience, I have found that a post stood with its large end up will bear a greater load than one stood with the small end up.

It is important that the cap-piece should be of softer wood than the post itself, so that when the weight comes on, the cap will bind the head of the post together. When both a cap and a wedge are used the wedge should be driven between the cap and the head of the post, and not between the roof and the cap. In this case, the cap may be of hard wood and the wedge of softer wood.

I have had six years' experience as mine foreman in the No. 8 Pittsburgh seam, and during that time have had but one man hurt by accident other than by a fall of slate at the face. In No. 8 seam, there is a drawslate averaging from 12 to 15 in. thick, which the miner tries to hold up for three or four yards at the face, to give him an opportunity to load out his coal before dropping the slate. In this way we have had more men hurt in the mine, than from any other cause.

The best plan, in No. 8 seam, in posting this drawslate, is to set the posts 4 ft. apart each way so that they will form a triangle. Large caps, say 3 ft. long, if necessary, should be used, pointing toward the face. The caps should always point toward the face, unless it is necessary to point them in another direction in order to cross the slips in the roof. Too small a wedge or cap-piece will often cause a post to "trip" and they do not give the proper support across the slips or breaks, which makes their use dangerous. If miners would be more careful to use good wedges and long caps under a roof stone or slate, at the face, it would greatly reduce the number of accidents.

It is always important that a post should be set so that the weight comes directly over the post; otherwise, the post may "trip" and the cap be broken. Where the bottom is soft, a mudsill should be used; and this should not be less than 10 in. wide, 18 in. long and 4 to 6 in. thick. In some cases, a larger and heavier sill will be required to give a suitable foundation to the post. The system of timbering will necessarily depend on the conditions at the working face. In many cases, it is necessary to set the posts in rows parallel to the face. Sometimes, four rows of posts will be necessary, the rows being only 2 ft. apart, while the posts are 4 ft. apart in each row. This method throws an equal weight on each post and greatly strengthens the roof.

MICHAEL FREEMAN, Mine Foreman.
Glendale Coal Co.

Glendale, W. Va.

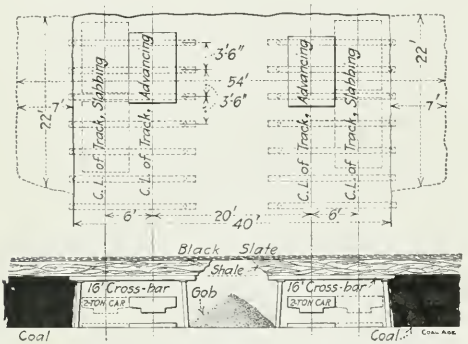
Letter No. 6—The following brief description, together with the inclosed drawing, shows a new method of working I have inaugurated in this district. The whole plan depends on the special style of timbering adopted, which, therefore, will be of interest in this discussion.

The method of timbering I am about to describe is used to mine a 6- or 7-ft. seam of coal, overlaid by a bench of shale varying in thickness from a few inches up to 3 ft. The cover above the shale is nowhere thicker than 80 ft. and often less than 25 ft. The stratum immediately above the shale is a hard black slate that breaks

easily. The roof shale, if not supported, will stay in place but a few days, a couple of weeks at the most, after the coal has been removed. It weathers rapidly when exposed to the air, detaching itself in large slabs measuring sometimes 3 or 4 sq.yd. and only 5 or 6 in. thick.

The rooms are driven 40 ft. wide, with two loading tracks spaced 20-ft. centers. The roof is supported by crossbars spaced 3½-ft. centers. One end of each crossbar is "hitched" into the coal, while the other end rests on a prop so placed as to clear the mine cars by at least 8 in. This has been found amply sufficient to hold the roof. The coal is undercut 7 ft. deep by electric-chain machines. After the room is driven up to the assigned limit, the miner starts what is called "slabbing"; a 7-ft. slice being taken off each rib.

Starting at the face, the machine makes a cut extending outward under six crossbars. This is plain sailing, as there are no props in the way. But, as soon as the cut is done, the timbermen set a prop under each crossbar, leaving a space of not less than 8 in. between the rib and



Plan and Cross-section of a 40-ft. Room, Showing Method of Removing Pillars by "Slabbing"

the prop. The timbermen then shift that part of the track which is opposite the newly made cut, 6 ft. toward the rib. The work is done in a very short time with ordinary crowbars and without disconnecting any rail joint. The slab is then bored and shot by special men before the loaders come to work.

The shooting seldom knocks down a prop, so accustomed to the work have the men become. If, however, a prop is either knocked down or moved, it is immediately reset. When the loaders come to work, in the early morning, they at once set themselves to dislodging and shoveling the coal. It would seem, and for a time, it certainly did seem to me, that the distance between the props was too short to permit of quick work on the loaders' part. But, after the men got accustomed to the work, the thing proved a great deal easier than was at first anticipated.

The first slab cut is started at the face of the room and consequently, both ends of it are fast. This is the case shown in the figure. But the next cut will have one loose end—the upper or inside one. The lower or outside end of the cuts will, of course, always be fast; but it is a matter of only 30 min. work for two men to make an opening there. When this has been done, the work progresses rapidly. In slab work, four men work together, and two mine cars are set out for them every time a change of cars is made. After a slab-cut is loaded out and before another cut is started by the machine, the timbermen remove all props and crossbars they can take out without exposing themselves, always stopping at the last set of timber, above the lower end of the cut where the coal has just been loaded. This set they leave for the present. The timbermen are careful to remove also the upper end of the track that has now become useless.

It has been found practicable to save six props out of ten, and about the same proportion of crossbars. It has always proved easy to knock down any standing props that it was thought too risky to attempt to save. This allows the falls to take place more easily. The space left open is only 54 ft. wide, but it falls nicely, in a few days. The caves appearing on the surface are so neatly and definitely cut, that a map of the workings could be made from them without the surveyors going underground.

F. C. Cornet,
Mining Engineer.

Charleston, W. Va.

Letter No. 7—Timbering at the working face is, I believe, one of the most important subjects connected with mining, and, at the same time, the work most neglected by the miners. The disregard of miners for their own safety is the most serious problem with which mine officials have to contend. Many mine officials fail in their duty by not requiring of each miner the proper timbering of his working face, at the proper time. As a consequence, we are losing more lives from falls of roof slate and coal than from all other causes combined.

The question is, what can we do to reduce the number of accidents from this cause? I am a firm believer in *systematic timbering*. Any kind of a *system* is better than none. I am also convinced that the miner is the proper person to do the timbering, except in some special cases that require the skill of experienced timbermen, employed for that purpose.

The miner should understand the necessity of setting a post, at the proper place and time; if he does not, he should be instructed along these lines. On the other hand, if he had to wait till men employed to do the posting arrived, he would too frequently take chances and load an extra car of coal, which, in past experience, has often proved to be the fatal car. Accidents from this cause will continue as long as the negligence of the miner is allowed to prevail.

In my experience, the best results have been obtained by adopting and enforcing a certain system of posting, more or less adapted to the conditions. Then, satisfy yourself that the miner thoroughly understands it and hold him directly responsible for the proper performance of the work. I am of the opinion that systematic timbering, in one form or another, will cover most of the conditions in coal mines. It may be, of course, necessary to have different systems to cover different conditions, in different mines, or in different sections of the same mine. In the various systems that I have recommended, I have only given the *minimum* amount of posting required or, in other words, the *maximum* distance apart of the timbers, which would not prevent intermediate posting should the case require. By so doing the miner or the official will always have to keep within this limit in setting posts. In case the rule is violated by setting post timber farther apart, an example should be made of the person or persons at fault.

My remarks and rules are particularly adapted to the Pittsburgh coal seam; but the same rules can be modified so as to apply to similar seams and conditions in other mining districts. The accidents from falls seem to be on the increase, so that about twelve of the bituminous-mine inspectors, I being one of the number, met early in 1910, and after several meetings and much discussion, adopted a system of posting the drawslate in the Pittsburgh coal seam, which posting is temporary while the miner or loader is loading out the coal from under the slate. This system was shown and fully described in COAL AGE, Vol. 2, p. 258.

We also adopted seven rules for timbering, which are particularly adapted to the Connellsville coke region, but will meet the requirements in seams of coal where conditions are similar. I give them here for the benefit of the reader:

Rule No. 1—In all rooms, entries, cut-throughs and chutes, exceeding 10 ft. in width, posts must be set nearly at right angles to the pitch of the seam, with good cap-pieces and in a straight line as near the center of the place as practicable. The distance between centers must not exceed 4 ft. 6 in., and the distance between the last post and the working face must not exceed 6 ft., except in places being undercut by machine, when the distance between the last post and the face may be such as the mine foreman, using sound judgment, may deem necessary for the safety of the workmen.

Rule No. 2—Where roof conditions necessitate the use of crossbars, no room, entry, cut-through, or chute shall exceed 10 ft. in width, except where special requirements render a greater width necessary. All crossbars must be properly and securely set, the distance between centers not exceeding 4 ft. and the distance from the last crossbar to the working face must not exceed 5 ft. We advise the use of temporary center posts, with good cap-pieces, to be set between the last crossbar and the working face, until another crossbar has been set, or until the loose coal or slate is taken down, as the case may be.

Rule No. 3—In all places after a blast has been fired, the roof and timber must be carefully examined by the workmen before they start to work, and any displaced timber must be promptly placed in position.

Rule No. 4—In the removal of pillars, the timbering should be done in a systematic manner. The distance between posts and between rows of posts must not exceed 4 ft. 6 in., and they must be set nearly at right angles to the pitch of the seam, with good cap-pieces and in parallel lines as close to the working face as practicable, maintaining a sufficient number of rows to insure the roof being kept in a safe condition until the posts are withdrawn.

Rule No. 5—In cutting across ribs or pillars where their thickness requires track across the working face, posts should be set on each side of the track, in the manner described in Rule No. 1 or Rule No. 2, according to the nature and condition of the roof.

Rule No. 6—In all cases when the coal is removed and the gob exposed, a line of posts shall be set near its edge. The distance between such posts or between the posts and the coal must not exceed 4 ft. 6 in.

Rule No. 7—In the removal of posts or timber while making rib-falls, none but competent workmen shall be permitted to perform the work.

You will understand that the system described in the above rules gives but the minimum amount of posting required and is not to be understood as forbidding intermediate posting or the adoption of additional precautions that circumstances may render advisable; nor as permitting you to omit such additional precautions if circumstances should render them reasonably necessary; nor does it permit you to neglect the rigid enforcement of any of the provisions of the mining laws pertaining to the prevention of accidents.

In order that these rules may be fully and carefully carried out and in order that the desired results may be secured—the prevention of accidents from falls—we would respectfully recommend a more rigid and frequent inspection, by mine officials, of all working places, roadways, etc.; because we are decidedly of the opinion that by exercising good judgment and strict discipline in the enforcement of these rules, there will be a very material decrease in the number of both fatal and nonfatal accidents from falls in the mines under consideration.

In mines where the coal is undercut, in wide rooms, by mining machines, the coal should not be blasted until the roof is posted within 6 ft. of the face. The blast many times causes a sag in the roof, and a number of accidents have resulted therefrom, that could have been avoided by setting timbers to prevent this sag.

In timbering, in pillar work, the cap-piece should be directed toward the fall or gob, and wedged in the same direction, so that when rock presses against the post from the side of the gob, it will tend to tighten the post instead of knocking it out. Accidents, both fatal and nonfatal, have resulted from the failure of properly wedging a post, on pillar-work.

The ordinary posting of a room should be carried out on a system best adapted to the particular locality in which the mine is located, and which past experience has proved adequate.

F. W. CUNNINGHAM.
Mine Inspector, 21st Bituminous District.
Charleroi, Penn.

Self Education of Miners

To become a fireboss is the ambition of many miners. It is the stepping stone to something higher. The general run of miners and men employed in and around the mine began work at an early age and, as a result, many have considerable less than a common-school education.

When a man has attained his first position as fireboss he begins, if he is ambitious, to educate himself and make up for his lack of schooling. While acting as fireboss, if he makes the most of his spare time, studying a few hours a day, he can soon master any line of study that interests him. If he does not want to follow up mining, there is no necessity to do so.

The usual hours in which a fireboss must do his work makes it possible for him to devote much time to study. He starts out between one and two o'clock a.m. in order to be at the mine and ready to begin his examination at three. He returns home about noon, tired and hungry. But, after washing up and eating his dinner, he can often utilize an hour or so to good advantage as no one should go to bed immediately after a hearty meal.

If he is wise he will begin to study the common-school books first, such as arithmetic and spelling, and apply these to his daily work or the work he wants to follow. A little study along these lines each day will soon give him a broader view of life and a broader mind. But a man who makes no effort to improve his position or broaden his mind, will sooner or later have to step aside to make room for a more earnest, eager and deserving man who will take his place.

A. F. DICKSON.
Roscoe, Penn.

[We are glad to indorse these brief remarks of our correspondent, drawing attention to the many opportunities that mine workers *can* improve if they *will*. The man who toils with his hands, during 8 or 10 hours of the day, and devotes the balance of the 24 hours to recreation and rest, often thinks his time for study is less than that of the office worker. It proves the old maxim: "Distance lends enchantment to the view." Office men, who must often toil 16 and 18 hours of the day, have learned the value of spare moments that are so generally wasted by other toilers.—EDITOR.]

EXAMINATION QUESTIONS

Fan Ventilation

Ques.—What would happen to a mine-ventilating fan if the doors at the top of the upcast shaft were suddenly opened; would the fan stop, slow down, or increase in speed? Give reasons for your reply.

Ans.—If the doors at the top of the upcast shaft were suddenly opened (assuming, of course, that the fan is exhausting the air from the mine), the mine would be cut off from the action of the fan, the air current being short-circuited at that point and passing directly from the outside atmosphere into the fan drift and through the fan from which it is then discharged through the expanding chimney into the atmosphere again.

This cuts out the mine resistance, which always opposes the circulation of the air; and, as a result, a very large volume of air enters and passes through the fan, greatly increasing the work lost or the power absorbed by the fan. Assuming the power applied to the fan shaft remains constant, the effective power causing the circulation of air would be very much decreased. It is this effective power that turns the fan; and, under the conditions just named, the fan would run slower but would, as stated, pass a larger volume of air per minute.

Ques.—When do the workings of a mine give off the most gas, when the fan is running or when it is stopped?

Ans.—The answer to this question depends wholly on conditions not named in the question. For example, assuming, first, that the conditions in the mine remain unchanged with respect to the emission of gas from the coal and other strata, if the fan is a blower, the mine pressure will be reduced by stopping the fan, and the outflow of gas from the strata will be increased. On the other hand, for the same conditions in the mine with respect to the emission of gas from the strata, if the fan is exhausting air from the mine the mine pressure will be increased when the fan is stopped, and the outflow of gas from the strata will naturally be less than before.

There are other conditions, however, affecting the outflow of gas from the strata, which produce a far greater effect on the outflow of gas into the workings than that produced by the stoppage of the fan whether blowing or exhausting. The emission of gas from the strata is not regular, but increases or decreases, from time to time, according to conditions existing in the strata itself. There are periods when the outflow of gas from the strata is abundant and, again, it will almost cease for a time. Besides these conditions existing within the strata, the advance of the working face and the extraction of the coal open new feeders of gas continually. Owing to these conditions, no definite answer can be given.

Ques.—A fan 15 ft. in diameter, working alone, produces 40,000 cu.ft. of air per minute, under a water gage of 1.06 in., giving an efficiency of 50 per cent. At a distance of 4000 ft. from this fan and on the same entry, another fan is placed and driven by a 25-hp. motor. The efficiency of this second fan is such as to make available 60 per cent. of the power applied. What will be the quantity of air and water gage produced when both fans are running?

Ans.—This is one of those unintelligible questions to which no answer can be given that would be of any practical value. If it were possible to introduce another motor of a given power, into an air current circulated by a given motor, in the same manner as it is possible to increase the power moving a train of cars, at any point of the train, the increase of air or the quantity in circulation could then be calculated, assuming the quantity proportional to the cube root of the power applied to move the air or the effective power on the air. The effective power or power on the air, in the first instance, is

$$H = \frac{40{,}000 \times 5.2 \times 1.06}{33{,}000} = 6.68\ hp.$$

In the second instance, the effective horsepower is increased by the effective power of the second motor, which is 25x0.6 = 15 hp., which makes the total effective power or the total power on the air 6.68 + 15 = 21.68.

Then, if the quantity of air in circulation varies as the cube root of the power on the air, the quantity ratio will be equal to the cube root of the power ratio. Or, calling the required quantity of air in circulation, x,

$$\frac{x}{40{,}000} = \sqrt[3]{\frac{21.68}{6.68}} = 1.48$$

$x = 40{,}000 \times 1.48 = 59{,}200$, say 60,000 *cu.ft. per min.*

Then, since the water gage varies as the square of the quantity of air passing, the increased water gage will be

$$w.g. = 1.06\left(\frac{60{,}000}{40{,}000}\right)^2 = 1.06\left(\frac{3}{2}\right)^2 = \frac{1.06 \times 9}{4} = 2.385\ in.$$

The conditions, however, that exist in the mine, with respect to these two ventilators, make this solution very problematic.

Ques.—A fan, 12 ft. in diameter, having an equivalent orifice of 30 ft., is running at a speed of 90 r.p.m. If the equivalent orifice of the mine is 19 sq.ft., what is the manometrical efficiency of the fan and what is the quantity of air this fan should deliver.

Ans.—It is necessary, first, to calculate the value of the manometrical efficiency of this circulation, from the given values of the equivalent orifices of the fan and mine, respectively. This efficiency is the ratio of the square of the equivalent orifice of the fan to the sum of the squares of the orifices of the fan and mine. Thus,

$$K = \frac{O_f^2}{O_f^2 + O_m^2} = \frac{30^2}{30^2 + 19^2} = \frac{900}{1261} = 0.7137$$

The quantity of air circulated by this 12-ft. fan, running under a speed of 90 r.p.m., in a mine having an equivalent orifice of 19 sq.ft., is then calculated thus:

$$Q = 3\ O_m D n \sqrt{K} = 3 \times 19 \times 12 \times 90 \sqrt{0.7137}$$
$$= 52{,}000\ cu.ft.\ per\ min.$$

This style of question depends on the correct determination of the equivalent orifices of the mine and fan, respectively, which is a difficult matter.

Study Course in Coal Mining

By J. T. Beard

The demand for increased efficiency grows steadily in every industry, and in none is this demand greater, today, than in coal mining. The shortest road to efficiency is the *education of the workers.*

Large industries and corporations employing workers in every capacity, have long since felt the need of increased efficiency of the workers in the mine, the shop and the field. To meet this growing need, many of the larger companies have organized special training schools and classes for their employees and the progress of students is rewarded by the advancement of those who prove their fitness for the work.

The work done in this direction by several of the large coal companies has produced commendable and gratifying results. Mine workers today recognize more than ever what proper training and education can do for the man who has them. The evidence of this fact is shown by the number of ambitious mine workers who are anxious to study.

The cry that comes to COAL AGE from these men is for "something simple—something that a man of little schooling can study and understand." The cry is pathetic when we reflect that these men must study while they work. Others of their number, with an overmastering ambition to learn, rob the much-needed hours of rest and burn the midnight oil while the family sleeps.

In response to repeated requests from readers—miners, mine officials and engineers—for the publication, in tangible form, of reliable formulas and rules used in calculating all kinds of mining problems, the editors of COAL AGE have decided, after carefully considering the needs of these different classes of men, to publish each week one or more pages of useful formulas, constants, tables, etc., together with practical rules, examples and brief, clear explanations of important principles in coal mining.

This will appear each week under the title, Study Course in Coal Mining. The matter will be published in page form, as shown by the two pages printed below. The size of these pages, 3x5 in., will make them available for compiling later in book form, which will be done as soon as a suitable number of pages have been completed, to make a useful handbook.

The book will be published as The Coal Age Pocketbook and will be as complete a reference book for coal men as it is possible to make it. To this end the editors of COAL AGE invite suggestions from all their readers.

The subjects treated will cover every branch of coal mining, but will give only what is most essential, avoiding duplications, and all unimportant matter. The pages will be complete in themselves, but will follow no regular order, as they first appear. In the later publication, they will be classified and indexed.

The Coal Age Pocketbook

AIR

Composition—

	By Volume	*By Weight*
Oxygen,	20.9 *per cent.*	23.0 *per cent.*
Nitrogen,	79.1 *per cent.*	77.0 *per cent.*
	100.0	100.0

Air also contains 0.04 per cent. of carbon dioxide (CO_2). Average mine air seldom contains less than 20 per cent. of oxygen, unless the air is diluted with other gases generated in the mine.

Quantity of Oxygen Consumed in Breathing—A man at rest consumes 263 c.cm. of oxygen per min., or 263 × 0.06102 = 16 cu.in. per min. and exhales an equal volume of carbon dioxide. Air exhaled from the lungs contains 2.6 per cent. carbon dioxide, 18.3 per cent. oxygen, 79.1 per cent. nitrogen.

In violent exercise, a man consumes from eight to nine times the amount of oxygen required when at rest; or, say 128 to 144 cu.in. per min. The exhaled breath may then contain 6.6 per cent. carbon dioxide and only 14.3 per cent. oxygen.

Depletion of Oxygen in Air, Effect on Life—Air containing 3 per cent. carbon dioxide can be breathed without discomfort, even when the oxygen content has been reduced to 16 per cent.; but 5 per cent. carbon dioxide causes headache, dizziness and nausea, after a short time.

When no carbon dioxide is present in the air the oxygen content may fall as low as 14 per cent. before much difficulty is experienced in breathing; but air containing but 10 per cent. is no longer breathable; but will cause death quickly by suffocation.

Weight of Air—The weight of air, for the same volume, varies directly with the pressure it supports, and inversely as the absolute temperature. There are two formulas for finding the weight of 1 cu.ft. of air, one in terms of the barometer (B), in inches, and the other in terms of the pressure (p) in pounds per square inch.

By the barometer,

$$w = \frac{1.3273\,B}{460 + t}$$

By the pressure,

$$w = \frac{p}{0.37\,(460 + t)}$$

The Coal Age Pocketbook

WATER

Water is a liquid; practically incompressible; freezes at 32° F. (0° C.); boils at 212° F. (100° C.), at sea level.

Decrease of pressure lowers the boiling point.

Increase of pressure raises the boiling point.

Elevation 10,000 ft. above sea level; pressure = 10.1 lb. per sq.in., water boils at 194° F.; but in steam boilers, under 150 lb. gage (150 + 14.7 = 164.7 lb. absolute pressure, sea level) the temperature of the water is 366° F.

Density of Water—Although water is practically incompressible, its density and, therefore, its volume, does change slightly with the temperature. Water reaches the point of maximum density at 39.2° F. (4° C), and expands in freezing at 32° F. It is this expansion in freezing that bursts water pipes and disintegrates porous rocks saturated with water. Taking the maximum density of water as unity, the relative density at any absolute temperature T is calculated by the formula

$$D = \frac{1000\,T}{500^2 + T^2}$$

Water as a Standard—Pure distilled water is an important standard in many ways. The melting point of ice being more uniform than the freezing point of water, is taken to mark the zero of the Centigrade and Reaumur thermometer scales or 32° F.; while the boiling point, at sea level, marks 100° C., 80° R. and 212° F.

As a standard of weight, the weight of water (max. density) is taken as unity or 1, and the weights of equal volumes of other liquids and solids are referred to this standard by what is called the specific gravity of the substance. Thus, the average specific gravity of anthracite coal is 2.5, which means that this coal weighs 2½ times as much as water, volume for volume.

As a standard of measure, 10 lb of water was, at first, adopted as the English gallon. In the metric (French) system, 1 kilogram of pure distilled water (max. density) = 1 liter (cu.decimeter).

As a standard of pressure or measure of pressure, the height of water column supported by the pressure is used to measure the pressure per unit of area. Thus

In pumping: 1 *ft. water column or head* = 0.434 *lb. per sq in.*

In ventilation: 1 *in. water gage* = 5.2 *lb. per sq. ft.*

SOCIOLOGICAL DEPARTMENT

The Financial Outlook of a Frick Employee

By Thomas W. Dawson*

SYNOPSIS—The H. C. Frick Coke Co. provides free insurance to all its employees, the maximum payment being $3000 in case of death. Pensions are paid to the old and incompetent. The company is endeavoring to enable the employee to increase his earnings by increased output and to conserve them by investment in U. S. Steel Corporation stock.

The H. C. Frick Coke Co. has not restricted its work to protection against accidents, but provides a plan whereby those who are injured, or whose relatives are killed, may be provided with a livelihood.

The plan of relief in case of death or accident was put into operation May 1, 1910, and was tried for one year to determine its success. It is purely voluntary, and was established by the company for the benefit of all employees injured, and for the families of all workmen who might happen to be killed in the service of the company. There is no contribution whatever from the employees. The principal features of this plan are that relief is paid regardless of legal liability, and without any legal proceedings. Even application for relief is not required.

The company provides treatment by surgeons and hospitals. No relief is paid for the first 10 days of disability, such restriction having been found necessary in all legislation on the subject. In case of accident, single men who have been in the employ of the company five years or less are paid 35 per cent. of the daily wages received at the time of accident, and an additional 2 per cent. for each year of service over 5 years. Married men in the service of the company for five years or less receive 50 per cent. of their daily wages at the time of accident, with 2 per cent. additional for each year of service, and 5 per cent. additional for each child under 16 years of age. The maximum payment is fixed at $2.50 per day and for the loss of a hand 12 months wages; of an arm, 18 months; of a foot, 9 months; of a leg, 12 months; and of an eye, 6 months wages.

For death by accident the company pays reasonable funeral expenses, and the widows and children of men so killed receive relief equal to 18 months wages of the deceased if in the service of the company five years or less, with an addition of 3 per cent. for each additional year of service above five years. An additional 10 per cent. is added for each child under 16 years of age, the maximum being fixed at $3000.

When the plan was put into effect, it was printed in the various languages and a copy given to each employee. One is now given to every arrival as he goes to work.

Pensions for the Old and Those No Longer Competent

The United States Steel Corporation, of which the H. C. Frick Coke Co. is a subsidiary, has provided $8,000,000, which, with the Carnegie Relief Fund, created by Andrew Carnegie on Mar. 12, 1901, makes a joint fund of $12,000,000, in which the employees of the H. C. Frick Coke Co. participate. Its principal features are; compulsory retirement for men at 70 years of age after 20 years of service; retirement at the request of the employee, or his employing officer at the age of 60 after 20 years of service; retirement by reason of permanent total incapacity after 20 years for a man under 60 years of age.

The basis of the pension scheme is; first, for each year of service, 1 per cent. of the average monthly earnings for the last 10 years of service; second, credit for service rendered to any of the plants of the subsidiary companies of the United States Steel Corporation, or to the predecessors of such companies; third, a minimum pension of $12 per month and a maximum pension of $100 per month.

Thus it has been seen that the company in the first place leaves nothing undone to protect its employees from injury, that when injured, as some of them are bound to be in the operation of some 65 mines, everything possible is done for their care and treatment; financial provision made for them and their families, and in case of death, for their widows and children; and when old age comes after years of service, the employees are assured sufficient income to take care of them to the end of their days. Thus, while conducting the great business done by the H. C. Frick Coke Co., it ever keeps in sight that one great factor "the employee."

Interest in Raising the Earnings of the Employees

The company has done much to increase the efficiency of their employees and to assist them in making the highest earnings possible under the contract prices. The company pays the highest wage in the region, and has always been foremost in increasing it when justified. It has established a standard efficiency basis, indicating what each employee, no matter what is his job, should accomplish for a day's work. This standard is not based on what the most capable man can do, but on the strength and endurance of the average man.

Daily reports are made showing the efficiency of each group of employees, setting forth the work performed by those mining or hauling coal, laying track, setting timber, etc. To aid the miner to earn all he can, steel track is used in headings and rooms, instead of the former wood track, on which the mine car can be far less easily moved. Haulage partings are continually moved up to the working sections. Empty cars are supplied to the miner as fast as he needs them, being delivered to the face

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Note—Abstract from paper entitled "Welfare, H. C. Frick Coke Co.," read before the winter meeting of the Coal Mining Institute of America.

of his working place. All loaded wagons are promptly removed.

General Rule No. 18 requires that: "Superintendents and foremen shall see that the turns are fairly distributed among the workmen on contract or piecework, and that no more men are employed than are absolutely necessary to perform the required amount of work well, and at the proper time."

Rule No. 21 states that: "Superintendents must pay strict attention to the rights and privileges of all employees, hear and give prompt attention to any reasonable complaint or claim for redress made by any employee, and not allow any discrimination on account of nationality or creed."

Where the working sections of a mine are a considerable distance from the entrance or shaft bottom, workmen are transported on "man trips" to and from a point near their work, thus eliminating the expenditure of a vast amount of energy which would be required in walking to and from their working places.

Inducements Offered for the Saving of Wages

Each year the employees of this company are offered stock of the United States Steel Corporation upon easy and especially favored terms which involve benefits beyond those granted to the ordinary stockholder. Of recent years the stock allotted has been over-subscribed. The figure charged is the market price or a little less, usually the latter. The minimum payment is $2 to $3 per share for preferred, varying in accordance with the price of the stock, and $1.25 to $1.50 for common stock.

The maximum which can be paid is 25 per cent. of the monthly earnings. A payment of $5 for preferred and $3.50 for common per annum for five years is paid on each share of stock purchased by employees under this plan. Non-paid-up subscriptions can be cancelled and the money paid in is refunded to the employee with 5 per cent. interest.

Premiums are not paid to employees who cancel subscriptions, sell their stock or leave the employ of the company, and the forfeited or unpaid premiums are kept in a fund and divided pro rata among the remaining stockholders under this plan at the end of the five years. If death occurs to an employee who has subscribed for stock and made payments under this plan, his estate receives the unpaid premiums for the full five-year period and a pro rata of the undivided premium at the time of death.

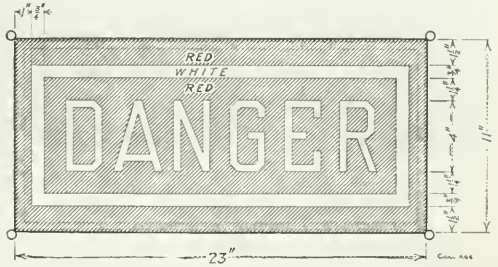
A Uniform Danger Signal

By L. R. Douglas*

During a discussion on the fencing off of bodies of gas, or other dangerous places, at a recent meeting of the Trinidad Chapter of the Rocky Mountain Coal Mining Institute, reference was made to a danger signal of some kind. Also a clause in the proposed mining laws for the state of Colorado alludes to a uniform danger signal. It is highly important that whatever warning device is used, should be uniform throughout the district. The majority of our miners today are foreigners, and unable in most cases to read the English language.

In the southern Colorado coal fields, where the mines are close together, it is common practice among the men to keep changing from one place to another. Wherever they would go the uniform danger signal would convey to them the same meaning, for the reason that it would look just the same as the sign they learned meant danger at the first or last place at which they were employed. Since "Safety the First Consideration" is the slogan now adopted by all operators, it seems that the uniform danger signal would be an additional step in this direction.

An efficient and serviceable signal is shown in detail by the accompanying sketch. It should be of No. 24 sheet tin, 12x14 in., with beaded edges, a wire being strung



Danger Sign

through the bead, and looped at each corner. The diameter of the loop should be about ¼ in., making it easy to hang up. The background should be enameled red, and the border around the word "Danger," and the letters should be white.

This would form a striking signal, and one not affected by water or humidity in the atmosphere. The enameled surface can be readily cleaned of dust and grease, with a piece of waste or cloth. This sign being durable and easily made, is presented to the mine operators for their consideration.

*Assistant engineer, Danford & Sanderson, Trinidad, Colo.

First Aid Demonstration of Pittsburgh Coal Co.

By H. G. Adamson*

On Thursday evening, Mar. 5, the Pittsburgh Coal Co.' first-aid teams in the Thoms Run district, gave their first competitive exhibition in the hall of the Knights of Pythias, at Federal, Penn. The three teams composing the organization were dressed in new white uniforms having a red cross on the left sleeve and these suits gave the contestants a neat and military appearance. The classes had been thoroughly instructed and drilled by Dr. Rittenhouse, of Federal, Penn.

An audience estimated at 500 persons witnessed the contest and many late arrivals were unable to secure admission to the hall. Among the visitors were several of the officials of the Pittsburgh Coal Co., including J. M. Armstrong, manager of mines, F. C. Fritchman, assistant manager of mines, J. M. Sloan, district superintendent, J. E. McDonald, superintendent of the relief department, Dr. Kennihan and Mr. Judd, also of that department.

The mothers, wives, fathers, brothers and sisters awakened to a realization of the fact that the men who are members of first-aid teams will help materially all the mine employees in the district. One feature that the company and its local officials much appreciate, is that a number of those who attended the exercises for the first time, expressed their desire to become members of the first-aid teams.

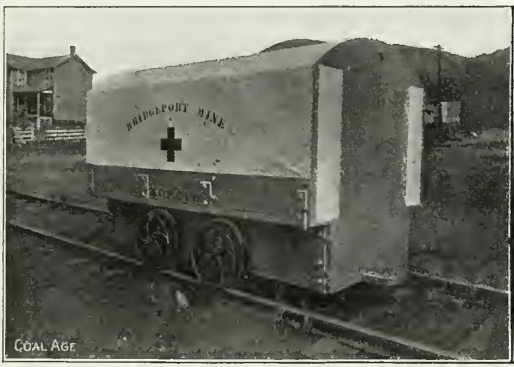
The company has furnished a hall at Federal, Penn., centrally located, and it is fitted with first-aid charts and a skeleton for the benefit of all the employees who wish to avail themselves of first-aid instruction. The classes meet once a week.

*Burdine, Penn.

Views of H. C. Frick Coke Co. Welfare Work

Exterior of Bathhouse at Collier, Smithfield P. O., Fayette County, Penn.

Interior of the Collier Bath and Change House, Showing Shower Compartments



An Underground Ambulance Car for Use on Mine Tracks, Bridgeport Mine, Fayette County, Penn. Coal 6 to 8½ Feet Thick

First-aid Team at Phillips Mine, Which Won First Prize at Ninth International Red Cross Conference, Washington, D. C.

A Safety Shaft-gate Latch, When Cage Is Not at Landing, Latch Will Not Open. Gate Removed to Show Mechanism

Same Safety Device with Latch Open. The Cage Has Risen, and Acting as a Fulcrum Has Permitted Cager to Open Gate

BOOK REVIEW DEPARTMENT

BRITISH COLUMBIA BUREAU OF MINES, BULLETIN NO. 1, 1913. PRELIMINARY REVIEW AND ESTIMATE OF MINERAL PRODUCTION, 1912. By Wm. Fleet Robertson, provincial mineralogist. Paper, 7x10 in.; 29 pages.

The bulletin has been prepared before the receipt of the official reports of the gold commissioners and mining recorders of the Province, for the year 1912; and before receiving the usual returns made annually by the managers of mines and reduction works. In estimating the net production for 1912, the bulletin has made allowance for a possible slight reduction in the total final figures, to be received later.

It is estimated that the coal mines of Vancouver Island have produced during the year 1,553,000 tons; those of the Crowsnest district 1,299,000 tons; while those of Nicola and Similkameen have produced 214,000 tons. Of this coal production 393,000 tons were made into coke, the coking operations being confined entirely to the Crowsnest district which fact reduces the production of coal in that district to 904,000 tons, net. The bulletin gives a brief summary of the important mining developments in the Province, during the year.

EINFUHRUNG IN DIE MARKSCHIEDEKUNDE MIT BESONDERER BERUCKSICHTIGUNG DES STEINKOHLENBERGBAUS. (An introduction to the study of subterranean surveying with particular reference to coal mines) by L. Mintrop, teacher at the Bochum Mining School. 209 pp. with index. 6¼x9⅜ in. 191 ill. and 5 double-page plates. Julius Springer, Berlin, 1912.

The title of this book sufficiently defines its character, and the author's standing proclaims its reliability. The discussion covers land surveying, the instruments used above and below ground and their use, and the estimation of areas and earthwork.

A few useless traverse tables are given, which are carried down only to even degrees, even meters from 1 to 10 and two places of decimals. We can hardly see what use these would be, even in a classroom. The plates are interesting and suggest that the German coal mines are not operated without considerable difficulty.

COAL MINES REGULATION ACT, 1911—HOW TO REMEMBER IT—Arranged by Henry Davies, director of mining instruction for the County of Glamorgan, Wales. 120 pp. 5⅜x8¼ in. Thos. Wall & Son, Ltd. Wigan, England. Cloth boards. Price, 1/6.

The writer of this book has taken the British mining law and rendered it into everyday English, giving each subject a bold and easily visible title. Moreover, the information is alphabetically arranged so that ready reference can be made to any part of the contents. It would be well if a book, following a somewhat similar method and containing the various state laws, were printed in this country.

It is probably well known to our readers that Great Britain is governed by both laws and Home-office orders. Several of the latter relating to coal mines are included in this book and also the Coal Mines (Minimum Wage) Act. This book is both cheap and handy, and should obtain a ready sale.

ANNALES DES MINES, RECUEIL DE MEMOIRES SUR L'EXPLOITATION DES MINES, Vol. III, Series XI, 1913. H. Dunod et E. Pinat, 47 & 49 Quai des Grands-Augustins, Paris; 5⅜x9. Paper.

This edition of the Annales contains a study on magazines containing black powder, by M. Saladin, chief engineer of the Schneider establishments, representing the committee on iron works and iron mines in Meurthe et Moselle, and M. H. Dautriche, chief engineer in control of powders and saltpeter.

It may be well here to quote the conclusions at length:

1. In case of an explosion in an underground magazine or one built on the cut-and-cover principle, the mine powder in grains, the compressed and unenveloped powder and that compressed and confined in cartridges produced almost equally destructive effects.

It appears to be justifiable to use the tables prepared for dynamite magazines, buried or sunk and covered over, for estimating the clearance needed around powder depots of like kind with the proviso that one pound of black powder be considered equivalent to half a pound of dynamite.

2. In the case of an explosion of a light magazine in free air, the mine powder compressed to a density of 1.5 produces effects comparable to those of powder in grains. It is the most important conclusion of the Droitaumont tests that the effects are considerably reduced when the compressed powder is carefully put up in paper cartridges.

This reduction results from the slow progress of the inflammation. Consequently the pressure produced was more marked when the magazine had light walls and presented less resistance to the discharge of the first gaseous products. The weakening of the effect was considerably greater for the light magazines than for those which were sunken.

3. We can therefore increase the safety of magazines of powder when compressed and made into cartridges by dividing the powder into such suitable sockets that the inflammation of one of them will not be communicated to neighboring sockets. The experiments at Droitaumont ought to promote the use of socket magazines having unit cells capable of containing 1, 5 or 50 kg. (about 2½, 11 or 110 lb.). In the building of such a magazine, it seems necessary to reduce to a minimum all combustible parts.

Nearly half of the concluding part of the book is taken up by a bibliography and a list of the personnel of the department of mines in France. We recommend this list to those people who believe that our own bureau is disposed to undertake too large a scope. There are commissions on steam engines, automobiles and cartography, all under the control of the Mines Council.

MINE-RESCUE WORK IN CANADA. By W. J. Dick, mining engineer, Commission of Conservation, Canada. 48 pp., with index. Paper, 6⅜x9⅝; 19 illustrations, mostly insets. The Rolla L. Crain Co., Ltd., Ottawa.

This book contains an account of the mine-rescue provisions of all nations and a full description of the excellent work being done in Canada. British Columbia requires rescue apparatus to be kept at all mines and it may surprise many to learn that when the book went to press in November, 1912, there were 182 mine-rescue apparatus in use or ordered, 22 belonging to the province of British Columbia.

An interesting chart shows the death rate in all the coal-producing countries. In 1902, Canada had a fatality of over 13 per thousand. Our own death rate in 1907, which approximated 5 per thousand, shrinks in comparison. Never before or since that time have our coal-mining operations been nearly so fatal as in that year.

Canada has difficulties which demand peculiar precautions. In some years past, its death rate has been lower than our own and this little volume shows that it has determined that the future risks of mining shall be reduced and is taking radical steps to that end.

COAL, ITS COMPOSITION, ANALYSIS, UTILIZATION AND VALUATION. By E. E. Somermeier, professor of metallurgy, Ohio State University. 169 pp., with index; 6⅛x9⅜; 8 ill. McGraw-Hill Book Co., 239 W. 39th Street, New York, Cloth boards. Price $2.

This book is written by undoubted authority and can therefore be recommended to anyone seeking information on coal as a heating agent. The word "composition" in the subtitle refers to its chemical characteristics, and has no reference to the physical and biological nature of the coal.

There are chapters on composition and heating value, chemical analysis, sampling, methods of analysis, determination of heating value, methods of reporting analysis, improvement of coal by washing, purchase of coal under specifications and on flue-gas analysis. Several analytical tables are contained in the concluding chapter.

It will be seen therefore that the book is valuable to the coal chemist and the coal user. The remarks on washing are purely applicable to the theoretical determinations of the chemist and do not take up washery practice and the efficiency of different methods.

Trifling exceptions may well be taken to the view that sulphur is an extraneous and not an intrinsic part of the coal, and to the use of analyses of ash which do not show the presence of titanic acid. This dioxide which runs from 0.10 to 1.30 per cent. in clays is usually found in coal, probably as an extraneous impurity. It is generally, as in these analyses, included as silica.

However, the exceptions we have taken detract in no manner from the value of a book which is intended for practical use and completely fits the place for which it was published. The coal analyst and coal burner will find in it those facts which are needed in their daily work and a book logically arranged and free from non-essentials.

COAL AND COKE NEWS

PENNSYLVANIA

Anthracite

Edwardsville—The Woodward Colliery of the Delaware, Lackawanna & Western R.R. Co., Coal Department, at Edwardsville, has been closed for repairs. The time of the suspension has not been announced, but it is expected to last about three weeks.

Scranton—The first strike to receive the indorsement of the district officers of the United Mine Workers since the signing of the agreement last spring is that at the Oxford Colliery of the People's Coal Co., at Scranton. The miners allege that the company is not abiding by the award of the strike commission of 1902 and the agreement of last spring, under which the mines of the anthracite field are being worked. The indorsement of the district union carries with it the support of all the anthracite miners, and implies that the union is to make an issue of the Oxford matter.

Mrs. Cora Evans, of West Scranton, widow of Joseph A. Evans, the rescue foreman of the U. S. Bureau of Mines, who lost his life in the Pancoast mine in Throop, Apr. 7, 1911, while leading a rescue party, has been granted a pension of $1320 by Congress. The pension is payable at once, and is equal to one year's salary.

Bituminous

Meyersdale—A coal mine is to be added to the varied industries of the Somerset County Home and House of Employment, according to the annual report of Poor Directors Jacob W. Peck, Chauncey F. Dickey and George F. Kimmel. The mine will be located on the county farm.

Pittsburgh—The meeting of the American Institute of Electrical Engineers will be held in Pittsburgh, Friday and Saturday, Apr. 18 and 19, under the auspices of the new committee, which has just been formed to discuss the use of electricity in mines. Of this committee Geo. R. Wood, consulting engineer of the Berwind-White Coal Mining Co., is chairman.

A number of interesting papers covering the various phases of this subject have been promised and it is expected that an interesting discussion will take place.

Owing to the location of the meeting in the heart of the bituminous coal mining district, it is expected that a large number of coal-mine papers will be presented.

OHIO

Columbus—Operators in Ohio are fearful that the Gilson bill now pending in the Ohio General Assembly, which gives the right of eminent domain to condemn an approach to a mine will pass. It is claimed the bill is so loosely drawn that owners of coal mines could seize another mine and use it as an entry to their own mines.

The Green anti-screen bill, providing that miners shall be paid on the basis of all coal mined instead for that which does not go through a screen, passed the senate of the Ohio legislature recently by a vote of 21 to 8. Senator Green, father of the measure, pushed the bill through suddenly although considerable opposition developed. Senator Green stated that between 25 and 38 per cent. of the coal mined in the state goes through the screen. The measure as it passed the senate does not become effective until Apr. 1, 1914, when the present miners' scale expires.

Bellaire—Fire of unknown origin, starting in the oil room of the general store of the Pittsburgh Belmont Coal Co., at Neffs, just east of here, destroyed that structure, the warehouse adjoining and the blacksmith shop of Alex Neff, and threatened the destruction of the entire town recently. The loss was $25,000 with $14,000 insurance.

KENTUCKY

Winchester—John C. M. Day, of this city, has discovered a seam of coal on his land, near Campton Junction, on the Lexington and Eastern R.R., east of here. He intends to begin working the mine at once.

Whitesburg—A 6-ft. seam of cannel coal is reported to have been discovered on the property of the Mineral Development Co., up Boone's Fork on the new Lexington & Eastern R.R. If the report is correct, the seam is one of the largest in eastern Kentucky.

Jenkins—John Potter, a farmer, will probably receive a fancy price for an acre of land now located in the heart of the town, which he reserved for his house when he sold his 200-acre farm to the Northern Coal & Coke Co., a few years ago. The Consolidation Coal Co., who bought the land and constructed the town, is said to have offered Potter $40,000 for his remaining acre, but he has thus far refused to sell.

Lexington—In connection with that part of the program of the Kentucky Mining Institute involving demonstration of first-aid work, to be given at its meeting on May 16 and 17, the treatment of various injuries will be required. For this purpose volunteers will be needed to submit themselves to the application of tourniquets and other first-aid devices, the use of the plumotor, and the like. Among the injuries which will be theoretically treated are listed right ear torn off, bright-red blood coming out in spurts (indicating a severed artery), compound fracture of right thigh, man unconscious, overcome by gas, broken back, electrocution, right hand cut off, and compound fracture of jaw. Naturally, it would be impracticable to produce these injuries for the occasion, and some skillful "faking" will be necessary in order to make the work as realistic as possible.

The Board of Examiners in the office of State Mine Inspector C. J. Norwood, at Lexington, Ky., has completed its examination of applicants for mine foremen's certificates, and has granted first-grade certificates to 7 men, second-grade to 17 men and third-grade to 2 men.

Under the gradings established by the Department, a first-class certificate entitles the holder to take charge of any mine in the state; a second-class qualifies him to assume the position of foreman in any nongaseous mine, and a third-class to take charge of any nongaseous mine not employing more than 26 men.

TENNESSEE

Coal Creek—A 30-ft. vein of coal has been discovered near Coal Creek, according to recent reports, on a farm which has been taken over by parties who intend developing it at once. The property is said to lie between the Southern Ry. and the L. & N., and to contain three veins of iron ore, in addition to the coal.

INDIANA

Princeton—William H. Raney, member of the district executive board of United Mine Workers, received a message from National President White, announcing that the National Board had given its consent for a 30-day test of a new explosive in the coal mine at Fort Branch, this county.

Indianapolis—The shotfirers' bill, which proposed to compel the operators to pay the shotfirers, failed to get through the Indiana legislature. The operators put up a stiff fight against it. The bill got through the House, but was killed in the Senate committee, of which Jacob C. Kolsem, operator, of Terre Haute, was chairman.

The new weights-and-measures law prohibits the selling of coal by the basket, unless the baskets are of standard bushel size. In the Ohio River towns, it has been the custom to sell coal by the "bushel" of 72 lb. and the "load," of 1800 lb. This will be superseded, probably by the 80-lb. basket and the full 2000-lb. load.

CALIFORNIA

Magalia, Butte Co.—The boiler building and hoist at the Crystal mine, formerly known as the Princess mine, was destroyed by fire. R. C. Andress is superintendent of the mine.

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Coming Meetings

ENGINEERS' SOCIETIES

The regular monthly meeting of the Engineers Society of Northeastern Pennsylvania will be held in the Board of Trade Auditorium, Scranton, Penn., Thursday evening, March 20, 1913, at 8:15 o'clock. Refreshments will be provided by the social committee. Subject: Centrifugal Fans, Design and Application, by E. B. Williams, manager mining department of the B. F. Sturtevant Company.

HILL PUBLISHING COMPANY

Notice to Stockholders

A special meeting of the stockholders of the Hill Publishing Company will be held on the 7th day of April, 1913, at 11:00 o'clock a.m., at the offices of the Company, 505 Pearl Street, New York, N. Y., for the purpose of voting upon the following propositions:

a. To increase the number of the directors to nine;

b. To increase its capital stock from $1,000,000 to $3,000,000, to consist of 30,000 shares of the par value of $100 each;

c. To classify the aforementioned increase of capital stock amounting to $2,000,000, so that $1,000,000 thereof shall be six per cent. cumulative preferred stock, also preferred on dissolution, and $1,000,000 thereof shall be common stock;

d. To alter the certificate of incorporation by eliminating the provision in Section 7 thereof relating to cumulative voting; and

e. To ratify the by-laws of the Company as amended by the directors.

Dated, New York, March 20, 1913.

JOHN A. HILL, President.
ROBERT McKEAN, Secretary.

Correction

In our issue of Mar. 8, Vol. 3, No. 10, in the third line of the last paragraph on p. 369, the word first-motion" should read "second-motion."

PERSONALS

M. D. Reyer, of Birmingham, Ala., has resigned his position as assistant general manager of the Galloway Coal Co., and the position has been abolished. The duties are now being looked after by Cyrus Garnsey, Jr., general manager, of Memphis, Tenn., we will make his headquarters at Carbon Hill, Ala., where the largest operations of the company are located.

William Hadley, who was appointed temporarily superintendent of the Foundry Furnaces of the Tennessee Coal Iron & R.R. Co. on Nov. 1 last, when E. P. Williams resigned, was on March 1 transferred to his former position as assistant superintendant of the company's furnaces at Ensley. W. E. Oldham, superintendent of Vanderbilt Furnace of the Woodward Iron Co. has been appointed to fill the vacancy as general superintendent of Foundry Furnaces, comprising four furnaces at Bessemer, Alice Furnace at Birmingham, and Oxmoor Furnace at Oxmoor. Mr. Oldham was for a few years superintendent of Alice Furnace for the Tennessee Coal Iron & Railroad Company.

John Markle, head of the firm of G. B. Markle & Co., the Jeddo coal operators, has given out an official statement contradicting the report that he was to resign from the firm. He sails on March 22 for Europe, where he will undergo treatment by noted oculists.

Announcement has been received that F. F. Taplin, formerly sales manager of the Youghiogheny & Ohio Coal Co., will be president of the recently incorporated Cleveland & Western Coal Co. This concern will do a rail and lake business in coal from Pittshurgh and Ohio districts.

CONSTRUCTION NEWS

Lansford, Penn.—Contractor Louis Riebe, of Lansford, is erecting a big washery at Hauute for the Lehigh Coal & Navigation Co.

Middlesboro, Ky.—The Mary Moose Mining Co., operating in the Middlesboro field, is planning to sink an additional shaft on its properties.

Osaka, China—The Osaka Shosen Kaisha has placed orders with the Osaka Iron Works for the construction of two 3000-ton steamers having a speed of 10 knots.

Syracuse, N. Y.—The Semet-Solvay Co. will build 20 additional coke ovens at Holt, Ala., increasing the plant 50 per cent., and daily capacity to 350 tons coal.

Hamilton, Ohio—Extensive improvements are being made at the plant of the Hamilton, Otto Coke Co., at Hamilton. These improvements will include a coal mixer.

Coshocton, Ohio—J. H. Daley, who has been operating a coal mine on the Lee Moore farm, at Mohawk, has opened up another mine on the L. N. McVey farm, near Walhonding.

Saginaw, Mich.—The Consolidated Coal Co., which controls the soft-coal mines in the Saginaw Valley, announced today that three new mines will be opened within the next month.

Monongahela, Penn.—A number of coal test holes are to be drilled in the vicinity of Eighty-Four this coming spring, with a view to the location of a number of coal shafts in that vicinity.

Lonaconing, Md.—Robert Izzett has a force of workmen engaged in reopening the mine on Big Vein Hill, near the Silk Hill. Mr. Izzett will devote himself to developing the fire coal business.

Topeka, Kan.—The Union Pacific coal chute that was destroyed a few days ago by fire, will be replaced by a new concrete and steel structure. The new chute will cost about $20,000, and its capacity will be about 200 tons.

Cumberland, Md.—The Stanton mine, at Short Gap, a mile east of Clarysville, will be ready to ship coal this week. This mine has been reopened by the Stanton Coal Co., of which Louis Stanton, of this place, is the president.

Tamaqua, Penn.—Besides ten dwelling houses the Lehigh Coal & Navigation Co. is erecting at Lansford and ten at Seek, near Tamaqua, it has contracted for twenty-five blocks of houses at Hauto for employees of the new electrical plant.

Pottsville, Penn.—The Kaska William Colliery, of the Alliance Coal Co., has been closed down for a full month. This was done to permit repairs, a fire having done great damage. A new shaft has been sunk 100 ft. and it is only about half finished.

Connellsville, Penn.—The interests which acquired the coal under the lands of the Peter Miller Estate, near Rogers Hill, in the Indian Creek Valley, will construct a coke plant of 50 ovens. The interests are represented by Charles Pore and H. N. Odbert, of Monessen.

Jenkins, Ky.—The Consolidation Coal Co. has started the construction of a large central hospital to be used by all of the company's constituent branches. The building is to be of brick and stone, and will cost in the neighborhood of $40,000. It will be completed within six months.

Greensburg, Penn.—Rockwell Marietta has purchased 134 acres of coal north of Wilpen and near to the plant of the Marietta Stillwagon Coal & Coke Co., of which he is president and manager. Engineers are now on the ground laying out the ovens, coal tipple and railroad sidings.

Pottsville, Penn.—The Locust Mountain Coal Co. has awarded the contract for breaker of 2500 tons capacity per day. Nine hundred thousand feet of lumber will be used in its construction. Baird Snyder, Jr. formerly superintendent of the Lehigh Coal & Navigation Co., is the head of the new company.

Wellesburg, W. Va.—The Finley Coal Co. will build thirty houses this spring to accommodate the employees of the company, fifteen of these will be built at their mines just north of the city and the remainder at the La Belle mine. The company also proposes to build a large electric plant at Buffalo Creek, near the old tipple.

Pomeroy, Ohio—Report is now extant among railroad men that the 12 miles' extension of the river division at Pomeroy, will commence when the good weather appears. Contractor John Lindsey secured the job. This extension will tap a virgin coal field in Meigs County, and should produce thousands of tons of tonnage annually for that division of the H. V. R.R.

Birmingham, Ala.—The contemplated construction of a railroad line in Walker County, joining the Jasper-Manchester R.R., to that now extending from Burgin, will mean development that will bring about expenditures of $2,000,000, at least. The Maryland Coal Co. is developing as fast as money and labor can do the work. Milton Fies is in charge of the coal developments in this section.

Homer City, Penn.—The Miller Construction Co. is beginning the building of a branch line for the Buffalo, Rochester & Pittsburgh R.R. in Indiana County, Penn., to tap the new mine opening of the Clyde Coal Co. A high trestle will be built in connection. A new mine opening at Craigsville, south of Punxsutawney, will also be given a railroad connection by the same construction company. The Clyde Company will put up about 45 houses for workmen.

Wilkes-Barre, Penn.—Sinking operations at the new shaft of the Butler Colliery, of the Hillside Coal & Iron Co., have been suspended temporarily, at a depth of seventy feet, in order to permit the concreting of the shaft for a depth of thirty-five feet. McConville and Fitzpatrick, of Pittston, are doing the concrete work. The inside dimensions of the shaft, after the concrete has been placed in position, will be twelve by twelve feet. After the completion of the concreting, the shaft will be sunk to a depth of about 150 feet.

Birmingham, Ala.—The Woodward Iron Co. is making improvements at its No. 2 Woodward mine, consisting of concrete and steel tipple and crusher building, electric hoist housed in a fireproof building built of brick with the tile roof. The ore will be handled in a 14-ton steel skip on the upper 1,100 ft. of the slope, to which point it will be gathered in the mine cars by an auxiliary electric hoist in the mine and dumped in to a 300-ton bin from which it will be loaded into the skip. The power for operating the skips comes from the electric plant at their byproduct coke plant at Woodward, about three miles distant.

NEW INCORPORATIONS

Blocker, Okla.—The Belt Coal Co.; capital stock, $25,000. Incorporators: James L. Brazel, Al Belt, and R. P. Harris.

Hazard, Ky.—The Kentucky Jewel Coal Co.; capital stock, $50,000. Incorporators: H. E. Bullock, D. C. Foley and T. F. McConnell.

New York City, N. Y.—Loyalsock Coal Mining Co.; capital stock, $100,000. Incorporators; F. C. Overton, J. R. Overton, E. P. Young.

Louisville, Ky.—The Drake Blue Gem Coal Co.; capital stock, $8000. Incorporators: T. B. Mahan, John Goias and Frank Owens.

Armerford, Penn.—The Armerford Coal Mining Co.; capital stock, $100,000. Incorporators: Charles C. Pfordt, C. F. Armstrong and A. L. Walker.

Birmingham, Ala.—The Donalison-Grant Coal Co.; to mine and sell coal; capital stock, $5000. Incorporators: G. J. Grant, G. M. and T. M. Donalison.

Salt Lake City, Utah—The Utah Coal Sales Co.; capital stock, $50,000. Incorporators: W. D. McLean, W. O. Bridgeman and George E. Forrester.

Blocker, Okla.—A charter has been granted to the Belt Coal Co.; capital stock, $20,000. Incorporators: James L. Brazell, of Hartshorne, president.

Nashville, Tenn.—The United Mining Co.; capital stock, $10,000. Incorporators: R. M. McMillen, S. M. Copper, Edward Maynard and Henry W. Curtis, Jr.

Nashville, Tenn.—The Southern Ice & Coal Co.; capital stock, $20,000. Incorporators: James H. McCall, O. T. McCall, A. McCall and James H. McCall, Jr.

Camden, Ark.—Dr. George Kimball, and associates, plan the organization of a $1,000,000 corporation to develop coal and clay property in Ouachita County.

Ashland, Ky.—The Southeast Coal Co. has been organized with a capital stock of $1000. The incorporators are John F. Hager, K. M. Fitzgerald and L. S. Wilson.

Charleston, W. Va.—The Camplatt Coal Co.; to develop coal; capital stock, $200,000. Incorporators: W. I. Robinson, H. C. L. Forler, R. M. Mackenzie, A. A. Meyers and A. Meyers.

Packard, Ky.—The Drake Blue Gem Coal Co. has been organized at Packard, Ky., with a capital stock of $8000. The incorporators are T. B. Mahan, John Goins and Frank Owens.

Phoenix, Ariz.—The Frontenac Mining Co.; to deal in coal and other mineral lands and mine coal and other minerals; capital stock, $100,000. Incorporators: Wm. C. Muntz, and others.

Prestonsburg, Ky.—The Beaver Pond Coal Co., has increased its capital stock from $20,000 to $50,000, with a view to extending its operations and enlarging its existing plants.

Houston, Tex.—The G. B. Zigler Co.; to drill, open and work mines for obtaining oil, coal ore, etc.; capital stock, $25,000. Incorporators. G. B. Zigler, W. A. Rowson and N. S. Wishenhunt.

Wheeling, W. Va.—The Richland Block Coal Co.; to develop coal fields; capital stock, $100,000. Incorporators: J. C. Long, H. B. Lockwood, L. W. Brown, Nelson C. Hubbard and L. L. Talbot.

Cleveland, Ohio—The Euclid Brick & Supply Co.; builders' supplies, coal, etc.; capital stock, $100,000. Incorporators: L. J. McFarland, Don B. Swisher, O. B. Long, C. M. Addison and D. Strader.

Phoenix, Ariz.—The Slug Gulch Mining Co.; to deal in coal and other mineral lands and to mine coal and other minerals; capital stock, $400,000. Incorporators: Fred H. Larsen, H. A. Babbitt and others.

Boston, Mass.—The Wakefield Coal Supply Co.; capital stock, $35,000. Incorporators: Edward P. White, F. Horace, Perley, Herbert M. Whitten, Albert R. Perkins, Daniel D. Peabody and George H. Smith.

Birmingham, Ala.—The Black Warrior Mill Co.; to develop coal and mineral lands and to do a general sawmill business; capital stock, $100,000. Incorporators: E. L. More, Cyrus A. O'Nealand, Henry Stanley.

Cleveland, Ohio—The Cleveland & Western Coal Co. has been organized by F. E. Taplin, F. C. Danielson and E. W. Astel. The new company will do a lake and rail business, principally from the Pittsburgh district.

Shawtown, Ohio—The Shawtown Grain Co.; general elevator business, coal, cement, fencing, etc.; capital stock, $10,000. Incorporators: F. S. Burhley, W. S. Moorhead, F. S. Robinson, B. J. Otte and George B. Mulford.

Wilmington, Del.—The Artificial Coal Co., of Philadelphia; capital stock, $100,000; to acquire lease, own and control coal mines of all kinds. Incorporators: J. Howard Much, John D. Wolf, John T. Waite, all of Philadelphia.

Cleveland, Ohio—The Cleveland & Western Coal Co.; to do a lake and rail business. Incorporators: F. E. Taplin, F. G. Danielson, E. W. Astel and J. M. Todd. All the members of the new firm were formerly connected with the Y. & O. Coal Co.

Pine Bluff, Ark.—The Ark-Ol Manufacturing Co. has been organized here to manufacture products from lignite coal. The officers are John Holmes, president and general manager, Clifton Howell, vice-president, and Frank Tomilson, secretary.

Hopkinsville, Ky.—The West Kentucky Fuel Company has been incorporated with a capital stock of $5000, to engage exclusively in the wholesale coal business at that point. The incorporators are Paul Wynn, Sam W. Wynn and James Breathitt, Sr.

Shamokin, Penn.—A charter has been granted to the Northumberland Coal & Coke Co., of Shamokin Dam, Penn., with capital stock of $10,000. The company intends to mine and market coal and will establish a coaling station at Shamokin Dam.

Jefferson City, Mo.—A charter has been granted to the George E. Smith Coal Mining Co., Hudson Township, Macon County; capital stock, $5200. Incorporators, George E. and Annie Smith, Andrew H. Clark, Roy D. Conley and John Parker McCanne.

Birmingham, Ala.—The Donaldson-Grant Coal Co., Inc., has been incorporated with C. J. Grant as president and general manager and J. M. Donaldson as secretary-treasurer; capital stock, $5000. The company will do a general coal mining and selling business.

Concho, W. V.—The Rock Lick Coal Co.; to mine coal in Fayetteville district of Fayette County, W. Va., drill for oil and gas; capital stock, $200,000. Incorporators: Angus W. McDonald, V. L. Black, O. P. Fitzgerald, John Wherle and L. G. Summerfield, all of Charleston.

Punxsutawney, Penn.—The Brush Creek Coal Mining Co.; to mine, quarry, excavate and bore for and otherwise produce coal, iron ore, limestone, fireclay and other minerals and substances. Incorporators: Lucius W. Robinson, Lewis Iselin, B. M. Clark, F. H. Beck and J. W. Brown.

Columbus, Ohio—Papers of incorporation have been filed with the secretary of state of Ohio for the Kittaning Coal Co. of Columbus with a capital stock of $10,000, to mine and deal in coal. The incorporators are, C. E. Leslie, A. H. Jones, J. C. Yontz, Herbert M. Myers and M. H. Recob.

Cincinnati, Ohio—The Beaver Fond Coal Co. has started new financing in the shape of an increase of the capital stock from $20,000 to $50,000. The new issue is to be in the shape of preferred stock at 8 per cent., par value $100. Headquarters of the company are at Prestonburg, Ky., at the mines.

Charleston, W. Va.—For the purpose of mining coal, drilling for oil and gas, operating coal washeries, mills and manufacturing plants, in Brooke County, W. Va., a charter has been issued Richland Block Coal Co., Wheeling; capital stock, $100,000. Incorporators: J. C. Mclnley, H. B. Lockwood, L. W. Brown, Nelson C. Hubbard, and L. L. Talbot, all of Wheeling.

INDUSTRIAL NEWS

Indianapolis, Ind.—The South Side Lumber & Coal Co., Kokomo, has increased its capital to $20,000

Columbus, Ohio—The D. A. Thomas Coal Co. will develop about 1000 acres of coal land near Seng, W. Va.

Sullivan, Ind.—Twenty-five land owners in Curry Township have filed deeds for part of thir land to the Indiana Coal Co., and it is expected mining operations will begin promptly.

Shamokin, Penn.—While engaged in driving a tunnel at the Bear Valley shaft, owned by the Philadelphia & Reading Coal & Iron Co., workmen uncovered a 7-ft. seam of fine anthracite coal.

Ryder, N. D.—While drilling for artesian water on the Ben Rosenberg claim near here, the drillers struck a seam of coal at a depth of 170 ft. Samples of the coal will be sent to experts at the university for testing.

Connellsville, Penn.—The Berwind-White Coal Mining Co. is developing a mine between Harborton and Pan, Va. The shaft will be 600 ft. deep. The company will build a town which will have 750 dwellings, and will open a 12,000-acre tract.

Philadelphia, Penn.—Philadelphia capitalists are making overtures for the purchase of the 10,000-acre tract of coal land recently taken over by Howard Davis, of Conemaugh, George Gore, of Johnstown and others, at Garway, near Hastings.

Artemus, Ky.—The Anchor Coal Co. has been purchased by J. B. Rogers and associates, and the company will be reorganized, with Mr. Rogers as general manager. The facilities of the plant, and its capacity, are to be increased by the installation of additional machinery.

Belle Vernon, Penn.—Men from Monessen will open a 540-acre tract of coal in the Indian Creek Valley next week. John I. Rogers' plant has been taken over by Pittsburgh men and the output will be increased to 200 tons a day. The Pittsburghers will take charge at once.

Altoona, Penn.—The Pennsylvania Coal & Coke Co., operating mines throughout Cambria County, will this summer electrify all its working. The Penn Central Electric Co. of this city will furnish the power. The company will also build new offices at several of its mines.

St. Louis, Mo.—The Mississippi River Commission, Major Clarke S. Smith, secretary, Liggett Building, is asking for sealed proposals for furnishing 380,000 bushels of coal in barges, to be opened at noon, on Apr. 5. Major Smith will furnish all necessary information on the subject.

Welch, W. Va.—The Pocahontas-West Virginia Coal Co., a new operation at Leckie, nineteen miles above Welch on the Tug Fork branch is pushing its work rapidly. Mine No. 1 is equipped with electric power and No. 2 with a gasoline engine to haul the coal. William Leckie is president.

Connellsville, Penn.—The Jamison Coal & Coke Co. is electrifying all of its mining and coking plants in the Greensburg-Connellsville field, substituting electricity for compressed air. Fifteen locomotives, electrical machines, dynamos and generators have been purchased, and nearly all of the new equipment has been installed.

Columbus, Ohio—Pennsylvania Railroad officials here have announced that the Sandusky docks of this company will be extensively improved before the opening of the navigation season. It is expected that the capacity practically will be doubled and new loading machinery added, which will greatly facilitate the coaling of vessels.

Pittsburgh, Penn.—The Buffalo & Susquehanna Coal Co. will hereafter pay the miners regularly on the 15th and 30th of the month, instead of at somewhat irregular times twice a month. In some of the mines the men are to be allowed to load something more than the former exact two tons to the car. This will result in an increase of earnings.

Irwin, Penn.—The Penn-Westmoreland Coal Co. a new organization, has taken over the J. A. Guy block of four-foot coal, just east of West Newton and expects to put the product on the market this summer. The tract comprises about 100 acres, $60,000. The company has purchased from Charles Suter ground for tipple. A. R. Byers, of New Stanton, is president.

Binghamton, N. Y.—With nearly 500 acres of land situated just northeast of Port Crane, leased or sold to Scranton capitalists, the plan to mine coal in that village is fairly well under way. The H. A. Allerton farm of 150 acres and the Willian Bunzey farm of 100 acres are among those said to have been leased to the Scranton people. Boring will be started as early as possible.

Brockwayville, Penn.—C. A. McDonald and other DuBois men have leased the mine property at Westville formerly operated by the Jefferson Coal Co. and are re-opening the same for the purpose of shipping coal. They will also lease an additional ten to twenty acres. The new company will be known as the Sandy Lick & Rochester Mining Co., and will be managed by Mr. McDonald.

Morgantown, W. Va.—A deal for the sale of 500 acres of coal in the Union district has been consummated. Surface, Pittsburgh, Sewickley and all other seams of coal were sold to W. H. Seymour, of Pittsburgh, and the price was $300 an acre. The property is situated between the Stewartstown and Warm Hollow roads in the Union district. The purchasers expect to develop it without delay.

Nicktown, Penn.—Options on what is probably the biggest undeveloped tract of coal in Cambria County are being taken by Anselm Kirsch and his brother, A. F. Kirsch. Between 6000 and 7000 acres are involved. It will eventually fall into the hands of the Manor Real Estate & Trust Co. The deal, if put through will mean the exchange of something like $600,000. Between 50 and 60 owners will get a portion of this sum.

Louisville, Ky.—Certain well-defined rumors current in the Harlan field indicate that foreign capital other than Welsh is on the verge of becoming heavily interested in that region. Exact details of the deal are not yet available, but it is stated on good authority that French interests are involved in a purchase which has practically been arranged. A few days more will probably see its consummation, and full details will be published.

Whitesburg, Ky.—A big Letcher County deal, recently reported, is that closed by Maxwell & Litts, of Wise County, Va., for a tract of about 2000 acres, lying on the proposed line of the Cincinnati, Licking River & Virginia R.R. The development of the property will probably await the construction of the road, which promoters intend to begin this spring or summer.

Waynesburg, Penn.—P. J. Bradley and J. J. Koelfert closed a big sale of coal with Fayette County parties last Saturday. They disposed of 490 acres of coal in Wayne and Gilmore Townships, Green County, at a consideration of over $100,000. Local parties who owned the coal are P. J. Bradle, J. J. Koebert, J. L. Rush, Delbert Orndoff, R. E. Kent, of Waynesburg; Frank Gump, of Mt. Morris, and Dennis and Peter Meighen, of Jollytown.

Pittsburgh, Penn.—At the request of a number of customers, the Goodman Mfg. Co. has decided to open a repair and supply department in Pittsburgh. This will be known as the Pittsburgh Repair & Supply Department, 700 Phipps Power Building. E. Kent Davis will be manager.

The electrical repairing done in this shop will be of the same high-grade character as they do in their Chicago shops.

The Goodman company is now carrying in Pittsburgh a small stock of shortwall machine parts, and expect, within a short time, to have a complete stock of parts for this type of machine.

St. Louis, Mo.—Representatives of the Eastern Coke and Coal Syndicate who have been here two months are said to have options on tracts of land on both sides of the river. They are reported to have obtained nearly 200 acres on both sides of the River Des Peres, between Broadway and the Iron Mountain Railroad.

Part of the tract was owned by the Laclede Gas Light Company. Julius Pitzman, civil engineer and investor, who owns a large tract there, says that he has been dealing with a prospective buyer, but that he does not know whom the agent represents.

Cincinnati, O.—Details have been arranged for the transfer of coal property which involves over half a million dollars and which will be the second large holding of the Canadian coal interests in the West Virginia fields.

Captain Michael Roach, the president of the New River and Ohio Coal Co., has arranged the sale of the properties to the Lake Superior Coal Co., which is a subsidiary of the Superior Co., the largest coal, iron and paper pulp producer of Canada.

This company bought the Cannelton Coal & Coke Co., in the Kanawha district. Coal from these mines is shipped to the headquarters at Sault Ste. Marie.

Pineville, Ky.—It is reported that the Harlan Coal Mining Co. has recently leased to the Lick Branch Coal Co., composed of John W. Williams and associates, its recently completed coal-mining plant at Croxton, Ky., in the Harlan field. The new plant is one of the largest in capacity and most up-todate in equipment in the eastern Kentucky field, and under the management of the experienced operators who have leased it, is expected to cut a considerable figure in the production figures. It is probable that with this plant off its hands the Harlan Coal Mining Co. will shortly begin the construction of another plant in that vicinity. The lease referred to is said to provide for minimum royalties aggregating $100,000 during the first five years, with the privilege of renewal for an additional five years, during which period the royalties are fixed at a minimum of $125,000.

COAL TRADE REVIEWS

GENERAL REVIEW

Anthracite orders for April delivery, when the spring discounts will be in effect, are coming in rapidly, and indications are that the trade will be active over that month. In fact, some believe that production will be so heavy through April and May that June, and even July, may find prices still below the April circular.

At the moment, the hard-coal market is slow and dull. It has been definitely announced that the customary spring discount will go into effect the first of the month, so consumers are cutting orders to the lowest possible minimum, in order to avoid carrying over any of the high-priced product. As a result, current orders are scarce. Production is still being restricted, and some stocks are being accumulated. Egg is particularly easy and is being freely offered at well below the April circular; pea size continues the strongest of the hard-coal grades.

Conditions in the Eastern coast-wise bituminous trade are unsettled and inclined to be a little tense. Pocahontas and New River operators are actively seeking contract business, but the consumers do not believe they are justified in the large increase they are demanding over last year's quotations, and, as a result, little business is being closed, and the contract market is decidedly dull. Spot prices are ranging 10 to 15c. below contract asking prices. Pennsylvania operators are holding off on prices, pending a more settled condition in the labor situation in West Virginia, which now appears to be assuming serious proportions. In the event of extensive trouble there, the Pennsylvania operators will be materially benefited. What contracts are being closed are for uniformly heavier tonnages than during the previous year.

The Pennsylvania and the Western Maryland railroads have both announced that, effective Mar. 20, they would accept consignments for Lake destinations, and it is believed the initial shipments will be heavy. Deliveries on the Northern border are still a trifle uncertain, but railroads are rapidly gaining control of the situation; consumers in this district point to numerous low prices being quoted, but dealers claim the trade is steady and showing a strong tone. In the Pittsburgh district shipments to the Lake trade are rapidly increasing.

The demand in Ohio continues fair, and there is considerable activity in renewing contracts; operators believe that industrial conditions are steadily improving and that consumers will soon be in the market for a large tonnage. The domestic dealers have fair stocks and will be out of the market until the fall stocking begins; prices remain at a rather low level. Coal continues to accumulate at Hampton Roads, in spite of some curtailment on the part of the operators, who are, however, firm in the belief that there will be a distinct improvement in the trade shortly. The dumping is rather light, and few contracts are being let, but there is a good demand on the existing ones, and the export business continues to show a steady increase.

The Middlewestern retailers have definitely concluded buying for the current year. Prices are down to the summer schedule and are showing no disposition to change. There is a total absence of activity in the trade.

BOSTON, MASS.

There is much uncertainty over bituminous prices. Most of the agencies for Pocahontas and New River are actively seeking contract business on the $2.85 f.o.b. Hampton Roads basis, but only a small share of the total tonnage of those coals for New England is understood to have been placed. The larger buyers particularly, are declining to accept so high a figure, feeling that conditions do not warrant so large an advance over 1912, both on coal and on water transportation. The result is that the contract market is decidedly dull. The fact that spot coal is still being offered more or less freely at from 10c.@15c. less than on contract, and that certain shippers are going slow on commitments after Apr. 1, in view of possible labor troubles in the New River field, makes the outlook rather complicated. The Georges Creek and Pennsylvania shippers are awaiting developments on the Southern coals before announcing their own season prices, so that in general the spring prospects on bituminous are more or less mixed.

Georges Creek is now coming to tide in better volume and the demand seems right up to the supply. Coals from the Pennsylvania districts are being railed only on orders and there is only a moderate call for the medium grades. Demurrage has been paid for coal standing at Philadelphia and at New York, but the accumulation was not significant and is now well cleared up. Prices at the mine are practically unchanged and the movement all-rail is steady for the more popular coals.

Water freights are strong at 95c.@$1, Hampton Roads to Boston, with 75@85c. on yearly contract on large vessels. The Reading barge rate on bituminous has been reduced, however, from 90 to 80c., Philadelphia to Boston. On Long Island Sound freights from New York are 40@50c., with a demand now for anthracite shipment the last of March at April prices.

Anthracite is expected to start in with a rush Apr. 1. Orders have been filed for all the Eastern points and shipments are expected to be heavy until the retailers get their storage filled and call a halt. There is quite a tonnage being carried over at almost all the New England points and the weather is so mild that this situation is not likely to improve.

With a fair amount of domestic sizes taken on in April and May the dealers are likely to rest on their cars until the demand from the public begins to deplete their stocks. Egg is in the least demand and continues to be offered by the independents at prices well below the anticipated April circular. There is a fear on the part of some anthracite buyers that there will be such a surplus of individual coal mined in July that prices then will be as low or lower than the companies' list for April. This feeling is not shared, however, by the dealers who have had experience before with dull years in anthracite. At least, those whom the companies served well in 1912 are apparently quite willing to let the same companies fill them up during April and May.

Present wholesale quotations are about on the following basis:

Clearfields, f.o.b. mine	$1.25@ 1.45
Clearfields, f.o.b. Philadelphia	2.50@ 2.70
Clearfields, f.o.b. New York	2.80@ 3.00
Cambrias, Somersets, f.o.b. mines	1.30@ 1.65
Cambrias, Somersets, f.o.b. Philadelphia	2.55@ 2.90
Cambrias, Somersets, f.o.b. New York	2.85@ 3.20
Pocahontas, New River, f.o.b. Hampton Roads	2.65@ 2.80
Pocahontas, New River, on cars Boston	3.80@ 3.90
Pocahontas, New River, on cars Providence	3.75@ 3.90

NEW YORK

Bituminous—There are rumors current in the local market that a number of the smaller operators have succeeded in closing contracts covering their production over the next contract year. This would seem to indicate an increased activity in contracting, but since only the smaller companies were mentioned in this connection, the tonnage involved is probably not large. As a matter of fact, operators are finding it difficult to close, particularly with the larger consumers, who are holding off, apparently in hopes of a sharp decline in the spot market, which would naturally have a sympathetic effect on contract business.

There has been little change in the prompt market, which still continues rather dull and weak, particularly on the lower grades. The better qualities are in good demand and slightly short in supply. Stocks of all kinds and size at tide have fallen off considerably during the week. Production is still being curtailed, especially those operations producing off quality. Prices have experienced no change, except on the West Virginia steam grade, which we quote 5c. off of the price prevailing over the last three weeks, the market being about as follows: West Virginia steam, $2.55@2.60 fair grades, Pennsylvanias, $2.65@2.70; good grades of Pennsylvanias, $2.75@2.80; best Miller, Pennsylvania, $3.05@3.15; Georges Creek, $3.25@3.30.

Anthracite—Several of the large companies have sent out instructions to their agents to the effect that the customary spring discount on the domestic grades will go into effect Apr. 1 as usual. With this feature finally eliminated from consideration, buying is becoming even more restricted, and there is an almost total absence of any demand for the domestic sizes; dealers and consumers generally have sufficient coal on hand to carry them over until the first of the month, and consequently there is no incentive to buy.

Production in the mining regions is still being curtailed, most companies laying off on an average of three days per week. However, this feature is being welcomed by the operating departments, who are taking advantage of the idle time to effect repairs which have been accumulating for several months, while the mines were working under a heavy pressure. With the lowest prices of the year in effect next month, it is expected there will be a great deal of activity in the trade. All sizes are in ample supply, with the exception of pea, which, as has been the case for several months, is a little difficult to obtain.

Quotations have not undergone any material change during the week. Both stove and barley have suffered a slight decline, while chestnut is quotable on a little higher basis. The following are the nominal New York prices on hard coal:

	Circular	Individual—Lehigh	Individual—Scranton
Broken	$5.00	$4.50 @ $5.00	$4.50 @ $5.00
Egg	5.25	4.55 @ 5.20	4.75 @ 5.25
Stove	5.25	4.70 @ 5.20	4.75 @ 5.25
Chestnut	5.50	4.95 @ 5.45	5.00 @ 5.50
Pea	3.50	3.45 @ 3.55	3.50 @ 3.60
Buckwheat	2.75	2.00 @ 2.45	2.50 @ 2.75
Rice	2.25	1.80 @ 1.95	2.25
Barley	1.75	1.10 @ 1.50	1.60 @ 1.75

PHILADELPHIA, PENN.

About all the dealers are doing now is waiting for Apr. 1, when the reduction in the price of anthracite goes into effect. It is practically understood now, that there will be the same reduction as customary in normal years. Some of the companies have already issued circulars making this announcement. The individual operators have been using this April price as a basis for some time past, and even so are not having particularly easy sledding in getting rid of their product. Dealers are loth to turn down an offer for a car of egg, stove or chestnut at fifty cents off the present circular prices, but when it comes to putting on coal now that they really do not require, that is another matter. The thought of the premiums of $1.50 to $2 per ton they were compelled to pay to these same individuals no less than three months ago, still lingers in their minds, and there will undoubtedly be lots of feeling manifested in the placing of orders during the coming season. Companies that took care of their own trade and gained new friends, are likely to hold on to them.

It is useless to speculate on the coming business for the month of April as it could not help being good. Every dealer has a little space that he would like to see filled up at the reduced price, and this will make an active demand, which perhaps may be duplicated in May. The weather for the balance of March is not likely to be conducive to the clearing up of stocks purchased at the old prices, and in almost every case, some coal will be carried over. It is understood that the large companies are still receiving orders for the prepared sizes, but they are few and far between, and it is further understood that they are obtaining the full prices.

Instead of reduction in quotations Apr. 1, there is talk among bituminous operators of advancing the price on contracts after March 31, and as a consequence, there is a little flurry to get as much of the old-priced coal as possible. This is particularly true at Tidewater points, where considerable coal is moving. Whether the threat will hold good remains to be seen, but judging from present conditions, it will be a difficult position to maintain. The soft-coal trade at this time seems to be willing to take almost anything that is offered, in the way of prices.

PITTSBURGH, PENN.

Bituminous—Mining and shipping of coal for the Lake trade has increased and is now of considerable proportions, although practically confined to Lake shippers who have mining interests of their own. The production of so much ¾-in. coal has naturally increased the supply of slack which has resulted in the premium for this coming off, the slack market being now quotable at the regular figure of 90c. The coal market as a whole is not overly firm, chiefly because a number of small operators are indifferently well supplied with contracts and are occasionally cutting prices. The large interests are adhering closely to schedule prices, which we continue to quote as the general market: Slack, 90c.; nut and slack, $1.05; nut, $1.25; mine-run, $1.30; ¾-in., $1.40; 1¼-in., $1.55, per ton at mine, Pittsburgh district.

Connellsville Coke—Demand for both spot and contract furnace coke has continued extremely light, but for foundry coke it is slightly improved. Production has decreased a total of 30,000 tons a week, according to the last report, and the position is sound, as actual consumption is fully up to the record. The decrease in production has been due chiefly to restriction by operators making off coke, which can hardly find a market now at any figure. In December and January cokes running above 1.25 per cent. in sulphur and very high in ash were accepted in lieu of anything better, but today furnaces will hardly consider a badly cut price if it involves coke running even a tenth per cent. above the recognized sulphur limit of 1 per cent., or running much above 12 per cent. ash. Such off cokes are available, at least as low as $2.20 for prompt furnace, and perhaps might be had at $2. Standard furnace coke we quote fairly firm at $2.40, with contract nominally at $2.50. Foundry coke is quotable at $3@3.50 for both prompt and contract, depending on grade, per ton at ovens.

BALTIMORE, MD.

The orders so far booked by the Consolidation Coal Co., for delivery during the next six months, show an increase of over 500,000 tons as compared with the same period of the previous year; this is mostly for coal from the Fairmont field. This increase in tonnage has done much to revive hope in the Baltimore market.

By the last of the week, coal from the West Virginia and Pennsylvania fields will begin moving to the Lakes. The Western Maryland Ry., following in the footsteps of the Pennsylvania, has notified shippers that the road would accept Lake shipments on Mar. 20. All business received will be forwarded to Buffalo and other lake ports and held there until the Lake traffic opens. There is considerable business ready to be turned over to the roads, and it is believed that the initial shipments will be large.

Prices softened a bit on spot business during the week, where low-grade coals were concerned; sales were reported under $1. But only a slight change took place in the price of the better grades. The car situation seems to have been eliminated as a factor in the trade. About the usual activity was witnessed at the railroad piers. The coke market continues fairly firm and there has been a slight reduction in the output of the product, especially in the Connellsville region.

BUFFALO, N. Y.

There is still much complaint that the railroads are making uncertain deliveries and thus complicating the bituminous trade badly. One operator says that he has been billing out coal for ten days, but none of it has yet reached destination. It looks as though the roads were getting farther behind in certain branches of their business in spite of the fact that the weather is more favorable to quick despatch.

Another disturbing element in the bituminous trade is the resumption of shipments to the Lake ports. There is such a shortage of coal in the Northwest that much lake tonnage will be loaded before the opening of navigation. A favorite size for this trade is three-quarter, which necessitates the turning out of a great amount of slack and sometimes breaks that market badly. Often the Lake firemen refuse to handle anything but three-quarter for steamer fuel and that also increases the amount of slack.

There is more unsold bituminous on track generally than for sometime, so that everything indicates a period of quiet trade. There will be small fluctuations that the active salesman will take advantage of, while the slow one will get left. The contract season is on and there is some indication that prices are to be held stiffer than they were last year. The lowest bid for furnishing nut and slack, to the Buffalo State Hospital, is $1.99, as compared with $1.92 last year; the bidder who obtained the contract last year now bids $2.05, which shows what he thinks of the business. It is understood that there is likely to be a good amount of docking for ash and other tests.

Buffalo anthracite shippers are loading considerable hard coal into lake steamers, but the D., L. & W. is handicapped by a dispute with the government over possession of the dock. It now appears that the fast-accumulating anthracite will have to be dumped in great part, as a loaded steamer is grounded at the Lehigh Valley dock, blocking it completely.

Bituminous prices are held pretty firmly in spite of the lack of demand, on the basis of $2.80 for Pittsburgh lump, $2.65 for three-quarter, $2.55 for mine-run and $2.15 for slack, with Allegheny Valley and Reynoldsville 15 to 25c lower. It is said that coke is becoming firmer, but jobbers generally admit that it does not sell here for more than $5 for best Connellsville foundry.

COLUMBUS, OHIO

While the weather has not been favorable for an active coal trade, there has not been any great falling off during the past week. There is a fair demand for tonnage from

steam users and considerable activity is shown in the renewing of fuel contracts by the railroads. The domestic trade is a thing of the past and operators and shippers are looking forward to a rather active Lake trade.

Dealers have pretty fair stocks generally. This means that they will not be in the market for much coal until the stocking up period begins later in the season. On the whole the retailers had a pretty fair trade despite the unfavorable weather conditions. They secured good prices generally and not a great deal of trouble was experienced in obtaining prompt deliveries from the mines.

Operators, especially those who engage in the Lake trade, are anticipating a good demand from the Northwest. Reports from that section show that the docks have been well cleaned up and this means an active season. Improved dock machinery is being installed at many places in order to take care of the expected increase in tonnage.

Prices are still at a rather low level and no improvement in that direction is expected for the time being at least. Dock prices have not yet been determined and there is a strong movement to place them back to the level of two years ago, before the recent decline. Chartering of boats is going on and everything is being arranged for the opening of navigation.

Quotations in the Ohio fields are as follows:

	Hocking	Pittsburgh	Pomeroy	Kanawh
Domestic lump	$1 40	....	$1.50	$1.40
¾-inch	1.30	$1.20	1.35	1.30
Nut	1.25	....	1.30	....
Mine-run	1.10	1.10	1.15	1.10
Nut, pea and slack	0 80	....	0.75	0.80
Coarse slack	0.70	0.85	0.65	0.70

HAMPTON ROADS, VA.

There has been little actual change in the coal situation at Hampton Roads; prices remain at about the same level, few contracts have been let and the dumping has been comparatively light. The accumulation of coal still continues notwithstanding light loading and some curtailment of output, the effect of which will appear later. An encouraging feature is the steady demand on existing contracts, which, with the growing export tonnage, represents about all of the coal loaded at the piers during the past week.

There is more talk of labor troubles in the smokeless coal fields and there is undoubtedly a deep feeling of unrest among the miners. To combat this one of the larger New River operators has voluntarily given some concessions to the men, in the shape of a two-weeks' payday and a nine-hour day. It is also said that the Berwind interests in the same field have announced substantial concessions.

What changes the coming two weeks will show in prices, it is difficult to predict, but those best informed anticipate a change for the better and a stronger demand. There is no doubt of the steady contract growth of the export business, emphasized by the shipments to markets not entered by our coals until lately and by the increasing prestige of these abroad, as shown by the items in the foreign trade papers regarding the American product.

LOUISVILLE, KY.

It is rather odd that there is almost as much domestic coal moving from the mines as during any time in the fall and in December, when the demand was brisk, in anticipation of some real winter weather, and the car shortage kept the mines down to about half-time. The poor demand now has cut operations down to about the same extent. Sales are only to supply current requirements, as dealers are doing little stocking, being generally pretty well supplied.

Prices remain at about the same levels as heretofore reported. The best grades of Jellico block are quoted at $2 a ton f.o.b. mines, with 3-in. lump and block at $1.85, and larger sizes at $1.90, but it is doubtful what sales are being made. Round is priced at $1.60, with domestic nut at about $1.50. The best grades of nut and slack from both the eastern and western Kentucky districts can be had for 75c., the lower grades being available in fair quantities at 50 to 60 cents.

BIRMINGHAM, ALA.

The increased requirements of the blast furnaces in this district are serving as an excellent stimulant to both the steam coal and furnace coke markets. Keen competition from other districts seems to have weakened the foundry-coke market, but the quality of Alabama cokes, due largely to superior methods of preparation, is enabling local producers to obtain higher competitive prices than ever before.

Contracts are being closed rapidly for the year on domestic coal, all protests against the recent increase in price having apparently disappeared. One of the largest producers of Cahaba coal reports their April output fully sold up. Industrial conditions in the South are, as a whole, on a prosperous basis and the outlook for the year is bright.

The state mine inspector's office has given out Alabama coal-production figures for the year 1912, the exact output being 16,513,040 short tons. These figures are somewhat below early estimates, the production for the latter half of the year having been cut down considerably on account of shortage of cars. Equipment is plentiful at this time and the rate of production is much higher than the average of 1912.

INDIANAPOLIS, IND.

There is little change in the Indiana coal situation; prices, having got down to about the summer schedule, are showing little or no change. It is reported that there are mines ready to make alluring concessions but operators in general say it would be useless, especially on domestic grades.

Retailers have practically finished buying for the present coal year and will be glad to be able to dispose of all they contracted for. Considerable more coal has been available since the new year opened than usual in this city. The declining prices at the mines, when January showed that the winter was going to be mild, enticed new ventures in the trade, for it was seen that the old established operators would have to hold up prices on account of having made high contracts in the fall, when the supply situation looked ominous. The smaller ones have been making considerable fuss about their cut prices.

The standard retail prices in this city are:

Anthracite, nut	$9.25	Winifred	4 75
Anthracite, grate, egg and stove	9.00	Falling Rock, cannel	6.50
Lump	6.50	Linton lump	3.75
Pocahontas, forked		Linton, egg	3 75
Pocahontsa, shoveled lump	6.00	Hocking Valley	4 75
Pocahontas, mine run	5.00	Hocking Valley, egg	5.00
Pocahontas, nut and slack	4.00	Brazil block	4 50
Blossburg	5.50	Gas house lump coke	7.00@8.00
Ohio Jackson	5.75	Crushed gas coke	7.00@8.00
Raymond	4.75	Citizens oven coke	7.00@8.00
Kanawha lump	75	Connellsville coke	7.50@8.00
Pittsburgh lump	4.75		

DETROIT, MICH.

Both steam and domestic consumers are showing much indifference in the matter of placing orders and the operators and shippers find business dull. There is little or no difficulty in getting shipments through from the mining districts, and buyers of steam fuel are taking advantage of this, and seem to think they will be able to pick up whatever fuel they require whenever they need it and at almost their own quotation; domestic coal users appear to be suffering no urgent need of replenishing their stock. Weather conditions during the week have been unusually mild. Operators and jobbers are looking forward to the opening of Lake navigation, which seems to be only about two weeks distant

The prevailing prices for today are as follows:

	W. Va. Splint	Gas	Hocking	Cambridge	Ohio No. 8	Pocahontas	Jackson Hill
Domestic lump	$1 40	....	$1.40	....	....	$1.75	$1 90
Egg	1 40	....	1.40	....	....	1.75	1 90
Nut	1 30	....	1.30	....	....	....	1 50
1½-in. lump	1.25	....	....	....	....	....	....
¾-in. lump	1 10	$1 10	1 10	$1.10	$1 10	....	....
Mine-run	0 90	0 90	0 90	0 90	0 90	1.25	....
Slack	0.80	0.80	0 80	0 80	0.80	1.10	....

Anthracite—Hard coal is coming in, in large quantities at present, and with the unusually mild weather, it is causing the market to be flooded with all sizes. The jobbers who have large supplies of independent coal on hand are disposing of it at from 25 to 50c. below circular. In a few instances demurrage has accrued on some of this fuel.

MINNEAPOLIS—ST. PAUL

The general brizzard which has prevailed during the past week has been a very great relief to both wholesalers and retailers, and should cut a large hole in the stocks of coal on hand. Wholesalers are again hustling for new business, and beginning to agitate the storage question. Salesmen, who have been idle since the first of the year are again on the road, and while their orderbooks are not being filled very readily they are turning in some business.

Circulars for Apr. 1 are in the hands of the printers and the phrase "Subject to change without notice" will be prominently displayed. Anthracite at Lake Michigan and Superior points on Apr. 1 circulars, is quoted at $6.25 for egg and stove, $6.50 for chestnut, $5.25 for pea and $4 for buckwheat. It is expected with continued mild weather the opening of navigation will be early this year in which event large shipments will reach the docks during April and May.

Prices on all grades of Illinois coal are still unsteady and Franklin County, Harrisburg and Carterville coals can be bought for anywhere between $1 and $1.50 for prepared sizes at the mines. New River, lump and egg, from the East is

selling for $1.35 at the mines and Pocahontas can be had at the same price; mine-run is selling for as low as $1 at the mines.

CHICAGO

There is a continued lack of activity in the Chicago coal market. No demand exists for domestic coal, retailers declining to increase their stocks lest they be compelled to carry a large part of them over into the summer. Domestic grades are not being produced by the mines except where it is necessary to do so in order to obtain fine sizes to apply upon contracts. Scarcely any orders are being received from the retailers for high-grade, southern Illinois coal. Operators in the Springfield district and producers of various Indiana coals are making no effort to sell their domestic product in Chicago. A number of them have changed their screens to make steam lump coal and others are disposing of what domestic they have at points nearer the mines.

The smokeless trade is unusually dull. Until the latter part of February, smokeless operators reported large sales at satisfactory prices. Business among dealers in anthracite continues to be slack. Prevailing prices in Chicago are:

	Sullivan Co.	Springfield	Clinton	W. Va.
Domestic lump	$2.47	$2.07 @ 2.22	$2.27	.....
Egg	2.47	.....	.....	$3.95
Steam lump	$2.12 @ 2.37	1.92 @ 1.97	2.17	.....
Mine-run	.....	1.87 @ 1.92	1.97	3.30
Screenings	1.67 @ 1.72	1.57 @ 1.62	1.67	.....

Prevailing prices for coke are: Connellsville and Wise County, $5.75 @ 6; byproduct, egg, stove and nut, $5.50; gas house, $5.50.

ST. LOUIS, MO.

A slight touch of winter, following an unusually pleasant spell of spring weather, brought about a slight demand for domestic coal in St. Louis the early part of the week, but it was of short duration and did not cause any change in prices.

Everything indicates that it will be a dragging market for the balance of the spring, and the operators are curtailing their tonnage, some of them having closed down.

There is considerable demurrage coal at diverting points, and it is usually sacrificed at prices far below the cost of production. The circular is:

	Carterville and Franklin Co.	Big Muddy	Mt. Olive	Standard
2-in. lump	.....	.....	.....	$0.85 @ 0.90
3-in. lump	.....	.....	$1.25	.....
6-in. lump	$1.20 @ 1.25	.....	1.35	1.10
Lump and egg	1.25	$2.25	.....	.....
No. 1 nut	1.10 @ 1.15	.....	.....	.....
Screenings	0.90 @ 0.95	.....	.....	0.65
Mine-run	1.05 @ 1.15	.....	.....	0.85
No. 1 washed nut	1.40 @ 1.50	.....	.....	.....
No. 2 washed nut	1.35 @ 1.45	.....	.....	.....
No. 3 washed nut	1.25 @ 1.30	.....	.....	.....
No. 4 washed nut	1.15 @ 1.20	.....	.....	.....
No. 5 washed nut	1.00 @ 1.05	.....	.....	.....

OGDEN, UTAH

Coal shipments from Wyoming and Utah have dropped off in the past week and the mines in both states are experiencing idle days, due to lack of orders. This has decreased the production of slack and at present there is no appreciable surplus on the market.

Warm weather is prevailing generally over the territory west of the Mississippi River, and the demand for coal is decreasing. The over-production of nut coal continues, and there is quite a surplus of this grade at the mines drawing demurrage. Now that winter is practically over, and there is a diminishing call for lump, the mines will be compelled to decrease operation, and this will tend to keep down the surplus nut coal.

Conditions in Nebraska have not improved and it now develops that the Wyoming operators were unable to take care of the market during the fall and winter and the dealers were compelled to look elsewhere for coal. This gave the Colorado producers a chance to gain a foothold and as a consequence a portion of the spring and summer trade will go to them. This condition was caused by the car shortage during September, October and November.

May and June quotations for shipments to Nebraska have been announced as follows: Lump, $2.25; nut, $2; mine-run, $1.75; slack, $1. Quotations for the balance of the territory remain unchanged as follows: Wyoming Lump, $2.75; nut, $2.25; mine-run, $1.85 and slack, $1; Utah lump, $2.75; nut, $2.25; mine-run, $1.85 and slack, $1.25.

PORTLAND, ORE.

The coal market here is quiet at this time, being between seasons. The demand is light and prices are unchanged, with no probability of any occurring until the summer rates go into effect. This will probably be in July as usual, when people begin to put in supplies on the strength of the reduction of $1 per ton for storage. So far there has been no indication of any Australian coal coming this way during the summer, although it is yet early, since chartering of carriers for the summer and fall business has not yet opened, excepting in some cases for lumber.

PRODUCTION AND TRANSPORTATION STATISTICS

COAL MOVEMENT

The following is a comparative summary of the coal movement in January of this year and last year as reported by seven of the largest railroads or districts in short tons except where otherwise noted:

	1913	1912
Anthracite shipments (long tons)	6,336,419	5,763,696
Penn. R.R. (bituminous only)[1]	5,498,710	4,522,296
Baltimore & Ohio[2]	3,442,580	2,443,528
Norfolk & Western	2,218,125	1,819,588
Philadelphia & Reading[3]	1,624,298	1,088,697
Chesapeake & Ohio[4]	1,295,043	1,337,216
Virginian Ry.	453,886	317,405
Total	20,869,061	17,292,426

Net Increase 20.7%

[1]On lines east of Pittsburgh and Erie only. [2]Includes coke and that from affiliated lines. [3]Bituminous only. [4]Includes coke and anthracite.

Note—Tonnage included in this table covers nearly 10% of the country's production and the results may be taken as a fair criterion of the progress of business.

CHESAPEAKE & OHIO RY.

The following is a comparative statement of the coal and coke traffic over the lines of the C. & O. Ry., for January, and the seven months ending Jan. 31, 1912-13, in short tons:

	January		Seven Months	
Destination	1913	1912	1913	1912
Tidewater	377,520	335,290	2,068,111	2,305,754
East	393,493	212,524	1,518,698	1,282,149
West	489,985	749,893	5,437,455	6,485,458
Total	1,170,998	1,297,707	9,024,264	10,073,361
Coke	30,764	17,440	165,700	128,037
From Connections				
Bituminous	92,894	18,914	334,565	136,240
Anthracite	378	3,155	7,349	21,904
Grand total	1,295,034	1,337,216	9,531,878	10,359,542

NORFOLK & WESTERN RY.

The following is a statement of tonnages shipped over this road from mines in West Virginia and the commercial and company coal, for the month of February, in short tons:

Field	Shipped	Tipple	Total	Commercial	Company
Pocahontas	793,880	17,158	811,038	1,069,520	127,882
Tug River	192,545	3,809	196,354	158,212	38,142
Thacker	252,527	8,955	261,482	179,584	81,898
Kenova	64,018	9,173	73,191	61,491	11,700
Clinch Valley	.....	.....	.....	136,994	8,121
	1,302,970	39,095	1,342,065	1,605,801	267,743

Shipments of coke entirely from the Pocahontas field, were 121,058.

FOREIGN MARKETS

GREAT BRITAIN

Feb. 28—Large and small coals of all descriptions are scarce and values firm with an improving tendency. Today's quotations are approximately as follows:

Best Welsh steam	$4 62@4 71	Best Monmouthshires	$4.26@4.32
Best seconds	4 44@4 56	Seconds	3 44@4 20
Seconds	4 32@4 44	Best Cardiff smalls	3.72@3.84
Best dry coals	4 38@4 44	Seconds	3.60@3.72

The prices for Cardiff coals are f.o.b. Cardiff, Penarth or Barry, while those for Monmouthshire descriptions are f.o.b. Newport; both exclusive of wrarfage, and for cash in 30 days—less 2½%.

SPANISH IMPORTS

Imports of coal into Spain during 1912 amounted to 2,322,657 tons as compared with 2,055,166 for the year previous and 2,021,116 tons in 1911. Coke imports during the same periods were: 355,149 tons in 1912; 316,448 in 1911 and 294,158 tons in 1910.

EGYPTIAN COAL IMPORTS IN 1912

Coal imports into Egypt for the year of 1912 were 1,638,417 tons, as compared with 1,581,619 in 1911.

FINANCIAL DEPARTMENT

Victor-American Fuel Co.

The following is a summary of the report of this company for the fiscal year ending June 30, 1912:

After providing for fixed charges and depreciation reserves, there remained a balance of $358,463 [against $510,688 in 1910-11]. Two dividends on the capital stock, aggregating $258,500, were paid. After making all adjustments, the credit balance in the profit and loss account, as of June 30, 1912, is $268,868 [as compared with $201,689 on June 30, 1911.]

The loss in earnings for the year was largely at the New Mexico mines, and due to a falling off in the tonnage of coal sold in Southern California and to increased cost from various temporary causes which have already been or will be removed. There is also a considerable loss as compared with the previous year in the falling off in the tonnage of coke sold. The Colorado mines, notwithstanding the halt in general business activity throughout the year, produced practically the same tonnage as the preceding year, with a slight increase in profits.

RESULTS FOR YEARS ENDING JUNE 30

Short tons	1911-12	1910-11	1909-10
Coal produced	2,228,448	2,256,041	2,358,909
Coal sold	2,069,361	2,033,699	2,063,085
Coke produced	54,600	84,943	108,409
Coke sold	52,625	85,213	108,693
Coal purchased and sold	6,459	103,353	206,833
Gross earnings	$3,437,062	$3,592,344	$3,669,070
Operating expenses	2,805,471	2,788,625	2,832,720
Net earnings	$651,591	$803,719	$836,350
Total net income	$739,980	$879,610	$923,250
Deduct			
Taxes	$30,339	$21,597	$20,152
Insurance	10,008	10,041	9,312
Miscellaneous	28,256	10,131	9,277
Interest on V.-A. F. bonds	127,325	126,000	152,500
Interest on V. F. bonds	92,350	93,550	95,000
Depreciation	103,238	107,603	116,580
Dividends	(2½%) 258,500	(5) 470,000	(3½) 305,000
Total deductions	$640,016	$838,922	$707,821
Balance, surplus	$99,963	$40,688	$215,429

BALANCE SHEET, JUNE 30

Assets	1912	1911
Real estate	$9,850,844	$9,882,939
Equipment	2,691,530	2,620,147
West. Stores Co. stk.	210,000	210,000
Col. & S. E. R.R. stk.	100,000	100,000
Col. & S. E. Ry. bds.	300,000	300,000
Mtn. Tel. Co. stk.	15,000	15,000
Bond redem. accts.	71,067	21,251
Development	199,485	187,905
Advance royalty	42,928	43,671
Supplies	100,561	112,869
Cash in banks	131,977	124,151
Accounts and bills receivable	390,900	356,030
Treasury bonds (V.-A. F. Co.)	53,000	.....
Coal and coke on hand	14,314	5,849
Miscellaneous	10,227	7,094
Total	14,181,833	13,986,906
Liabilities		
Capital stock	$9,400,000	$9,400,000
1st and ref. M. 6s	2,153,000	2,100,000
Victor Fuel Co. bonds	1,847,000	1,871,000
Interest accrued	100,900	99,534
Bills payable	107,900	2,000
Voucher and pay-rolls	161,163	168,211
Taxes accrued unpaid	10,350	10,600
Unpaid coupons	505	950
Net liability to sub cos. on current account	50,875	104,439
Res. for bond redem.	70,781	21,014
Disc. on V. F. Co. bonds redeemed	10,445	7,439
Acc'n for bond red.	44	.....
Profit and loss	x268,869	201,689
Total	14,181,833	13,986,906

x After deducting losses of $33,743 through Weaver mine fire and $1519 miscellaneous and adding misc. credits of $2478.

INCOME ACCOUNT

Net revenues:	1912	1911	1910	1909
Railroads	$2,288,899	$2,287,147	$2,285,253	$2,278,055
Canals	*12,916	32,898	22,264	*18,904
Coal	1,579,310	2,033,357	1,698,276	1,227,656
Miscellaneous	354,587	191,391	138,728	167,737
Total net	4,209,880	4,534,793	4,144,521	3,654,543
Deductions:				
General expense	$139,841	$146,454	$151,988	$137,239
Taxes	450,567	432,610	368,078	292,363
Interest	931,215	861,362	897,343	884,719
Rentals	.....	.....	.....	.....
Sinking fund	.....	.....	183,068	152,686
Depreciation	400,000	385,000	300,000	300,000
Total deduct	1,921,623	1,825,423	1,900,477	1,767,007
Surplus	12,288,256	2,709,370	2,244,044	1,887,536
Prev. surp.	1,514,771	1,010,605	748,203	4,294,163
Sdy. adj. dr.	22,926	177,007	49,897	469,108
Scrip div. 15%	.....	.....	.....	3,150,412
Dividends	2,124,636	2,028,196	1,931,744	1,813,976
P & L surplus	1,655,466	1,514,771	1,010,605	748,203

*Deficit.

†Equal to 8.61% earned on $26,557,950 capital stock after allowance for depreciation, compared with 10.2% earned on same stock previous year.

COAL SECURITIES

The following table gives the range of various active coal securities and dividends paid during the week ending March 15:

Stocks	Week's Range High	Week's Range Low	Week's Range Last	Year's Range High	Year's Range Low
American Coal Products	88	88	88	88	87
American Coal Products Pref.	101	101	109½	109½	109½
Colorado Fuel & Iron	34	32	33⅜	41½	31
Colorado Fuel & Iron Pref	.....	.....	155	155	150
Consolidation Coal of Maryland	102¾	102¾	102¾	102¾	102¾
Island Creek Coal Pref.	86	85	85	.....	.....
Lehigh Valley Coal Sales	240	204	204	.....	.....
Pittsburgh Coal	21½	19¾	20	24¾	22
Pittsburgh Coal Pref.	85	82	84	95	82
Pond Creek	23	22½	23	28½	22
Reading	157¼	152⅜	156⅜	168⅛	152⅜
Reading 1st Pref.	90½	90	90¼	91¼	89¾
Reading 2nd Pref.	.....	.....	90	93	87¾
Virginia Iron, Coal & Coke	50	48	50	54	44¾

Bonds	Closing Bid	Closing Asked	Week's Range or Last Sale	Year's Range	
Colo. F. & I. gen. s.f.g 5s	98	99	98	98	99¾
Colo. F. & I. gen. 6s	.....	.....	107¾ June '12	.....	.....
Col. Ind. 1st & coll. 5s. gu	78½	Sale	78½ 81	78½	85
Cons. Ind. Coal Mc. 1st 5s	.....	80	85 June '11	.....	.....
Cons. Coal 1st and ref. 5s	.....	94	93 Oct. '12	.....	.....
Gr. Riv. Coal & C. 1st g 6s	96	102½	102½ Apr. '06	.....	.....
K. & H. C. & C. 1st s f g 5s	.....	.....	98 Jan. '13	98	98
Pocah. Con. Coll. 1st s f 5s	87½	87¾	87½ 87¾	87½	87½
St. L. Rky. Mt. & Pac. 1st 5s	75	77½	76½ Feb. '13	76½	80
Tenn. Coal gen. 5s	100	102	100¾ 100¾	100¾	103
Birm. Div. 1st consol. 6s	101½	102¾	101½ 101¾	101½	103
Tenn. Div. 1st g 6s	101	103¾	102 Feb. '13	102	102
Cah. C. M. Co. 1st g 6s	.....	.....	110 Jan. '09	.....	.....
Utah Fuel 1st g 5s	.....	.....	.....	.....	.....
Victor Fuel 1st s f 5s	.....	84	79½ Feb. '13	79½	79¾
Va. I. Coal & Coke 1st g 5s	95	97½	95¾ 95¾	95¾	98

Ashland Coal & Iron Co.—Dividend of 1% payable Mar. 20 to holders of record Mar. 19.

American Coal Products Co.—Dividend of 1¾% on the common, payable Mar. 31.

Island Creek Coal Co.—Dividend of 50c. on the common, payable May 1 to holders of record Apr. 26. Dividend on preferred of $1.50 payable Apr. 1 to holders of record Mar. 25.

Burns Bros.—This concern was recently consolidated with the Curtis-Blaisdell Co., forming the largest retail coal company in the world. The new company is a New Jersey corporation, and will have $2,000,000 7% cumulative preferred and $5,500,000 common stock.

Reading Coal & Iron Co.—It is popularly believed that the anthracite companies are working on a basis that produces an enormous profit for them. As a matter of fact, the companies are working on a remarkably narrow margin of profit, and one which has been gradually contracting during recent years. Thus, in 1903, the Reading company showed earnings at the rate of 53c. per ton of coal mined; in 1908, this had fallen to 32c. per ton, and for 1911 it amounted to only 15c. per ton.

Monongahela River Consolidated Coal & Coke Co.—This company was incorporated in Pennsylvania, in June, 1899, to consolidate coal interests along the Monongahela River, and coal traffic to New Orleans, etc., including 200 steamers and 4000 canal boats, barges, coal elevators, etc. In September, 1903, the Pittsburg Coal Co. purchased $15,000,000 of the $20,000,000 common and $2,500,000 of the $10,000,000 preferred stock at $15 and $45 per $50 share, respectively.

COAL AGE

Vol. 3 NEW YORK, MARCH 29, 1913 No. 13

The Dust Eaters

By Berton Braley

Written expressly for Coal Age

It is quiet in the breaker—you could hear a cannon clear
If they'd fire it off beside you with the muzzle at your ear
An' exceptin' for the crushers an' the screens an' other gear,
Why, you never hears a solitary sound!
There is coal dust on the winders an' there's coal dust in the air,
It's stickin' to the timbers an' it's settlin' everywhere,
It's clingin' to our eyelids an' our whiskers an' our hair
An' we eats it in the breaker by the pound!

Eatin' the dust,
Eatin' the dust,
Feelin' the breaker throb;
You wouldn't care
To be workin' there,
But it happens to be *our* job!

It ain't ever any picnic when you got to stand an' stand
A turnin' over clumsy lumps that's heavy to the hand,
They say the "joy o' labor" is a thing that's mighty grand
But they otta eat the breaker-dust awhile.
They'd find the same old story in a hundred diff'rent plants,
A lot of dirt an' sweatin'—not a flicker of "romance,"
With the dusty breaker shakin' like a hootchee-cootchee dance,
As the coal comes flowin' downward by the mile!

Eatin' the dust,
Eatin' the dust,
Wishin' the shift was through;
Early an' late
Pickin' the slate
We are the breaker crew!

O the dust is in the breaker an' the dust is in our hide
And it kind of lines our stomachs an' the whole of us inside,
It doesn't help our beauty an' it doesn't help our pride
Though we go on eatin' coal dust day by day,
An' maybe, in the breaker, though it ain't a bit of fun,
We're doin' of our duty in the way it should be done,
For the world's a sort of boiler an' it must have coal to run
So we reckon we are earnin' all our pay.

Eatin' the dust,
Eatin' the dust,
(Rumble an' crash an' bang!)
Husky an' rough,
Dusky an' tough,
We are the breaker gang!

Education in Coal Mining

By J. T. Beard

An Outline of the Next Question for General Discussion

We propose during the month of April to discuss broadly the question of the need of education in coal mining. We want to ask: What is education as applied to the mining of coal? Has the miner any need of more than a common-school education? Many miners today went into the mine as trappers or oilers at the age of nine or ten years, and if they know how to read and write, they are fortunate.

The average miner's knowledge of arithmetic goes no further than the four rudimentary operations—addition, subtraction, multiplication and division. Fractions are to him an unexplored wilderness. He knows nothing of percentage, ratios, decimals and other simple processes that are necessary in the solution of mining problems. He knows nothing of geometry—of lines and angles. He cannot read a mine map intelligently.

However, notwithstanding these untoward conditions, many miners have, with keen insight, discovered what education has done to advance the earning power of men around them, and are today reaching out for the same knowledge that will enable them to, at least, hold their own in the unequal race of life.

Regarding now the ambitious English-speaking miner who aspires to learn such principles, methods and processes as will increase his efficiency, and incidentally, his earning power, what are the essential qualities of such an education? Shall we call it education or training?

Recognizing the responsibilities that rest upon all mine workers alike to perform their work in a manner that will not endanger themselves or their fellows, and the greater responsibility of men who must act in an official capacity in the operation of mines, the mining laws of most states require the examination of all miners, mine foremen and firebosses, before they can enter upon their duties in the mine.

This requirement by law, is quite generally, we might say universally conceded to be right and just as a necessary protection against the dangers that would arise from the presence, in the mine, of men unfamiliar with mining conditions. The ignorance of a single worker may cost the life of every man in the mine. The first principle of safety, then, is the education or training of all mine workers.

The question has been asked many times in the last few years: What should be the character of mining examinations? It is important to discuss this question in all its bearings. It is a broad question. The views of practical men and prospective candidates are necessary to reveal the difficulties that confront men who must pass such examinations.

Of equal importance are the views of practical mining men who have made a study of mining conditions and are able to apply the theory and principles of mining in the solution of every-day problems, in the mine. It is these men, alone, who understand fully the relation of education to mining.

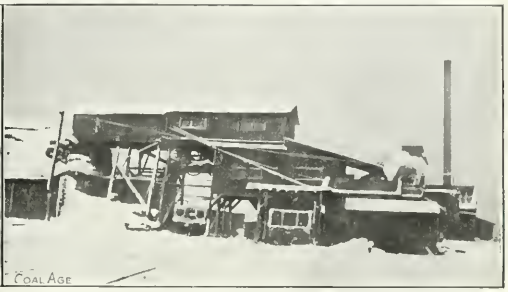
On the other hand, it is desired that the members of examining boards should take part in this discussion, and give their reasons why the examination is not made to conform more closely to the practical requirements of the men whom they are to certify as qualified for mining positions. Let these men say, if they can, why the examination of practical men should not be made to conform to the conditions in practice. Why, if the man in practice makes frequent and common use of mining textbooks should he not be allowed to use the same books in the examination that is to determine his ability to solve the given problems.

An unprejudiced mind will allow that to eliminate the use of textbooks, in certain sessions of mining examinations, is to give undue advantage to the man who is able to memorize formulas and constants; while the generally more able man, from a mining standpoint, is placed at a decided disadvantage because he is denied the privilege of working under the same conditions to which he is accustomed in the mine and in the office.

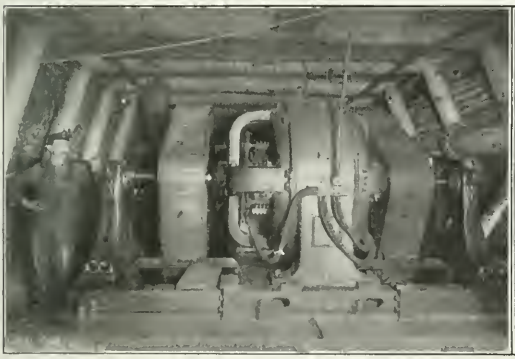
As secretary of the state mining board, for a number of years, I have seen good practical men abandon the examination and give their reason for not finishing the work, that they could not remember the formula that they wanted to use. There is an earnest call for the general use of textbooks in all sessions of mining examinations when practical problems must be solved. College students are now allowed to use textbooks, in such examinations; because it is realized that the requirements have become too severe to expect students to memorize what they should find in a reference book. We are glad to say some states have adopted this method. Why not all? Is the delay due to a desire on the part of some members of every examining board to hold in their possession the key that will make them the masters of the situation?

SNAP SHOTS IN COAL MINING

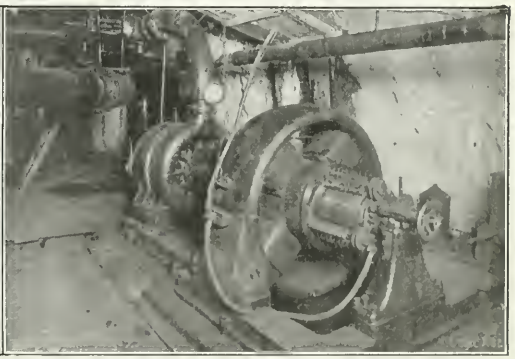
No. 9 Tipple of St. Bernard Mining Co., Earlington, Ky. Built 40 Years Ago and Now the Second Oldest Tipple in the Field



No. 11 Mine of St. Bernard Co. at Earlington. Oldest Tipple in Western Kentucky. Still Loads on an Average of 700 Tons per Day



Underground View of 10-in., Quintuplex Pump. Driven through Gears by 170-hp. G. E. Motor. Operating Head 400 Ft. Kohinoor Colliery Shenandoah, Penn.



Centrifugal Pump Operating against 330-ft. Head, Capacity 1000 G. P. M. Driven by G. E. 150-hp. Motor. North Franklin Colliery, Treverton, Penn.

Showing Tipple and Miners' Houses of Wyoming Coal Mining Co., at Monarch, Wyo.

Simple Flywheel Calculations

By Chas. W. Beers*

SYNOPSIS—In a simple manner that anyone possessing a knowledge of only the rudiments of algebra can easily understand, the author develops the various formulas used in flywheel computations. He also shows how to obtain, in the case of a planer, the experimental data necessary before calculations can be undertaken.

The object of any flywheel is to equalize the energy and the work done, on or by, any piece of machinery in which the load varies through large and comparatively quick changes, thereby preventing sudden speed variations in the driving apparatus, due to the amount of the resistance to be overcome.

Sometimes flywheels are installed for economic reasons. This condition is frequently thrust upon those who purchase electric power on a minimum demand basis. This state of affairs is often encountered by large coal operators in Germany (and in this country, also) who find it economical to make use of large flywheels on their shaft hoisting equipments, thus reducing the demand peak loads to practically $\frac{1}{3}$ or $\frac{1}{4}$ of what they ordinarily would amount to without the flywheel.

This is well illustrated in Fig. 1, which shows the peak load on the hoist motor compared to the demand peak as required by a flywheel motor-generator set from which the hoist motor is operated.

To illustrate the manner in which a flywheel gives up its energy in order to overcome extreme load fluctuations, let us take the case of the ordinary punch-press. When the press was initially started, considerable energy was expended in bringing it up to speed, much of this being due to the flywheel.

This starting load decreases rapidly as the press comes up to speed, but the instant the punch enters the metal plate the speed begins to decrease, owing to the large resistance encountered. It is at this instant that the flywheel comes into service, for as soon as the decrease in speed occurs, the energy that was originally put into the wheel when bringing it up to speed is given out in an effort to prevent this speed decrease. This energy, is, of course, expended on the punch, and assists in driving it through the metal. As soon as the punch is complete, the press begins to speed up again, thus storing more energy into the wheel where it becomes available for the next punch.

In the preceding paragraph, we have intimated that the amount of energy given up by a flywheel is proportional to the energy *input*, when changing from a lower to a higher speed. It has also been intimated that the amount of speed change permissible is one of the important factors in the correct design of flywheels. The determination of these two points has been a stumbling block to many, and it might be well at this time to make these points clear.

The Mathematics of the Flywheel

It is well known that work equals the product of force and space or the distance through which this force moves. Expressed mathematically this becomes

$$\text{Work} = F \times S$$

The fundamental definition of force (F) says

Force is equal to mass times acceleration, or

$$F = M \times A$$

and since the mass of any body is equal to its weight (W) divided by gravity ($g = 32.2$), or $\frac{W}{g}$, we see that the work or energy in any moving body is:

$$E = \frac{WAS}{g}$$ (by making proper substitutions for F and M).

Let t = time in seconds required to bring the speed of the given weight (W) up to a uniform linear velocity of

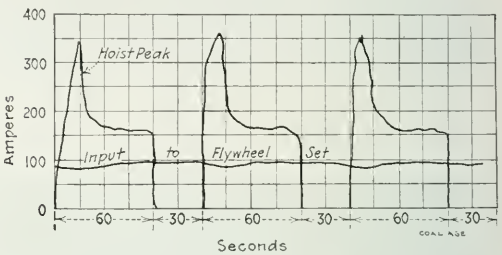


Fig. 1. Showing Input to Flywheel Set When Buying Power on Demand Basis

V ft. per second; then during each succeeding second of t, the speed was increased by $\frac{V}{t}$ ft. per second, hence we say the acceleration (A) $= \frac{V}{t}$ ft. per second. Substituting this value of A in the above formula, $E = \frac{WAS}{g}$, we obtain

$$E = \frac{WVS}{gt}$$

but S, or the space traveled in t seconds $= t\left(\frac{0 + V}{2}\right) = \frac{Vt}{2}$ (at instant of starting the velocity was zero, and at end of acceleration period of t sec. the velocity was V ft. per sec., therefore the average velocity $= \frac{0 + V}{2}$, and the space traversed in t sec. at an average velocity of $\frac{0 + V}{2}$ ft. per sec. $= \frac{Vt}{2}$). Therefore, substituting this value of S in the expression $E = \frac{WVS}{gt}$, we have

$$E = \frac{W \times V \times Vt}{g \times t \times 2} = \frac{WV^2}{2g}$$

This is the formula for the energy stored in a moving body during its acceleration period, or the time required to bring it from zero speed up to full speed. In the same way it can be proved that if the weight W had its speed accelerated up to V_1 ft. per sec., the energy stored in it would be $\frac{WV_1^2}{2g}$.

Hence if the weight W, while in motion, had its ve-

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velocity reduced from V ft. per sec. to V_1 ft. per sec. the energy change would equal

$$\frac{WV^2}{2g} - \frac{WV_1^2}{2g} = \frac{W}{2g}(V^2 - V_1^2)$$

It will be observed that this expression is in terms of foot-pounds per sec. (Since V = velocity in feet per sec.) and since one horsepower is 33,000 ft. lb. per minute or 550 ft. lb. per sec., then dividing the above final expression by 550 will give the amount of power in terms of horsepower seconds.

The expression $\frac{W}{2g}(V^2 - V_1^2)$ is the fundamental equation of the flywheel, and shows that the amount of energy that is stored up or given out, is proportional to the squares of its particular velocities. Conversely, since $E = \frac{W}{2g}(V^2 - V_1^2)$, and its value is known, then by simple transposition we get

$$\frac{2gE}{V^2 - V_1^2} = W$$

which is the expression used for determining the effective flywheel weight.

This equation is also important is it shows that the greater the effective velocities are, the less is the required weight in the wheel, and consequent cost.

The Limit Set by Experience

Practical experience in electrical work has limited the change in speed from V to V_1 such that $V - V_1$ shall not greatly exceed 15 per cent, as beyond this point the energy gain is not so valuable in dollars and cents, all things considered. Individual cases may arise, however, in which it would pay to greatly exceed this figure. Therefore, in order to get the greatest value possible out of the expression $V^2 - V_1^2$ it is necessary to use the highest speed possible for V, consistent with safe rim construction.

In ordinary cast-iron wheels, the safe peripheral speed is quite low (3000 ft. to 5000 ft. per min.); in cast-steel wheels it is considerably higher, amounting to an average of 18,000 to 20,000 ft. per minute; steel plate wheels (those built up from steel plate) have safe velocities as high as 24,000 ft. per mn. From this it is readily seen that the effective weights for wheels of the above materials differ considerably, varying in the proportions of $\frac{1}{3000^2} : \frac{1}{20000^2} : \frac{1}{24000^2}$.

Up to this point in the discussion, the term velocity has been used in a general sense.

The formula $\frac{W(V^2 - V_1^2)}{2g}$ shows the importance of V in these calculations, hence for any particular flywheel, it is necessary to have some definite value therefor. This value is taken as the linear velocity per second of some point in the plane of the wheel, such that if the entire weight of the wheel were conceived to be concentrated at that point, it would still have the same energy effect as where distributed in hub, spokes and rim.

This point is known as the "center of gyration," and its distance from the center of rotation of the wheel is called the "radius of gyration." To the ordinary mind, the conception of this point may cause some mental gymnastics; such a point is, however, a mathematical fact, and its location and uses are essential to flywheel calculations, but the definition, as given above, is sufficient for this article.

In the type of wheel ordinarily employed, in which the depth of rim bears an appreciable ratio to the outside rim radius, the value of the radius of gyration is $\sqrt{\frac{r^2 + r_1^2}{2}}$, where r is the outside, and r_1 the inside rim radius. (In this type of wheel the hub and arms may be neglected with perfect safety. They introduce complications, and contribute but little to the finesse of the result.) For the plate, or flat type of wheel in which $\frac{r - r_1}{r}$ is very small, or does not exist at all, the radius of gyration is $\sqrt{\frac{r^2}{2}} = 0.707r$.

A Supposed Case

Suppose that a complete cycle of power has been calculated (or otherwise obtained) for a punch press, and it has been found that a flywheel could be used to advantage, and that it is required to give out energy to the amount of 24.5 hp.-sec. to assist the punch.

Now,

$$24.5\ hp.\text{-}sec. \times 550 = 13{,}475\ ft.\text{-}lb.\ sec. = E$$

but

$$E = \frac{(V^2 - V_1^2)}{2g}$$

Equating these,

$$13{,}475 \times 64.4 = W(V^2 - V_1^2)$$

Since the energy required is not large, the wheel will be rather small, and we may assume it to be made of cast iron, and its safe peripheral speed may be taken at one mile per minute or 5280 ft., or 88 ft. per sec.

If D = dia. of wheel in feet, and S = its rev. per sec. $= \frac{\text{r.p.m.}}{60}$ then $\pi DS = 88$ *or* $DS = 28$. In order to make the wheel low in cost, we may assume it to have a speed of 7 rev. per sec. and the outside diameter D of wheel will therefore be 4 ft. A good, stiff rim section for a wheel of this type would be 6 in. in depth and 2 to 3 in. in width, and if the outside rim radius $r = 24$ in., then $r_1 = 18$ in. and the radius of gyration $= \sqrt{\frac{24^2 + 18^2}{2}} = 21.21$ in., and the velocity per sec. of the radius of gyration equals

$$\frac{7 \times 3.1416 \times 21.21'' \times 2}{12} = 77.77\ ft.$$

Let the speed drop = 14.4 per cent. Then the final velocity of the center of gyration is 77.77 − (14.4 per cent. of 77.77 ft.) = 66.57 ft. per sec.

Substituting these values of V and V_1, in the expression $13{,}475 \times 64.4 = W(V^2 - V_1^2)$ we obtain $W = 536$ lb., which equals weight of wheel required. From this amount deduct 86 lb. for hub and arms. We now have 450 lb. equals the weight of rim.

To determine a correct section, let us assume the rim to be d in. wide, and since it is 6 in. deep, then its cross-sectional area $= 6d$ sq.in. The mean dia. of rim is 3 ft. 6 in., consequently the rim volumne $= 792d$ cu.in., and if 1 cu.ft. of cast iron weighs 450 lb. then since the rim weighs 450 lb., its cubic content must be 1728 cu.in. $= 792d$., or $d = 2.2$ in. = thickness of rim.

The Value of E Should Be Known

In the above discussion it will be observed that the value of E was assumed; this was done simply to show the method of using the formulas as far as the actual calculations of the flywheel itself were concerned.

In almost all flywheel calculations, it is necessary that the value of E be known, and usually the conditions of the problem are such that this value can be readily determined, either by actual calculation of the total cycle, as would be the case in new machinery design, or by means of graphic curve drawing meters, properly applied to existing machines. The latter method is more accurate, and has the advantage of simplicity and reliability.

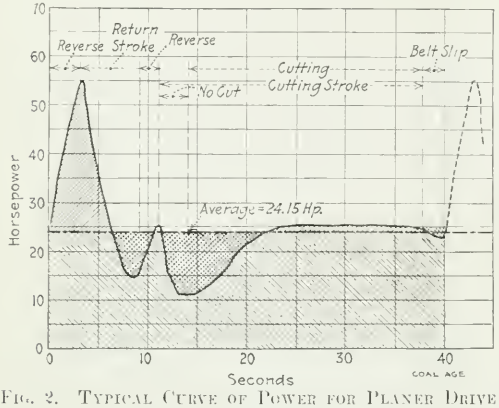

Fig. 2. Typical Curve of Power for Planer Drive

To make this clear, let us take the case of a large motor-driven planer, with a small flywheel attached, and, further, let it be assumed that it is desired to operate on heavier work, and that the present flywheel and motor have been found, by experiment, to be inadequate to properly meet these conditions. These would be excellent reasons for increasing the flywheel capacity of the machine and the method of procedure would be as follows:

Remove the present motor and flywheel, and attach a trial motor of same speed as original one, and of a capacity sufficiently large to perform the new operation without serious effort. A graphic curve ammeter is then properly inserted in the motor circuit (it may be found necessary to increase the speed of chart in order to get a diagram of respectable size).

The motor is then started up and the planer is operated at its desired capacity. At the conclusion of the test run, the graphic record should be carefully examined. This chart will be somewhat similar to Fig. 2, which may be taken as a type curve for one cycle of operation only. The consecutive steps in the process are clearly shown in the figure.

Now, if the total area of this cycle, expressed in hp.-sec., is divided by the length of the cycle in seconds, the result will be the average hp. required and indicates the size of motor that may be used on this planer, when provided with the proper size of flywheel. If such be the case, then the energy above the average line will be supplied, or given out, by the wheel, and that below the line will be supplied by the motor.

The cross-hatched portion below the line shows the energy, E, supplied by the motor to the wheel. The following calculations give the total hp.-sec. in the chart for one cycle, and also indicate the method used in determining the same:

Hp.-sec. at reverse for return stroke =	$\frac{24+55}{2} \times 3$	= 118 5
Hp.-sec. at return stroke =	$\frac{55+15}{2} \times 5$	= 175 0
	15×1	= 15.0
Hp.-sec. at reverse for cutting stroke =	$\frac{15+25}{2} \times 2$	= 40.0
Hp.-sec. at cutting stroke (cutting) =	$\frac{11+25}{2} \times 9$	= 162.0
	$\frac{25+11}{2} \times 2$	= 36.0
Hp.-sec. at cutting stroke (no cut) =	11×2	= 22 0
Hp.-sec. at belt slip at end of cutting stroke =	$\frac{25+23}{2} \times 3$	= 72
Totals	40 sec.	965.5

Then $965.5 \div 40 = 24.15$ hp. average.

Now the areas of the cross-hatched portions below the line are equal to the energy (hp.-sec.) supplied to the wheel by the motor, and, as indicated by the curve, this is given up by the wheel during each cycle, hence, if we determine the total of all areas above the line, we know the exact hp.-sec. or E that the flywheel must be designed for.

The Calculation of the Energy

This total area is as follows:

Hp.-sec. at reverse for return stroke =	$\frac{55 - 24.15}{2} \times 6.5$	= 100 26
Hp.-sec. at reverse for cutting stroke =	$\frac{25.5 - 24.15}{2} \times 1$	= 0 67
Hp.-sec. at cutting stroke =	$\frac{25 - 24.15}{2} \times 2$	= 0 85
	$(25 - 24.15) \times 13$	= 11 05
	$\frac{25 - 24.15}{2} \times 1.5$	= 0 64
Total hp.-sec		113 47

Call it 113.5 hp.-sec.

Now one hp.-sec $= 550$ ft.-lb., therefore $113.5 \times 550 = 62{,}425$ ft.-lb.-sec. equals the value of E, or the energy necessary to alternately absorb and give up. By equating this value against $\frac{W(V^2 - V_1^2)}{2g}$ and following the method indicated in the fore part of this article, the required size of flywheel may be easily determined to meet the above conditions.

In this discussion it has been the aim of the writer to illustrate the application of formulas in such a manner as to make the subject matter of interest to those who are not familiar with flywheels, and no effort has been made to introduce those finer details which, while they beautify the problem, quite often prove to be more of a hindrance than an assistance, and which have no direct value unless they are well tempered by experience. The hub and arms of any wheel have a definite effect upon the energy which may be stored up or given out, but this is ordinarily so small that it may be safely disregarded.

In conclusion the writer wishes to make acknowledgment to the *General Electric Review* dated June, 1912, for Fig. 1, which occurs on p. 401 of that issue, while Fig. 2 is reconstructed from Fig. 1, p. 79 of the same periodical for February, 1913.

Coaling Plants at Panama Canal

SYNOPSIS—Coaling stations are to be established at both ends of the canal. That at the Atlantic terminus is approximately twice the capacity of the one on the Pacific side of the isthmus. This article treats in more or less detail of the facilities and equipment necessary for loading, unloading and storing the coal.

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(*Announcement of Isthmian Canal Commission*)

Speed in handling coal with the least possible amount of breakage is the main requirement of the coaling plants to be established at the Atlantic and Pacific entrances to the Panama Canal, at Cristobal and Balboa, respectively. Specifications for the machinery of the two plants have been completed and advertisement will shortly be made for bids.

Coal for Use in War Will Be Stored under Water

It is planned to have a coal-storage basin at Cristobal with a capacity of 290,000 tons, and one at Balboa with a capacity of 160,000 tons. In each place the storage will be within a large basin made of reinforced concrete, in which approximately half of the coal will be stored under water for use in time of war, and the other half above water to be added to and taken from continually for the ordinary uses of commercial and government vessels. It is also planned, if the policy should be approved, to be able to lease parts of the storage basin to such private coaling companies as may wish to maintain their own coal stores on the isthmus; but in such cases all of the handling will be done by the government plant, a suitable charge being made for the service.

The specifications are not hard and fast, but merely establish certain general methods and standards, leaving it to manufacturers to devise suitable machines. One of the limiting conditions is that the government shall build the substructure or storage bin and place upon the walls such tracks as cranes and other movable machines may require. This substructure will cost more than the coal-handling plant. The details will not be decided upon until the bids for the handling plant have been canvassed, because each plan will require its own special substructure, and one of the points considered in awarding the contract will be the cost of the substructure required under each plan.

Ships To Be Coaled from Barges, Not from Pockets

In general, however, the specifications call for cranes that will unload coal from ships; a conveying system that will transfer it to bridges that will span the storage basin and dump it at any place desired; and such a system of buckets operating upon these bridges as will make it possible to lift coal from the storage basin, and by means of conveyors raise it to loading machines that will dump it into colliers or lighters. The Cristobal plant must be capable of unloading 1000 tons and loading 2000 tons of coal each hour, and the Balboa plant 500 and 1000 tons.

In the ordinary operations of each of the plants, vessels requiring bunker coal will not go alongside the wharves of the plants to receive such coal, but will be coaled while lying in the stream from barges laid alongside, these barges having been loaded by means of the reloaders forming part of the specified handling machinery for each plant.

The storage basin at the Atlantic entrance will be 1000 ft. long and 250 ft. wide. The bottom of the basin will be 19 ft. below mean tide, and the elevation of the decks of the wharves 10 ft. above mean tide. There will be 41 ft. depth of water alongside the wharves. The wharves will be founded upon steel cylinders filled with reinforced concrete resting upon hard rock. The maximum tidal oscillation in Limon Bay is 2.65 ft.

For this type of storage basin, at least two layouts of coaling plant are feasible; the first being that in which the loading and unloading wharves occupy opposite sides of the basin parallel with one another with the coal piles between them, and the second that in which the unloading wharf will be at right angles to the loading wharf. The normal capacity will be 240,000 tons, capable of increase to 290,000 tons by piling coal to 10 ft. additional height.

The coaling plant at the Pacific entrance will be on the quay wall south of the entrance to the large drydock. The size of the basin will be 500 ft. long and 250 ft. wide for one design of plant, and the same length and 340 ft. wide for a second design. The extreme tidal difference here is 21.8 ft. As at the Atlantic entrance, the loading wharf will be founded upon concrete cylinders resting upon hard rock; the unloading wharf will be gravity section concrete wall resting on rock. The normal capacity of the Balboa plant will be 135,000 tons, capable of increase to 160,000 tons, by piling coal 10 ft. above normal height.

In the first plan a basin 500 ft. long and 250 ft. wide is provided for, with bottom at 18 ft. below mean tide and top of wharf at 16½ ft. above mean tide. The capacity of this plant must not be less than 500 tons of coal an hour to be unloaded and 1000 tons per hour to be loaded aboard colliers or barges. Two unloaders will be required with conveyors, and two single stocking reclaiming bridges. Two reloaders will also be required. The operation of this plant is essentially the same as that for the Atlantic entrance.

Alternate Plan Provides Larger Basin

An alternate plan for the Balboa plant provides for the same location of the wharves, but for a basin 500 ft. long and 340 ft. wide. The unloaders are the same as in other plans, but instead of dumping into conveyors they will discharge by means of the cantilever end directly into the basin, and large cantilever cranes will then pick up the coal and deposit it at any desired point in the storage basin. For reclaiming, these same cranes will pick up the coal and trolley it into their towers, where it will be dumped into cars or other conveyors, whence it will be carried away from the basin, along the front of the reloading wharf to the reloaders.

The purpose of this second plan is to make use of four berm cranes now used in the placing of concrete at Miraflores Locks and thus save the expense of the stocking and reclaiming bridges. Whether they will be used depends upon the cost and general desirability of this plant compared with one having entirely new handling machinery.

Units of the Plants

The following paragraphs refer particularly to the Cristobal plant, but with certain modifications, as indicated above, apply also to the Balboa plant.

The unloading operation will consist of taking coal from a collier and depositing it any desired place in the bin or basin. For this purpose unloading towers, a conveying system that will carry the coal lengthwise of the storage bin along the wharf, bridges spanning the basin, and a conveying system upon these bridges, which will take the coal from the first conveyors and dump it wherever required, are specified.

Four unloading towers of not less than 250 tons capacity per hour each, making a total capacity of 1000 tons an hour, form the first unit of the unloading system. These towers must be capable of mining coal from a vessel and depositing it into a hopper built within the tower, whence it may be delivered by chutes to the conveying system, or to Panama R.R. cars running on a track beneath the tower; or of depositing it by the bucket or shovel into the storage pile behind the tower; and of mining coal from storage pile behind the tower and depositing it in the hopper in the tower.

Each tower will travel on two parallel pairs of rails between which, at the level of the wharf deck, there shall run a railroad track so located that cars may be run beneath the unloading tower and receive coal from its hopper. The speed of travel in either direction must be not less than 50 ft. per min. against a wind pressure of 10 lb. per sq.ft. The track travel must be by motors or engines within each tower, and not by cable drive.

The bucket or shovel by means of which the tower will mine coal from the colliers will have a capacity of 100 cu.ft. liquid full. Larger buckets may be offered, however, provided small buckets are also supplied and a rapid means of making the change from one to the other is provided.

General Construction of Towers

Each tower will be fitted with a lifting or folding boom on the water side and with a cantilever on the storage-basin side. The cantilever may be movable if necessary to permit the passage of the reclaiming bridges. In any case the track for the trolley of the bucket shall be horizontal and continuous, between the extreme ends of boom and cantilever, when both are in a horizontal position, and the passage of the trolley over the hinge joints shall be made easily and without shock. Suitable buffers will be fitted at each end of the trolley runway. The distances through which the trolley or bucket will be capable of operation are as follows: Maximum height above wharf level, Balboa and Cristobal, 60 ft.; maximum depth for reclaiming coal from ships below wharf level, Cristobal, 30 ft.; Balboa, 45 ft.; maximum horizontal travel of bucket on water side beyond center line of tower legs next to water, Cristobal and Balboa, 60 ft.; maximum horizontal travel of bucket on land side, beyond nearest wall of coal basin, Cristobal and Balboa, 35 ft.; maximum depth below wharf level for reclaiming coal from storage on land side at Cristobal, 29 ft.; maximum depth below wharf level for reclaiming coal from storage on land side at Balboa, 34½ ft.

In addition to these operations the towers will be able to dredge the bottom of the slip in front of the unloading wharf 51 ft. below wharf level at Cristobal and 61½ ft. at Balboa.

Conveying System

The conveying system must provide for the transfer of coal from the unloading towers along the wharf to any point at which the bridges may be spanning the bin, and the transfer along the bridges to any point desired, where it may be tripped into the storage basin. It must have a sufficient capacity to handle the maximum amount of coal delivered by the unloading towers. It may consist of either cars or trains propelled by electricity or cable, belts or continuous conveyors of similar construction, or any other approved, tried out and guaranteed means of doing the work, due regard being had to the basic requirement that breakage of coal in handling must be reduced to a minimum.

At the Cristobal plant the conveying system must be capable of performing any one of eight specified operations, so as to facilitate in general the processes of unloading coal from one or two vessels simultaneously and conveying it either to the storage pile, the reloaders or the wharf bunkers, or of conveying coal from the storage pile itself to the reloaders, and in such manner that these various operations shall interfere with each other as little as possible. At the Balboa plant the requirements are similar but are necessarily modified by reason of the smaller size of that plant and the use of the berm cranes referred to.

Four Bridges across Basin—Reloaders

Two duplex or four single bridges are required in the proposed plan for the Cristobal plant. The former are fitted with two shovels or buckets, and the latter only one each. These bridges will span the coal-storage basin over the coal piles and move along the walls longitudinally of the basin, so that they can cover any point in the basin. Upon them will be mounted the conveyors, that will carry coal from the conveyors upon the walls to any point desired within the basin; and the shovels or buckets that will mine coal from the basin and carry it to the conveyors, which will transfer it to the wharf bunker and to the machines for loading it upon colliers or barges.

The reloaders will be machines moving longitudinally along the wharf at which colliers and barges will tie up to receive coal. They will move by their own power, but not by cable. They will receive coal from the conveying system and deliver it to the vessels, and, to this end, will be fitted with the following essential parts: (*a*) A hopper or hoppers for the reception of coal from the conveying system of sufficient size to regulate the flow of coal; (*b*) a conveying system to transfer coal to the discharging end of the reloader; and (*c*) an adjustable arm or boom equipped with a telescopic chute to deliver coal with a minimum of breakage. This boom will house in sufficiently to lie entirely behind the plane of the front wall of the wharf when the reloader is not in use, in order that the reloader may be moved past shrouds, yards, upperworks, rigging, etc., of vessels lying at the reloading wharf. The extreme conditions of discharge that must be met by each reloader cover such matters as size of cargo holds and hatches in vessels, distance of vessels from wharf, distance of deck of vessel above or below deck of wharf, etc. The reloader must also be able to adjust itself to various minor conditions peculiar to each vessel.

Electric Equipment at a Sumatra Mine

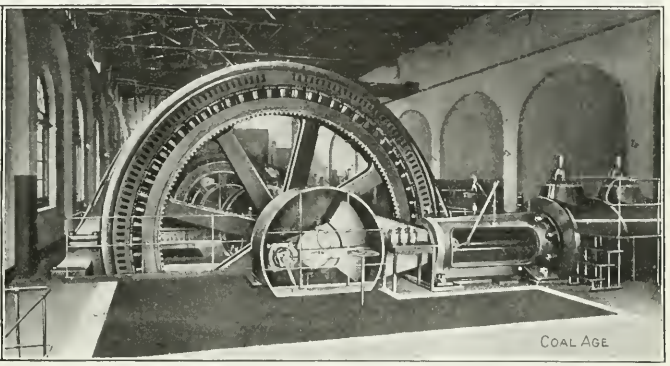
By Alfred Gradenwitz*

SYNOPSIS—A brief description of the electrical equipment at the Ombilin mines on the west coast of Sumatra. The installation is quite elaborate and modern in every respect. Electricity is used for hauling, lighting and pumping.

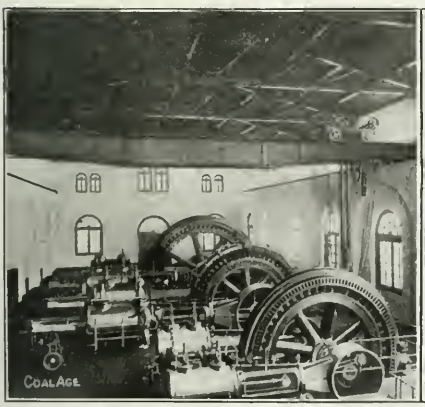
Electric operation was started as far back as in 1905 at the Ombilin coal mines, situated on the west coast of Sumatra, near Sawah-Loento, with a 900-kv.-a., 3-phase

Drift mining is used and there are three different seams worked. The coal is hauled on tracks having 600-mm. gage, and electric mine locomotives with adhesion drive. Since the mines are situated at a higher level than the town of Sawah-Loento where the railway—155 km. in length—to Padang and Emmahaven begins, the coal trucks are taken down on a chain railway to the screening house for sorting and loading into railway trucks.

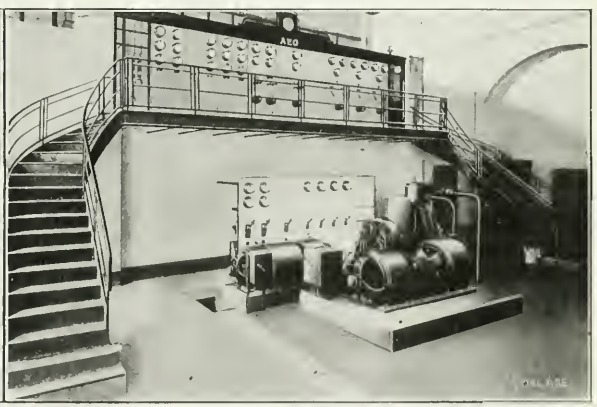
Back View of Switch Gear



1450-kv.-a. Three-phase Generator for the Ombilin Coal Mines



Interior View of Power Station



Front View of Switch Gear

steam dynamo, to which a 500-kv.-a. generator was added in 1907 and a 1450-kv.-a. unit in 1911. The generators are driven by horizontal, compound engines, manufactured by Stork & Co., of Hengelo.

Three-phase current is generated at a pressure of 6000 volts and is distributed, through overhead transmission lines, to the points of consumption where it is transformed down to a pressure of 225 volts. A curious feature of the mines is that there are no deep workings and therefore no electric winding plants are required.

An electric rack railway (see next page) runs parallel to the chain railway; this latter was constructed in the year 1908. It is used for carrying coal, but principally for taking up materials, mine timber, etc. The service is carried on with 7 electric rack locomotives; a photo of one of these on a trial track installed for experimental purposes is shown herewith. Besides for the transport and lighting, the current generated is chiefly employed for driving pumps, compressors, fans, small winches, and in the briquette factory, the screen house and the workshops.

*Gossenstrasse 20, Berlin, Friedenau, Germany.

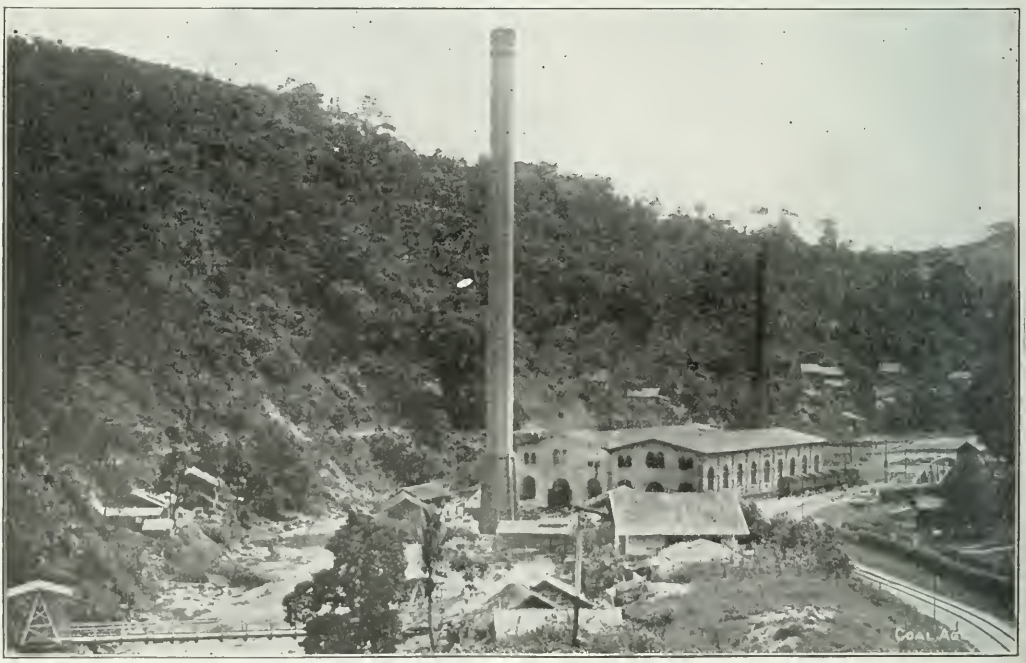
Inclined Electric Rack-Rail Haulage System

On the Ombilin River, 8.5 km. from Sawah-Loento, there is a pumping station for supplying water to the highest level of the mines. At the present time this station contains 2 centrifugal pumps for 1200 litres with a manometric lift of 424 meters; the pumps are driven by 200-hp. three-phase motors, running at a speed of 3000 revolutions per minute. With the increase in the output, which now amounts to approximately 1300 tons per day, on the average, the demand for electricity has also increased and the extensions to the power station have had to keep pace accordingly.

In the year 1907 the boiler house, which was originally equipped with three Steinmüller boilers, each having a heating surface of 240 square meters, was extended by adding two further units of the same kind.

View of Rack-Rail Locomotive

In 1911 a superheater was added and the iron chimney replaced by a reinforced concrete one. A view of the power station, which is situated on the small Loento River, is given herewith. The latter supplies the cooling water to the condenser, but during the dry season there is sometimes very little available.



General View of Power Plant, Which Is of a Modern and Permanent Character

The switch gear, which was not originally designed with a view to the extension of the power station, was entirely reconstructed in the year 1911, in accordance with the most recent practice. The building was extended at the back, a double busbar system was installed and the whole of the high-tension apparatus was arranged on the cell system, all these alterations being made without the slightest disturbance in the service of the station. The oil switches for the generators were fitted with remote control and automatic release by means of maximum and reverse current relays, and the switches for the transmission lines and transformers were arranged for hand operation with magnetic maximum release. A small battery of accumulators was installed for the remote control of switches, relays and emergency lighting. The lightning-arrester plant was also improved; each phase of all the transmission lines was fitted with rough and fine protection horn arresters, and water resistances mounted in cells, while water jet, earthing devices were connected to the busbars. The switchboard and high-tension room are shown in the accompanying illustrations. Since the recent improvements and extensions have been completed, the power station may be regarded in every respect as a model installation. It is now intended to modernize the transmission line and transformer stations in accordance with the more exacting requirements they have at present to comply with.

Electricity in a Group of Mines

Special Correspondence

SYNOPSIS—Aside from some of the equipment at one shaft, every one of the twelve operations of the United States Coal & Coke Co., in McDowell County, W. Va., is electrically driven from a central power station. This article enumerates most of the apparatus and gives some interesting figures on percentage of motor to generator capacity.

In extensive mining operations, the problem of supplying power to the various workings, which may be quite a distance apart, is best solved by electrification. The flexibility of an electric equipment, permitting the installation of motors at any point to which wires may be run, the ease of control of electrically driven machinery, the reliability and economy of the electric installation, all make for the most successful and economical operation.

The extensive mining operations of the United States Coal & Coke Co. in McDowell County, West Virginia, are electrically operated from a central power station located at Gary. This company operates twelve plants, all but Nos. 1 and 2 being drift mines. Plants 1 to 8 have coke ovens, while plants 9 to 12 have none, these latter being designed for mining and loading coal only.

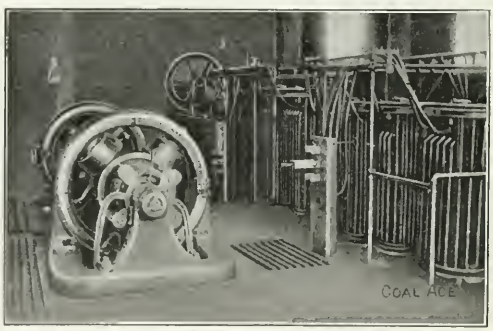
Electrical operation was gradually introduced, the first installation being made in 1902 and consisting of two 400-kw. generators, driven by direct-connected cross-compound engines. These furnished power for mine haulage, crushing, coke ovens, pumping, and fans. In the spring of 1904, one 750-kw., 6600-volt, engine-driven generator was added, this unit being duplicated in the spring of 1905. Power house facilities were further increased in the spring of 1907 by the purchase of two 1000-kw. turbines, one being high and the other low pressure, with complete condensing and cooling apparatus. This brought the power house capacity up to 3800 kw.

After three years of satisfactory experience with electrically operated machinery, it was decided to electrify mining operations, as regards mining machines. This was accompanied by the further installation of motor-driven air compressors, for lifting water from the deep wells.

Subsequently, electrically driven coke-drawing machines were installed to partially handle the coking processes at mines 1 to 8.

Capacity of Plant in Boiler Horsepower

The original boiler installation consisted of four 300-hp. Aultman-Taylor horizontal water-tube boilers. With the addition of power units, more boilers were installed until now, besides the four 300-hp. ones already mentioned, there are five 520-hp. boilers of the same type, making a total boiler capacity of 3800 hp., all of these being fired by Jones' underfeed stokers, which are supplied with coal from an overhead bin filled by a larry.



Interior of a Substation, Showing Transformers, Rotary, and Fan Motor

Duplicate feedwater pumps and heaters have been installed.

Every piece of the apparatus at the entire twelve plants, with the exception of the hoisting engine and the fan at No. 1 shaft, is driven by electrical power from the central station.

The generators are all 6600-volt, 25-cycle, three-phase machines and electrical power is transmitted at this potential to all the substations except No. 12. For transmission to the latter, which is about 12 miles from the central station, the potential is stepped up to 23,000 volts by oil-cooled transformers installed in the power station. All the transmission lines are calculated for 5 per cent. line drop.

The main station switchboard consists of twenty panels, six of these controlling the generators, while there are eight feeder panels controlling the lines to the different

plants, 5 panels controlling motor-generator sets used as exciters, and a Tirrill regulator panel.

Rotaries of 150-kw. capacity have been installed in each of the substations, nine plants having one rotary and three 2 rotaries each. These rotaries supply direct current at 275 volts for the operation of locomotives, inside mining pumps, mining machines, etc., the power being taken from the locomotive trolley, thus making it unnecessary to run another line into the mines, and greatly simplifying the installation.

The substation switchboards consist of from three to seven panels to control rotary converters, step-down transformers for both power and lighting, and synchronous motors driving generators or fans.

The transmission lines are supported on wooden poles with the exception of the line from the power house to No. 6 works, where for a distance of 7000 ft., a heavy galvanized steel tower line has been constructed. This line now carries two separate circuits, one for Nos. 6 and 7 and the other for Nos. 8 and 9 mines, and provision has also been made for a third circuit to proposed plants on the waters of Dry Fork.

Location of Substations

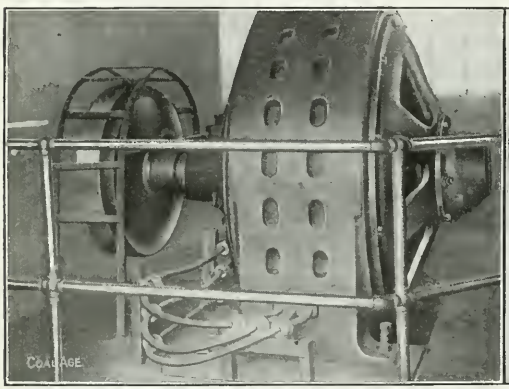
The substations are, for the most part, located at the pit mouths and, generally, the motors driving the mine fans are in this building. The power transformers for reducing the transmission potential to 440 volts for operation of the induction motors are located in these substations, although, at some works, it was found more economical to have the transformers nearer the tipples than the substations and they were installed accordingly in separate transformer houses. There are, in all, 87 single-phase transformers, having an aggregate rated capacity of 5745 kv.-a., which are used for power, and 27 of 400 kv.-a. total capacity used for lighting.

The transformer house switchboards consist of the necessary step-down transformers and out-going low voltage circuits for both power and lighting.

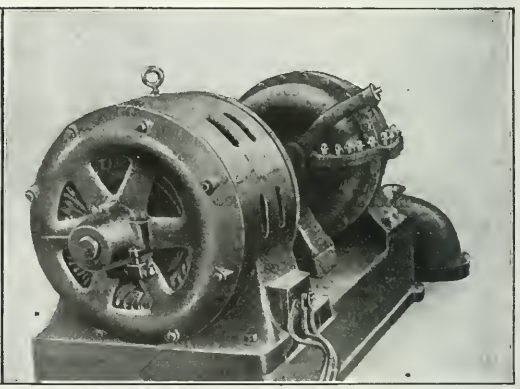
There are nine single and three double tipples, each of the latter receiving the product of two mines. At eight of the operations, steel tipples have been erected. All of the tipples are provided with Phillips automatic cross-over dumps and, in every case, the coal is discharged into a small hopper and from thence passed to the picking tables, all of which are 4 ft. wide, induction motor driven, and run at a speed of 50 ft. per min. The picking tables at all the coal plants, feed directly into a chute, from which the coal passes into the bins, while, at the coke plants, the coal is fed from the picking tables to chutes leading to the crushers and from thence it passes to bins.

At No. 2 mine, the dump is located at the foot of the slope, from which point an overlapping bucket conveyor, induction motor driven and working on a 40% incline, carries it about 260 ft. to the tipple. At No. 9 plant the difference in elevation between the two mines on opposite sides of the valley is so great that the coal from one is brought directly to the top of the tipple, while that from the other is lifted to the same elevation by a rubber belt conveyor 210 ft. long, working at an inclination of 28%. At No. 12 mine the coal is 600 ft. above the loading point, and about 1200 ft. horizontally from it, consequently, it was deemed best to locate the dump and picking tables at the top of the hill and to bring the coal down by three retarding conveyors, the first passing it to the second, the second to the third, while the third discharges it into the bin.

So satisfactory has been the electrical operation that individual drive by induction motors has been standard-



An Induction Motor Direct-Connected to a Fan through a Flexible Coupling



A Motor-Driven Centrifugal Pump for Domestic Water Supply

ized for the operation of the tipples of this company, the picking tables requiring, on an average, a 9-hp. motor, while a 40- to 75-hp. motor is required to drive the conveyors from the mine, the power demands varying with the grade.

At first the crushers were belt driven, but so much trouble was experienced with bearings and belts that they are now driven by direct-connected induction motors through a flexible coupling.

There are 14 crushers driven by motors ranging in capacity from 75 hp. to 300 hp., the total load being 2525 hp.

The Water Supply

At all the coke plants, the water supply for the ovens is obtained from the river or from its branches on which the plants are located, the water being pumped

from the streams into large steel storage tanks, by direct-connected, induction motor-driven, centrifugal pumps, the latter operating against comparatively low heads, the maximum being 250 ft. All plants have an auxiliary deep-well supply, which is used during the dry months of the late summer and fall. These wells also furnish an abundant supply of pure drinking water. Three of the plants, Nos. 2, 4 and 5, have deep-well pumps of the plunger type, each being driven by a 40-hp. motor, but at all the others air lifts are used, the water being blown into small tanks, from which the centrifugal pumps draw their supply. At four of the plants, Nos. 1, 3, 10 and 11, sumps have been cut out of the solid rock for the ground and stream waters to collect in. At Nos. 9, 10, 11 and 12 works, the water supply is for domestic use only and so nothing but deep-well water is pumped.

For inside pumping, 220-volt direct-current motors are used receiving their power from the locomotive feeders.

There are seven air compressors driven by induction motors, four of the latter having a capacity of 85 hp., two a capacity of 40 hp., while the seventh is a 75-hp. motor. These compressors supply air at a pressure of 100 lb. for the water lifts, and to operate gates under coal bins.

Ventilation is accomplished by means of fans, all motor driven, except the one at No. 1 mine, which is direct connected to an engine. The fans at works Nos. 2, 3, 5, 6, 7 and 8, are belt driven by motors. The fan at No. 4 works is driven by a 400-kw., 6600-volt synchronous motor, direct connected by a flexible coupling. The fans at works 9 to 12 inclusive are direct driven by induction motors through flexible couplings. In most cases the motors are two-speed machines, and are run usually for four or five years at the lower speed before increased size of the mine demands the full capacity of the fan. The motors direct connected to fans have a capacity of 150 hp. at 120 r.p.m. and 300 hp. at 240 r.p.m.

Improving the Power Factor

To improve the power factor, which otherwise would be low, owing to the large induction-motor load, two 400-kw. synchronous motors were installed at plants Nos. 4 and 6 to drive fans, one by a flexible coupling and the other by a belt, about 200 hp. being required for this purpose, and the excess capacity supplying leading current to improve the power factor. A 500-kv.-a., 6600-volt, synchronous-motor, direct-current generator set has also been installed for its condenser effect upon the transmission line.

Although for many years coke was made in beehive ovens at eight of these plants, its production has now been discontinued, and the entire output of the mines is shipped to Gary (Indiana), Joliet, South Chicago and other points, where, mixed with other coals, it is coked in the more economic byproduct oven. Such equipment as electric-charging larries, coke-drawing machines, etc., used in this process has, therefore, been disposed of.

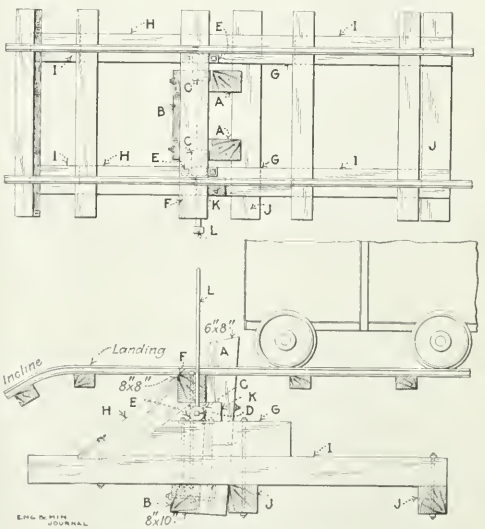
Motor-driven coal cutters are employed almost exclusively, there being 78 Sullivan machines, and eight Jeffrey short-wall machines each driven by a 30-hp., 250-volt, direct-current vertical-shaft motor, while, for a few low-vein machines, horizontal-shaft motors are used.

Gathering in these mines is performed mostly with mules. There are thirty 13-ton and eight 7½-ton, 250-volt locomotives for mine haulage.

The ratio of direct-current motors to direct-current generator capacity is 232%, while the ratio of all motors to generator capacity is 277%, and the load factor of the central plant is 30% with a total motor load of 16,000 hp. The consumption of electric power per month is approximately 1,200,000 kw.-hr., while the coal production is 15,000 tons per day.

Safety Block for Inclines

To prevent the accidental return of a car or skip that has been hoisted to the top of an incline and detached, the device shown in the accompanying drawing is recommended by William W. Jones, state mine inspector, Albany, N. Y. It consists, says the *Engineering and Mining Journal*, of two almost upright timbers *A*, fastened to the square shaft *D* by the straps *C*. The shaft is turned in two places to fit the boxes *E*. The bottoms of the timbers *A* are bolted to a transverse piece *B*. The hoisted car hits the timbers *A*, which revolve with the shaft, permitting the car to pass. The weight of *B* then brings them to the upright position and the cross piece *F* prevents their swinging in the other direction.



Automatic Safety Stop for Top of Incline

BILL OF MATERIALS FOR SAFETY BLOCK; TRACK 3-FT. GAGE

Timber	Iron
A 2 pieces 6x8 in.x4 ft. 4 in.	4 bolts ⅞x20 in.
B 1 piece 8x10 in.x2 ft. 2 in.	2 bolts ⅞x14 in.
F 1 piece 8x8 in.x5 ft.	2 bolts ⅞x17 in.
G 2 pieces 8x10 in.x4 ft.	2 bolts ⅞x28 in.
H 2 pieces 8x8 in.x3 ft. 2 in.	2 bolts ⅞x34 in.
I 2 pieces 8x8 in x10 ft	4 bolts ⅞x10 in.
J 2 pieces 8x8 in.x5 ft	2 bolts ⅞x18 in.
K 1 piece 5x6 in.x1 ft. 1 in.	1 shaft 1⅞x1⅞ in.x4 ft. 4 in.
	1 piece ⅝x1¼ in.x5 ft.
	2 clamps for shaft
	2 boxes 2¼x8x2 in. bore.

To permit a car to go over the head of the incline, the lever, which is attached to a square portion of the shaft, is used to tip the timbers over so far that they clear the car axles and permit the car to pass over them.

The New Brunswick man who built and lined his own coffin with asbestos must be reasonably certain where he is going.

CURRENT COAL LITERATURE

Does Coal Contain Living Organisms?

John Harger in his recent book on "Coal and the Prevention of Explosions and Mine Fires," says:

The occurrence in coal of such large quantities of methane practically free from other hydrocarbons is mysterious from a purely chemical point of view. Among the thousands of organic compounds which have been made in the laboratory, not one is known which spontaneously decomposes with the evolution of methane. Furthermore, no process is known, with the exception of the reactions between zinc methyl or aluminum carbide and water, by which methane, unmixed with other hydrocarbons or with hydrogen, can be prepared in the laboratory. For these and other reasons, I think it necessary to conclude, on purely chemical grounds, that the formation of methane in coal seams is due to bacterial fermentation.

Possibly the chief factor in the transition from decaying vegetation to anthracite is a constant fermentation. At the present time most geologists accept the bacterial theory for the first stage in the transition from vegetable matter to coal. Bernard Renault proved the existence of micrococci in the petrified state in some coals; he showed also that the tissues in some petrifactions show all the phenomena of cells attacked by bacteria.

E. Galle* found, in the course of a bacterial study of different kinds of coal under both anaerobic and aerobic conditions, that, out of seven kinds of bacteria isolated, four, when grown on suitable media in presence of coal, produced combustible gas mixtures containing from 71.5 to 84.8 per cent. of methane and from 5.4 to 27.3 per cent. of carbon dioxide. He showed that these combustible gas mixtures were generated by the bacteria even under conditions approaching those which prevail in nature.

*"Central Bakter a Parasiteuk," 1910, 28, 461-473; "Chem. Zeit.," 1911, 1, 48.

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Karns Reciprocating Heading Tunneler

By O. J. Grimes*

SYNOPSIS—The Karns tunneling machine consists of a drill head of diameter equal to that of the heading to be driven. This cutter is driven backward and forward, each stroke being seven inches long and each return being accompanied by a trifling rotation. Thus the machine breaks the rock into chips. It is said to advance from two to four feet per hour, and to operate at from one to five dollars per foot run.

❖

The latest idea in tunnel boring, the Karns tunneling machine, is operated similarly to the small air drill now used in drilling and blasting. It simply takes the place of the drill steel that goes into the chuck of the air drill except that it is heavier and must have a supporting carriage. The motion of the machine in operation is exactly the same as that of the small drill, the blows being delivered against the obstruction by direct forward motion. On the back stroke, the reciprocating parts turn slightly by means of a rotating device, similar to the rifle nut in the small drill, so that with each succeeding blow the cutting points strike the rock at a different place. The rock, instead of being ground into dust, falls down in small chips, resulting in more rapid progress.

Constructs a 6-ft. Circular Tunnel at One Operation

The latest and largest machine constructed has a cutting head 6 ft. in diameter. It is not a combination of individual drills, but is a single drill with innumerable points, striking simultaneously and rapidly.

*Snow Apartments, Salt Lake City, Utah.
Note—Extract from the "Engineering News" of Mar. 6, 1913.

There are 41 cutter blades made of tool steel, each 1 in. thick, 5 in. wide and of various lengths. Points like saw teeth are machined on one edge and the other edge is fastened in the face of the head. These cutter blades are set in grooves 1 in. deep and backed on one side by an extra inch, to resist the pressure of the cut rock at the bottom when the head is turning. They are held in these grooves by two hook bolts to each cutter, which pass through the head and hold them firmly in place.

To remove the cutters, the nuts on the hook bolts are unscrewed about 1 in., permitting the cutters to be pulled forward and slipped off the ends of the bolts. The entire set of cutters may be removed and replaced in about 2 hr. One set will drive from 25 to 75 ft. of tunnel, depending on the hardness of the rock, although 97 ft. have been driven without a change.

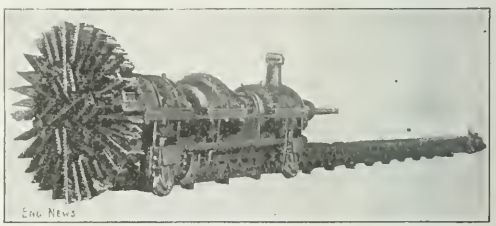


Fig. 1. Karns Tunneling Machine with Drill Head Measuring 6 Ft. in Diameter

Two to Four Feet of Progress per Hour

The reciprocating parts of this machine weigh 7¼

tons. This weight is thrown against the rock about 140 times a minute, each blow making a working stroke of 7 in., cutting from 2 to 4 ft. of tunnel per hour.

The cylinders are inclosed in a shell and connected to the supporting parts of the operating machine by heavy rods. The shell supporting the cylinders is held firmly in place by four columns, two in front and two in the rear, jacked to the top and bottom of the tunnel. The columns, shell and machine are advanced simultaneously with each 6 ft. of tunnel driven. The weight of the machine rests on four wheels under the supporting carriage

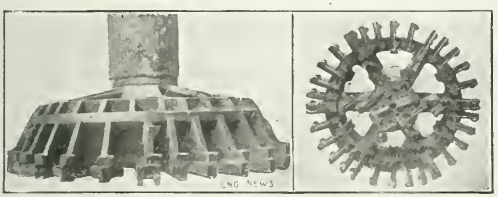


Fig. 2. Views of Rough Casting for Head of Karns Tunneling Machine

which run on heavy steel tracks on each side. These tracks are fastened to and move along with the carriage, eliminating the setting of tracks a second time.

Rotates on Ball Bearings

In the front cap of the machine are the front bearings, consisting of 48 steel balls, 3 in. in diameter, resting in 12 straight grooves, planed on the outside of the hub of the head casting. The other half of the grooves or bearings are on the inside of the heavy steel nut encircling the hub. The bearings at the back are under the rear cap and are similar to those in the front, except that there are but 8 races of 3-in. balls, three in each row.

On the forward stroke the motion is reversed and the nut turns, the dogs simply sliding over the ratchet teeth on the nut.

How the Machine Is Moved Forward

Having been fed ahead 6 ft., the moving up of the shell and holding columns under the cylinders by the feed screw is a very simple matter and requires but a few minutes. There is a truck under the shell supported by four wide-tired wheels on the rock. To move up, the columns are unjacked and made free. Then by a worm gear the surface of the supporting truck is raised so that the entire weight of the shell and columns rests on the truck. This done, it is simply a matter of turning the feed screw which pulls all under the cylinders again. The surface of the truck is then lowered and the columns rest on the rock, the jacks at the top are tightened and all is ready for driving another 6 ft. of tunnel.

The engine driving this machine is a double, 9½-in., tandem cylinder, with an extreme stroke of 8¼ in.

To operate a machine of this size, 2000 cu.ft. of air per minute are required, but a plant capable of furnishing 3000 cu.ft. per minute is always installed. The purpose of this excess of capacity is to avoid working the compressor and boilers to their full rating, thus lengthening their lives and providing extra power should a long stretch of hard rock be encountered. In such cases the additional air is used and the machine operated more rapidly, delivering much harder blows, with the result that the average speed is maintained throughout the work. A boiler of about 400 hp. is necessary to operate an air compressor of the required capacity.

Operating Expense

To operate the machine on each shift, one runner and helper, two muckers, one engineer and a fireman are necessary. A blacksmith and helper are required in one

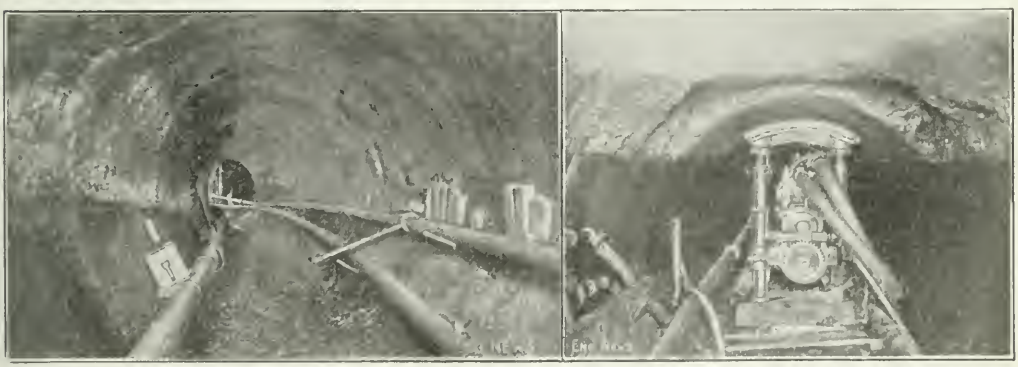


Fig. 3. A 6-ft. Diameter Heading, on a 10-deg. Curve Driven with the Karns Machine

Fig. 4. Rear View of Karns Machine in Johnstown, Penn., Tunnel

The middle cap covers the rotating device. It is the same as the front and back bearing except that the races for the 3-in. balls are spiral. There are four races with three balls in each race. On the outside of the steel nut there are ratchet teeth with dogs to drop into them on the back stroke and hold the nut from turning. This compels the shaft within to turn, as the ball races are spiral.

shift in three. The cost per foot to drive a tunnel with this machine ranges from $81 to $85, according to the rock and cost of fuel and labor at the place of installation.

Tunnels of large size can be driven quickly, safely and cheaply. If a round tunnel 18 ft. in diameter is desired, a heading 6 ft. in diameter may be driven through the

center, and from it holes drilled 6 ft. deep in a circle with a small air drill. When blasting, the tunnel will be broken the full 18 ft. In enlarging, the rock will be shot into the tunnel, where there is sufficient room for handling the débris.

It was the idea of the late David H. Moffat to use a Karns machine to drive the gigantic tunnel through the divide on the line of his railroad, the Denver, Northwestern & Pacific. He went so far as to have a model 18 ft. in diameter constructed, but his untimely death halted all preparations.

Used in both Coal and Granite

The tests to which the Karns machines have been subjected have been severe and practical. The first was made with a machine 52 in. in diameter through more than 100 ft. of solid granite near Boulder, Colo. The most recent demonstration was a tunnel 6 ft. in diameter and 200 ft. long, driven for the Valley Coal & Stone Co., near Johnstown, Penn. To show the adaptability of the machine to requirements, a 10° curve was driven as shown in the photograph.

The machine is controlled by the J. P. Karns Tunneling Machine Co., Mercantile Bank Building, Boulder, Colo. The inventor, J. P. Karns, president of the company, has offices in Citizens' Building, Cleveland, Ohio.

The Committee on Science and the Arts, of the Franklin Institute, Philadelphia, last year awarded the Edward Longstreth medal to Mr. Karns for his invention of the tunneling machine.

European Practice in Hydraulic Filling

By L. O. Kellogg*

Speaking before the New York Section of the American Institute of Mining Engineers, George S. Rice, chief mining engineer of the Bureau of Mines, described various methods of hydraulic filling in European collieries and potash mines. The filling of excavated parts of workings is becoming the standard method of support in Germany, Belgium and France and has been brought to a high state of development.

The character of material used depends on the relative accessibility of the possible sources of supply. Sand, crushed rock, loam and clay are used in varying proportions, and granulated slag is not uncommon. The manner of handling the material and the amount of water necessary varies with its character. Slag requires much water to move it, whereas clay moves easily but is slow to dry when placed and is unsuitable except in mixtures.

Natural sand or glacial drift is often handled through a rather elaborate series of screens and crushers. One plant stowing about 5000 cu.yd. of material per day dumps it from cars on a trestle, and flushes the dumped piles by hydraulic monitors (flushing nozzles).

In the potash fields, rock salt is used for a filling material. Large chambers are excavated in the rock-salt foot wall, and the broken salt stowed away in the workings, where the potash has been excavated.

The problem of suitable pipe for handling the water and material has received much attention. In Westphalia, porcelain-lined pipe is used, while in Upper Silesia, a steel pipe with a removable cast-iron trough-shaped bottom is finding favor.

As the method is practiced, there is no great saving in timber except in the quality; poorer classes of wood are permissible, since it does not have to stand up for any great length of time. The cost varies exceedingly, probably averaging somewhere between 20 and 30c. per cubic yard. Because of the higher cost of labor, this would be much increased in the United States, and a figure of from 30 to 40c. per cubic yard is given, tentatively when material can be obtained within two or three miles.

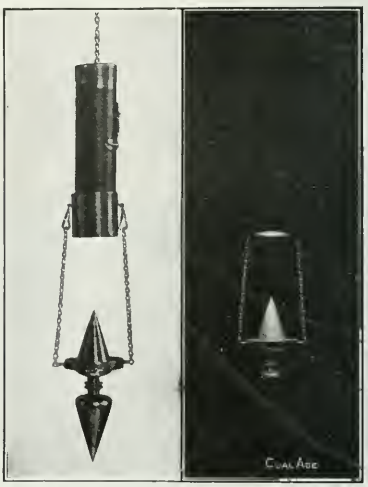
The use of the term "hydraulic stowing" is recommended for the purpose of designating the general process of flushing granular or fine material into mines to fill the excavations.

*Editorial staff, "Engineering and Mining Journal."

The Martin Plummet Lamp

Mining engineers will be interested in the following description of a plummet lamp recently invented by C. V. Martin, a mining engineer, of Zanesville, Ohio.

Every mining engineer and surveyor knows the difficulty in using safety lamps for fore- and back-sights where there is gas. Even when shielded carbide lamps, torches and reflectors are used, there are often many conditions in the work of the assistant that are trying to the transitman.



The Martin Plummet Lamp, Showing Its Appearance in the Dark

Two views of an improvement on the old methods are here given. One was taken in the outside light and the other by its own light as it hung from a spad in the mine. The illustrations are so plain that a description is hardly necessary. The device consists of a double plummet coupled and swung in gymbals by detachable chains from an electric cell lamp. The lamp has a sliding sleeve, to cover or expose the lens as occasion may require, and is fitted with a chain and hook for suspension from a spad. When not in use the entire device is conveniently carried in a leather case.

EDITORIALS

Metal Mining Accidents

We congratulate the Bureau of Mines on its work in collecting the statistics of metal-mining accidents and of the accidents occurring in mines producing nonmetals other than coal. A brief of these figures is contained in our sociological department.

There has been no public demand that this work should be done, because the mass of the people are interested only in great disasters affecting a large number of men at one time. An accident to an individual makes at best an unattractive headline and is relegated to those parts of the daily newspaper which contain advertising announcements. We fear that we would not have had a Bureau of Mines if it had not been for the Monongah, Naomi and Cheswick disasters. Even today the coal-mining division of that institution is the more popular and significant.

As we suspected, the returns diligently collected by Albert L. Fay for the bureau, show that the loss of life per man employed is higher than in the coal mines. The difference is actually about 12 per cent. And this is true, though there are no gas or coal-dust problems to be met and though 40 per cent. of the employees work in the open air, exposed to more easily avoidable dangers. The proportion of underground to outside workers in the bituminous mines of Pennsylvania is 17 per cent. and in the anthracite workings 28 per cent. It is obvious that all other things being equal, the coal-mining industry which exposes the larger number of men to the full risk would necessarily have the greater number of fatalities, should only equal care be taken.

It is unfortunately true that the metal-mining industry has not been conducted with the interest in safety which has marked the operations of collieries. This has not been because the metal industry has men of less liberal mold but because the general public, not being induced to consider the risks of metal mining by recurrent disasters of large proportion has never exercised so continuous a guardianship over the workers thus engaged.

The never wearying publicity which the coal operator has had to face has been irksome and expensive, but it has certainly been of great value and it has sustained admirably the hands of those who among the operating forces were disposed to regard the safety of the employee as one of the leading interests of the officers in charge of a mine.

The coal operator has to look back carefully if he would realize the progress he has made. Some 30 years ago, at the Long Valley coal mine, a mule driver was killed. As they brought his mangled body to the drift mouth, the foreman who till then had not heard of the accident strode up and blurted out "Was the mule hurt?" It was his first thought, and he narrowly escaped a lynching.

A few years ago, indeed, property was generally esteemed as more important than life as the anecdote of John Fulton at the Johnstown meet of the Coal Mining Institute of America last summer well illustrated. He stated that on one occasion when a man was killed by a vicious horse, the party in whose care it had been placed, remarked with considerable heat: "I don't care about your man Patsy; what I want to know is how I am going to explain the breaking of the buggy."

The loss of a life or the occurrence of an accident at a mine throws a dark shadow over the faces of all the officials. If a stranger happens to visit at the time, he is likely to receive but veiled hints of the misfortune, but if he once learns about it, there is no detail which is overlooked in describing it and it is likely that he will see the report to the inspector before he leaves.

We were interested in a recent article by Don D. Lescohier, of the Minnesota Bureau of Labor, in a recent issue of the *Survey*. He says:

"The key to the situation," said Michael Godfrey, general superintendent of the Canisteo iron district, "is the foreman. I hold my bosses responsible for every accident which occurs among their men. Their ability to prevent injuries and deaths is an important factor in determining promotion and an inability to prevent accidents is certain to result in their discharge. I have my foremen now where they come in and apologize for an accident. When the foreman is careful, the men have to be."

The point of view here stated is current wherever coal is being extracted. It comes as a shock that in the metal industry such a condition could be regarded as new.

Fuel Well Conference

The glamour of time, the obtaining of a great name, and the possession of a stately plant are needed to enable the Bureau of Mines to fill the requisite place in the public eye. Until a new generation has sprung up, replacing the present, the bureau will be an innovation to be resisted by every body of older establishment. Every element of conservatism in the republic, and many of these there be, will oppose itself to this new force, beneficent but too new for full national acceptance. The recent gas- and oil-well conference showed conclusively that local pride and petty jealousies are preventing the bureau from doing the large work, of which it alone is capable.

When a federal bureau calls a conference on a matter of national importance, and asks for the opinion of the public on this matter, it is unseemly for the persons who are employed by the various states for the promotion of a healthy public sentiment and for the enforcement of the law relative to such matters, to hold coldly aloof and try vainly to kill the conference by abstention.

Credit must be given to Richard R. Hice, the state geologist of Pennsylvania, F. W. DeWolf, director of the State Geological Survey of Illinois, I. C. White, state geologist of West Virginia, and to no others of the state institutions for their coöperation in the work of inquiry.

If the authorities in the various states think the federal conference without them will not be able to effect

anything, they are much mistaken. It is probable that the well represented gas and oil men have succeeded in providing a law to their liking by recognizing the conference, and that the abstainers may find themselves mated in every later play.

The man on the street evaluates the force on the Bureau of Mines as of more authority than the local inspectorates and with reason. The decisions of the courts will also be molded greatly by what at least appears to be concurrent testimony of the highest value.

It was proposed, as we explained in our issue of Feb. 22, to give an equal representation to the Bureau of Mines, the gas interests, the oil men, the coal operators, state geologists and coal-mine inspectors. The scheme apparently went awry for want of the coöperation to which the bureau was fully entitled and instead a subcommittee was appointed consisting of three men: W. S. McCloy, of Pittsburgh, Penn., district superintendent of the Philadelphia Co., which has extended gas interests; E. B. Moore, chief engineer of the Consolidation Coal Co., of Fairmont, W. Va., who has had much practical experience in the effects of gas leakages from wells passing through coal beds, and O. P. Hood, chief mechanical engineer of the experimental station of the Bureau of Mines.

They produced an act which appeared in our issue of Mar. 22, and which we criticized in an editorial of equal date. This act reduced many of the suggested enactments of the bureau in many important ways, yet it is easy to realize that Mr. Hood could not feel disposed to present a minority report to the conference.

When the meeting was called to consider the report, the following persons attended, whose 21 names we quote at length:

Gas Interests—John B. Corrin, assistant general manager, Hope Natural Gas Co., Pittsburgh, Penn.; H. H. Davis, superintendent, Land Department, Greensboro Gas Co., Pittsburgh, Penn.; John Gates, attorney, Land Department, Philadelphia Co., Pittsburgh, Penn.; M. P. Layton, Manufacturers Light and Heat Co., Pittsburgh, Penn.; E. D. Leland, Philadelphia Co., Pittsburgh, Penn.; C. M. Thorp, attorney, Pittsburgh, Penn.; and Henry Wittmeyer, American Natural Gas Co., Pittsburgh, Penn.—7 representatives.

Oil Interests—A. F. Corwin, South Penn Oil Co., Pittsburgh, Penn.; E. E. Crocher, vice-president and general manager, South Penn Oil Co., Pittsburgh, Penn.; William C. Edwards, Parker & Edwards Oil Co., Pittsburgh, Penn.—3 representatives.

Coal Mining Interests—James Burns, mining engineer, Penn. Salt Mfg. Co., Natrona, Penn.; W. E. Fohl, mining engineer, Pittsburgh, Penn.; C. H. Jenkins, Hutchinson Coal Co., Fairmont, W. Va.; C. B. Britton, mine inspector, Moreland Coal Co., Pittsburgh, Penn.; E. J. Taylor, chief engineer, Pittsburgh Coal Co., Pittsburgh, Penn.—5 representatives.

Bureau of Mines Representatives—George S. Rice, chief mining engineer; O. P. Hood, chief mechanical engineer; A. G. Heggem, petroleum engineer, all of Pittsburgh, Penn.—3 representatives.

State Geologists—F. W. DeWolf, director State Geological Survey, Urbana, Ill.; Richard R. Hice, state geologist of Pennsylvania, Beaver, Penn.; I. C. White, state geologist of West Virginia, Morgantown, W. Va.—3 representatives.

State Coal Mine Inspectors—None.

Thus the fuel-well interests outnumbered the coal men 10 to 5 or 2 to 1, though the safeguarding of gas and oil wells is largely a matter for the man who drills them. It is his apparent interest to make drilling as cheap as possible. Thus the act, as now formulated, is practically written by the parties it is to control.

The views of the fuel-well interests as to the importance of the conference are made abundantly evident by the presence of several attorneys who attended the last session in the interest of the gas- and oil-well owners.

Though some of the bureau's suggestions were not accepted by the assembled fuel-well men, it cannot but be evident that the federal organization has done its duty. It has asked for a discussion and has not attempted to dictate legislation. It is hoped that its more liberal point of view will find imitators, for in all matters discussed for the first time, differences of opinion are sure to occur.

The Buried Valley near Scranton

The buried valley occupied by the Susquehanna and Lackawanna Rivers and Newport Creek between Glen Lyon and Jermyn constitutes one of the geologic wonders of America. The sand is deposited in places over 300 ft. deep and for three miles near Plymouth, its depth is over 200 ft. When we compare these figures with those of the falls of Niagara where the water is precipitated only from 154 to 161 ft. we begin to realize what changes would take place in the topography of the buried valley were all the sand removed and snugly packed into the coal excavations below.

We remarked last week that such a removal in whole or in part would create engineering difficulties at least equal to those it would remove and it is easy to see that though the railroads might be moved back to the rock slopes and might thus be protected, yet crossings from slope to slope would be made with extreme difficulty.

The silt, being pervious and the outlet afforded by the Susquehanna River too high to lower the water considerably all the excavations would be converted into lakes; in fact, most of the sand would have to be removed by deep-water dredges.

The acid character of the water in the deep lakes thus formed would make it a difficult matter to maintain any buckets and chains in operating condition and the amount of water which would seep into the workings below would make their drainage almost infeasible.

Moreover, as the silt below the upper level of the Susquehanna waters near Nanticoke would be filled with water, it is probable that almost as fast as the sand was excavated, other bodies of sand would travel in to take its place with unfortunate results to cities and villages resting on the silt thus drawn away.

In fact, as far as filling is concerned we advise the Scranton people to look in large part "to the hills from whence cometh their help," rather than to the easy digging sand lying in the adjacent valley. It would be easier to crush rock than to dig it under such undesirable conditions.

Accident at Baskett Mines

As we anticipated when we published the report from the Baskett mine of the Pittsburgh Coal Co., Henderson County, Ky., the affair was much exaggerated. We were careful to throw some doubt on the character of the news by the nature of the wording. Alexander Blair, the general superintendent, in answer to our inquiries states that a part of the casing in the shaft broke loose and until it was repaired the cage could not pass it. Most of the men left the mine by the air shaft and those who did not want to climb the ladders remained below till the shaft was in condition. All the men got out and the hoisting of the coal was resumed at 3 o'clock the same day.

SOCIOLOGICAL DEPARTMENT

The Home of the Frick Employee

By Thomas W. Dawson*

SYNOPSIS—A half a million dollars spent in two years have revolutionized the Frick villages, and the improvements cover, among others: 105 small stables, 295 chicken pens, 150 pig pens, 38 miles of picket fence, 2700 stone cellars, 465 front porches, 650 back porches, water supply within 1200 dwellings, 132 new houses, 1379 concrete cesspools, 2500 garbage receptacles, 6600 shade trees and 61.7 miles of surface drains.

The H. C. Frick Coke Co. has spent during the last two years over one-half a million dollars in bettering the condition of the workman by improvements in sanitation and similar matters, and in making the home and its environments as comfortable as possible for the employee and his family.

The houses of the company are better than the ordinary dwellings erected by corporations for their employees. They are built on substantial stone foundations, and neat and sanitary cellars are being provided, there being 2700 such cellars built to date, and practically every house is equipped with spacious front and back porches. The company built 465 of the former and 650 of the latter this year. All dwellings are well painted a durable red with white trimmings. Running water has been placed in the kitchens of some 1200 dwellings, or in about 18 per cent. of the houses owned by the company. A number of bath rooms have also been provided, and many of them are electrically lighted, as are also the streets where electricity is available for this purpose.

Paling Fences Provided

Every tenant is provided with a lot, of suitable size, neatly fenced. Recently the company has been abolishing

Fig. 1. Model Alley at Standard, Mt. Pleasant, Penn.

Fig. 2. Street at Filbert, Penn.

It must be remembered that the majority of these employees are foreigners, many of them fresh from Europe. They are immediately encouraged in thrift and industry, and eventually become useful American citizens, much sooner than they would with environments not so elevating morally.

Unsightly Outbuildings Removed

One who visited the Connellsville coke region two years ago and returned to it today would be impressed at once with the wonderful transformation in the coke towns owned by the H. C. Frick Coke Co. Shacks or shanties which were standing on posts with unsanitary surroundings have been removed. At many of the towns whole rows of houses have either been replaced or moved to better locations. Nondescript outbuildings, built by the employee from all kinds of material, have been replaced by those of standard design and all these are neatly painted. The company built 105 stables, 295 chicken coops and 150 pig pens during the past year.

the old style of board fence and has replaced it with neat and durable palings. The gates have self-closing hinges. The company has built 202,000 lineal feet, or about 38 miles of this picket fence in the past year, representing 19.7 per cent. of the total fencing at all the plants. Fences are whitewashed each year. This is done by the householder, lime being furnished free by the company, which insists on the work being done. The rent which is received for the larger houses is about $7 per month; smaller dwellings rent for less. Free coal is given the tenant if he conveys it from the mine to his home. In the remodeling of these towns, in order to improve their appearance and make them more satisfactory, 67 shanties and old dwellings have been removed, and 132 in addition to these were torn down but replaced by new, uptodate dwellings.

Sanitation of Villages

The company has been replacing the old unsanitary wooden privy vaults by neat concrete cesspools. There have been 1379 of these constructed, and the recent type constitutes 38 per cent. of the total number of vaults at all of the towns. Similar vaults are provided for the employees around the mine buildings at the plant. Combin-

*Assistant chief engineer, H. C. Frick Coke Co., Scottdale, Penn.

Note—Abstract from paper entitled "Welfare, H. C. Frick Coke Co." read before the winter meeting of the Coal Mining Institute of America.

ation closets and coal houses to the number of 800 have been built in the last two years, replacing the old unsanitary closet.

The company has furnished 2500 neat garbage receptacles, which are emptied each week, or as often as necessary. These are found at all the towns, and at all times workmen and carts can be seen cleaning up streets and alleys to keep them free from rubbish and in a sanitary condition. To beautify the towns, 6600 shade trees have been recently planted.

Surface-water Drainage

Streets and alleys are graded and suitable concrete and brick drains constructed. Concrete water channels have been built where a short time ago unsightly and unsanitary water courses existed. The construction of 61,000 lineal feet, or about 11½ miles of brick drains; 71,000 lineal feet, or about 13.5 miles of concrete curb drain, similar to that laid in towns and cities; and 182,000 lineal feet, or about 34.5 miles of concrete drains of various sizes, in the past two years, as well as about 12,000 lineal feet, or about 2.2 miles of the larger type of concrete drain, has provided a complete system of drainage for each town. Thus all the towns of the H. C. Frick Coke Co. are in a first-class sanitary condition.

Specifications of Drains in Fig. 3

Illustrations accompany this article, showing standard methods of constructing drains. The cross walls in concrete curbs and gutters are 4 in. thick and the full width of the section. They extend to the minimum depth shown and further, when necessary to secure a firm bearing. Brick cross walls are 8 in. thick. All are set at 30-ft. centers. Expansion joints occur every 40 ft. These are made by inserting ⅛-in. sheet metal and withdrawing it when the concrete has obtained its initial set.

The wire rope used in concrete drains are old ropes of ½- to ⅝-in. diameter. Rope larger than the latter size are unstranded till the desired size is obtained. The brick are laid in 1:2 cement mortar.

Specifications of Drains in Fig. 4

Where wedge drains are used, subject to excessive wear, the bricks are laid on edge, and in 1:2 cement mortar at places of greatest abrasion; the excavation for brick laid on edge in wedge drains is 2 in. deeper than shown in the details. The brick used are ordinary hard-burned

SECTION	CU. YD CONCRETE PER LIN. FT.
CHANNEL	0.111
SEGMENTAL	0.070
SEMI-CIRCULAR	0.075
CURB DRAIN	0.068
SHALLOW DRAIN	0.040

PARTS	INGREDIENTS PER CUBIC YARD	
1	UNIVERSAL PORTLAND CEMENT	1.6 BBL
1½	No 1 SLAG SAND	0.33 CU YD
1½	No 2 BANK SLAG SCREENINGS	0.33 CU YD
3	No 1 BANK SLAG	0.66 CU YD

NOTE: Above mixture is equivalent to 1:2:4

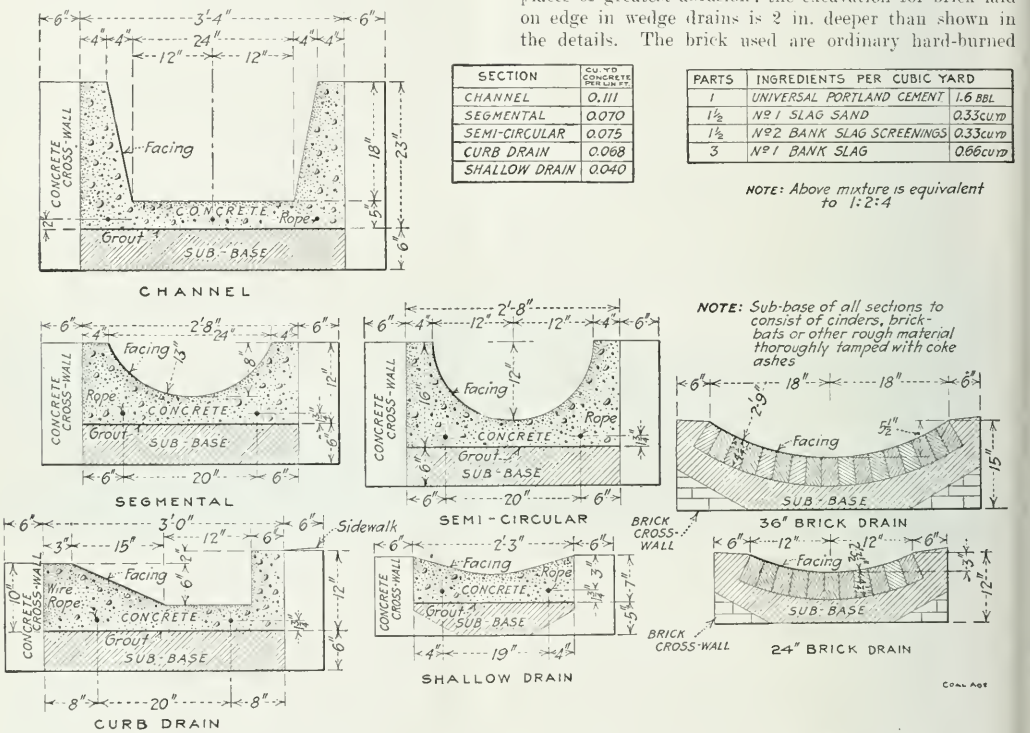


Fig. 3. Standard Sections of Drains of the H. C. Frick Coke Co. for Use in Their Mining Villages

Illustrations accompany this article, showing standard methods of constructing drains. The cross walls in concrete curbs and gutters are 4 in. thick and the full width of the section. They extend to the minimum depth shown and further, when necessary to secure a firm bearing. Brick cross walls are 8 in. thick. All are set at 30-ft. centers. Expansion joints occur every 40 ft. These are made by inserting ⅛-in. sheet metal and withdrawing it when the concrete has obtained its initial set.

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Specifications of Drains in Fig. 4

Where wedge drains are used, subject to excessive wear, the bricks are laid on edge, and in 1:2 cement mortar at places of greatest abrasion; the excavation for brick laid on edge in wedge drains is 2 in. deeper than shown in the details. The brick used are ordinary hard-burned red brick. The sub-base is of well tamped coke mixed with clay.

Fully Organized Health Department

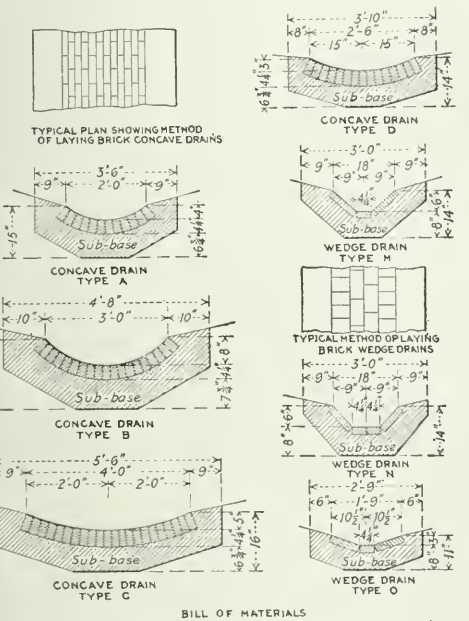
A sanitary inspector is on duty in each town, makes frequent inspection and gives instructions to the tenants to keep their houses and surroundings in such order as will insure the health of the community. Moreover the doctors in the various towns have been requested to make reports on the general health conditions, and steps are taken immediately to remove any menace to the public health.

An ample sewer system is also provided, consisting of underground and surface sewers. Thus the company has made it possible for its employees and their families to

live under conditions which are positively ideal and sanitary.

Bacteriological Analyses of Water Supply

It has been the company's aim to provide good, pure water, and make the surroundings at the source of supply such that the water cannot be contaminated. During the year, 788 bacteriological analyses were made of the water supply at the many towns of the company. Samples were taken from all the wells, springs, hydrants and reservoirs and from the water rings in the shafts. It was found that 72 sources of supply were unfit for use and these were made unapproachable. In addition, 88 sources which were in an unsanitary location were entirely closed, thus, in


TYPICAL PLAN SHOWING METHOD OF LAYING BRICK CONCAVE DRAINS
CONCAVE DRAIN TYPE A
CONCAVE DRAIN TYPE B
CONCAVE DRAIN TYPE C
CONCAVE DRAIN TYPE D
WEDGE DRAIN TYPE M
TYPICAL METHOD OF LAYING BRICK WEDGE DRAINS
WEDGE DRAIN TYPE N
WEDGE DRAIN TYPE O
Sub-base

BILL OF MATERIALS

CONCAVE DRAINS
TYPE A - 12 Bricks per Lineal Foot
" B - 19 " " " "
" C - 22 " " " "
" D - 14 " " " "

WEDGE DRAINS (BRICKS LAID FLAT)
TYPE M - 7½ Bricks per Lineal Foot
" N - 9 " " " "
" O - 7½ " " " "
(BRICKS LAID ON EDGE)
" M - 15 Bricks per Lineal Foot
" N - 18 " " " "
" O - 15 " " " "

COAL AGE

Fig. 1. Frick Standards for Brick Drains

all, the communities were protected against 160 possible sources of disease. These analyses are made periodically to make sure that the water is not contaminated.

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First Aid Competition at the Kentucky Mining Institute

The program committee of the Kentucky Mining Institute, for the meeting to be held May 16 and 17, has selected 24 events, given below, for the state-wide first-aid contest to be held on May 16 at Lexington, in connection with the spring meeting of the Kentucky Mining Institute, and the judges, on the day of the contest, will select five of the problems, and these five events will be performed by each team participating in the contest, and the prizes will be awarded upon the work performed in the problems so selected:

Event No. 1. Lacerated scalp; top of head with bleeding. One-man event.

Event No. 2. Right ear torn off; deep cut on chin; bleeding. Two-men event.

Event No. 3. Broken left arm below elbow. One-man event.

Event No. 4. Lacerated wound on left side of head (the temple). Lacerated wound on top of right shoulder. Two-men event.

Event No. 5. Wound of right eye; simple fracture of left knee cap; full-team event.

Event No. 6. Lacerated wound in palm of left hand. Right thigh, compound fracture; improvise stretcher. Full-team event.

Event No. 7. Treat burns of face, ears and hands. Two men carry patient without stretcher. Two-men event.

Event No. 8. Compound fracture of lower jaw on right side; deep wound on inner side of left ankle. Bright red blood. Full-team event.

Event No. 9. Left ear torn off; ends of fingers cut off right hand; bright red blood. Two-men event.

Event No. 10. Dislocated shoulder left side; right foot smashed, bleeding. Full-team event.

Event No. 11. Fracture right collar bone; lacerated wound of palm of right hand. Full-team event.

Event No. 12. Dislocation of right hip; leg thrown outward and broken left collar bone. Full-team event.

Event No. 13. Broken back; simple fracture of right forearm. Full-team event.

Event No. 14. Man fallen on electric wire, face down, clothing burning; treat burns of breast and arms. Full-team event.

Event No. 15. Fracture of right leg above the knee; carry the patient on a coat and pole stretcher and place in ambulance; mine at top of hill, hospital in the valley, road down hill all the way. Full-team event.

Event No. 16. Man overcome by gas in a four-foot seam with a dislocated left shoulder. Remove 30 ft. to fresh air. One-man event.

Event No. 17. Compound fracture of left leg below the knee; bone sticking out on the inside of the leg. Full-team event.

Event No. 18. Man overcome by gas; shoulder, lift and carry to place of safety. Perform standard form of artificial respiration. One-man event.

Event No. 19. Broken ribs on right side; dislocation of left shoulder. Full-team event.

Event No. 20. Man squeezed between mine cars; broken pelvis and left elbow badly crushed. Full-team event.

Event No. 21. Man overcome by afterdamp; burns on hands, arms, neck and face. Full-team event.

Event No. 22. Man found under fall of coal with punctured wound of abdomen; broken ribs on left side; cut on right side of face; bleeding with bright red blood in spurts. Full-team event.

Event No. 23. Man run over by motor found with right hand cut off. Left arm torn out of shoulder socket. Full-team event.

Event No. 24. Man fallen on electric wire; back down, unconscious. Rescue, give artificial respiration one minute; treat burns on back and right upper arm. Improvise stretchers. Carry 50 feet.

There will be a large number of teams from coal companies in the western, northeastern and southeastern coal-mining districts of Kentucky.

H. D. EASTON, Chairman.
HYWEL DAVIS,
W. L. MOSS.

⁂

Kentucky Mining Institute

The annual meeting of the Kentucky Mining Institute will be held, May 16 and 17, at the College of Mines and Metallurgy of Kentucky State University, Lexington, Ky. The following papers will be read, with others not yet announced:

Workmen's Compensation: K. U. Meguire, president, Snead & Meguire Coal Co., Louisville, Ky.

Welfare or Sociological Work: W. C. Tucker, general superintendent, Wisconsin Steel Co., Benham, Ky.

Coal & Mineral Taxation: Hywel Davies and W. H. Cunningham, president and secretary, Kentucky Coal Operators Association.

Mineral Development of Western Kentucky: Fluorspar District, C. S. Nunn, manager, Kentucky Fluorspar Co., Marion, Ky.

Mining Laws of Kentucky: C. F. Fraser, mining engineer, Taylor Coal Co. of Kentucky, Beaver Dam, Ky.

Calorimeter Tests Made on Kentucky Coals: A. M. Peter, chief chemist, Kentucky Experiment Station, Lexington, Ky.

How Best to Handle the Dusty Mine: David Victor, chief mine inspector, Consolidation Coal Co., Fairmont, W. Va.

A first-aid contest will be an attractive feature of the program.

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England's new coal-mines bill states that all newly opened coal mines shall have two main-intake airways, affording means of ingress and egress to the mine, one of which shall not be used for haulage purposes. Mines employing less than 100 men, or mines wet throughout, are exempt from this provision. Such mines are required to possess only two main airways, an intake and a return.

How Explosives Endanger the Miner's Home

By F. H. Gunsolus*

SYNOPSIS—There should be a storeroom for blasting powder, permissibles, caps and electric fuses at every mine. These dangerous explosives should not be taken home. The brightness of the caps attracts the eyes of the children and lures them to play with them. The use of permissibles and caps reduces fatalities in the mines and may increase the accidents in the home.

The subject of providing a house or storeroom in which miners can keep such powder as they have purchased but which they are not using, is of vital importance. This applies, particularly, to blasting powder. It is urged with reason that unless a storeroom is provided at the mines, the miners will have to take their powder to their homes, as the law does not permit them to take more than what is actually required into the mine.

A keg of blasting powder is not a particularly appropriate plaything for children, but how much more does this apply to blasting caps and electric fuses which are used by miners in places where permissible explosives and dynamite take the place of blasting powder.

Blasting Caps Are More Dangerous than Powder

The miner can, of course, gage the number of shots that he expects to make in one day closer than he can the exact number of pounds of powder or cartridges of Monobel, but he is less than human if he takes down into the mine the minimum number of detonators. As a matter of fact, he will usually allow himself several blasting caps more than he thinks he will need, and it is these blasting caps, when handled carelessly, which form a very decided menace to the health, happiness and prosperity of the community.

When the miner carries these articles loose in his pockets, they are apt to fall out or they may be removed by his wife when she puts his overalls in the wash. Being bright and attractive in color and outline, they excite the insatiable curiosity of youth to a much greater extent than the unattractive-looking powder.

The child may play with a small quantity of blasting powder without getting hurt, and it is unlikely that he would be able to drop a lighted match in a keg of powder, but it is the easiest thing in the world for a youngster to jab a pin or a nail in the open end of a blasting cap or to drop it into the kitchen stove, or hit it with a hammer, or do a number of other easily performed operations equally sure of disastrous results.

These blasting caps may be handled in the manner for which they were designed with practically no danger, but, on the other hand, they are exceedingly likely to explode if probed and a child is almost sure to lose several fingers, a hand or one or both eyes if he jabs a hat pin into the open end or holds a lighted match against it.

How the Permissible Explosives May Even Increase Fatalities

It is heartless and cruel, as well as shortsighted policy to contemplate these possibilities calmly. A child who has been blinded by a blasting cap, or has had a hand blown off, becomes a charge on the community and an expense to the tax-payer. Mine owners can ill afford to neglect their share in preventing these accidents after spending so much money in rendering the miner safe when at his place of work.

When the most progressive and enlightened mine owners go to enormous expense to reduce the number of accidents in their mines and the slogan of the entire industry is "Safety First," surely the prevention of the crippling and maiming of the children of their employees deserves instant consideration. There are over 600 accidents every year—practically all to children—due to the explosion of blasting caps and electric fuses. Unless some steps are taken to stop these articles from being carried home or thrown loosely into the pockets of the miners, this number is liable to increase, because more and more coal mines are abandoning the use of blasting powder and adopting the permissible explosives in order to promote safety.

Just imagine, for an instant, what a mine official would think if he saw his own youngster picking at the fulminate of a blasting cap with a hat pin to extract the explosive, so that the shell could be used as an ornament to a lead pencil. The picture of such an occurrence is not pleasant to contemplate. It is such an easy thing to prevent an occurrence like this, and it is so hard even to partially repair the damage, that no mine operator in his senses, appreciating the necessity for doing his share in preventing the maiming and crippling of children, should weigh for an instant, the trifling cost to him that is involved.

The miners, themselves, should, of course, be educated to do their part. It is not enough to provide a place where they can keep their powder and detonators when not in use, but they should also be warned of the danger of carrying these articles to their homes, and should be prevented, as far as it is possible to do so, from carrying blasting caps and electric fuses loose in their pockets and especially when they go home from the mine.

The Public Schools Will Assure the Safety of the Public

In some of the public schools in the large cities, children are taught how to avoid danger and it is explained to them in detail why they should not play on streets where traffic is heavy, why they should not coast in toy wagons on streets crossing others carrying heavy automobile traffic, why they should not hitch behind ice and other wagons, why they should look to the right on crossing the street until they get to the middle and then look to the left, and they are taught a number of other ways of taking care of themselves.

Would it not be fitting for the public-school teachers in the mining districts, to explain to the children, once in each session, at least, what a blasting cap is, how it is made, and what fearful things it sometimes will do to a child? It would seem that this instruction would be well worth the trouble involved.

* Manager, technical division, E. I. Du Pont de Nemours Powder Co., Wilmington, Del.

Fatality Rates Compared in Coal and Other Mines

An inquiry just completed by Albert H. Fay, mining engineer, of the United States Bureau of Mines, shows that fatal accidents in metal mines in the United States are more numerous in proportion to the number of men employed than are the fatalities in coal mines. Of the 165,979 employed in the metal mines in the United States during the calendar year 1911, 695 were killed, which represents a rate of 4.19 per 1000 men employed, as compared with 3.73 per 1000 for the coal mines of this country for the same period.

Fatality Rate in Metal Mines 12 per Cent. Higher Than in Coal Mines

The total number of fatalities, serious and slight injuries due to accident is as follows: Deaths 695, or 4.19 per 1000 men employed; serious injuries 4169, or 25.12 per 1000; and slight injuries 22,408, or 135.01 per 1000. Of the total number of fatalities, 532 occurred underground, or at the rate of 5.18 per 1000, and 153 were killed on the surface, or 2.49 per 1000.

The figures show that approximately two-thirds of the total deaths and injuries that occur in and about metal mines were caused as follows:

Of the fatal accidents, 32.52 per cent. are due to falls of ore or rock from roof, wall or bank; 11.23 per cent. to explosives; 15.39 per cent. to falling down stope, shaft or winze, and 5.32 per cent. to mine fires.

Of the serious accidents, 31.37 per cent. are due to falls of roof, wall or bank; 19.05 per cent. to car and haulage systems; 12.19 per cent. to machinery, and 6.41 per cent. to timber and hand tools.

Of the slight accidents, 28.86 per cent. are due to falls of roof; 15.52 per cent. to car and haulage systems; 10.10 per cent. to machinery, and 8.02 per cent. to timber and hand tools.

Copper Mine Underground Fatality Rate 6.31 per Thousand

The figures for the copper mines show 396 operators employing 44,693 men, of whom 31,557 were employed underground and 13,136 on the surface. The total number of deaths and injuries due to accidents reported is as follows: Deaths, 238, or 5.33 per 1000 men employed; serious injuries, 1326, or 29.67 per 1000, and slight injuries 9016, or 201.73 per 1000. Of the total number of fatalities, 199 occurred underground, making this rate per 1000 men employed 6.31. The surface fatalities were 39, or 2.97 per 1000.

Iron Mines Kill 5.34 per Thousand Underground Employees

The figures for the iron mines show 207 iron-mine operators, who employed 45,953 men, of whom 25,161 were employed underground and 20,792 as surface men, including those engaged in steam-shovel work. The number of deaths and injuries resulting from accidents in these mines is as follows: Deaths 197, or 4.29 per 1000 men employed; serious injuries 2032, or 44.22 per 1000, and slight injuries 8690, or 188.3 per 1000. Of the total number of fatalities, 136 occurred underground, or 5.31 per 1000 men, and 61 employees were killed while engaged in surface work, making this rate 2.95 per 1000.

In Mississippi Valley Lead and Zinc Underground Workers Have Accident Death Rate of 3.46 per Thousand

The figures for the lead and zinc mines refer only to those in the Mississippi Valley. The lead and zinc mines of other states are grouped with miscellaneous metal mines on account of the difficulty of making a distinct classification, as lead and zinc occur in so many places as associated metals in silver ores, as, for instance, in the lead-silver mines of the Cœur d'Alene district, Idaho. The Mississippi Valley lead and zinc mines form a class by themselves and hence are easily segregated.

The statistics given embody the reports of 483 operators, employing 12,521 men, of whom 9247 are underground employees and 3274 surface men. The total number of deaths and injuries due to accidents is as follows: Killed 43, or 3.43 per 1000 men employed; serious injuries 177, or 14.14 per 1000; and slight injuries 1311, or 125 per 1000. Of the number of men killed, 32 fatalities occurred underground, making this rate 3.46 per 1000 men employed, while 11 men were killed on the surface, or 3.36 per 1000 men.

Fatality Rate at Other Metal Mines Is 3.95 per Thousand Underground

The figures for the miscellaneous metal mines show 3817 operators, employing 48,919 men, of whom 35,176 were underground and 13,743 surface men. The deaths and injuries due to accidents are as follows: Deaths 193, or 3.95 per 1000 men employed; serious injuries 540, or 11.04 per 1000; slight injuries 3078, or 62.92 per 1000. Of the total number of fatalities, 163 occurred underground, or 4.63 per 1000, and 30 on the surface, or 2.18 per 1000.

The rates of serious and slight injuries are low when compared with the iron and copper mines. This may be accounted for in part by reason of the fact that this group includes many prospectors and small mines, which keep no records. Fatal accidents impress themselves on the memory and are easily reported. The serious and slight injuries are soon forgotten if not recorded. Many of these mines are in states where there is no inspection, and they are not required to keep accident records. Many of the larger companies operating gold and silver and lead-silver mines of the West have, for their own protection, hospital service and medical aid for their employees.

Non-metal Mines Are Comparatively Safe

The non-metal mines employed 13,893 men, of whom 3182 were employed underground and 10,711 on the surface. The total number of deaths and injuries due to accidents reported is as follows: Deaths 24, or 1.73 per 1000 men employed; serious injuries 94, or 6.77 per 1000, and slight injuries 313, or 22.53 per 1000. When compared with the copper and iron mines, these ratios seem exceedingly low. Judging from the reports received, this is largely accounted for by the fact that the mines, being small and employing an average of only 12 men each, do not keep complete records. The majority of these mines are in states where there are no state inspectors, and are therefore not obliged to keep accident records and make reports thereon.

The statistics have been published in Technical Paper No. 10. Copies may be obtained by addressing the Director, Bureau of Mines, Washington, D. C.

DISCUSSION BY READERS

Post Timbering at the Working Face

Letter No. 8—I believe in systematic timbering, to a certain extent: but I do not think it would be advisable for the state to pass a law specifying the exact distance that timber should be kept up to the face. Neither do I think it would be possible for the state mine inspectors, to specify the distance the props should be set apart and away from the face, in each seam and at each mine.

While mine inspectors, almost without exception, are practical and experienced men and know the nature of the roof in the different mines they visit, yet in some cases to employ one or two timbermen would be both practical and economical, particularly in view of the many ignorant miners that are now employed. In pillar workings, for instance, it is not economical or well to fill the places with props, especially where these are not taken out, as the pillars are drawn back. At the same time, it would not be safe to go into a place and tell the men they are standing too many props. I have actually seen men go into the gob and stand new props, because some of the old ones were broken under the weight. They actually thought they were doing a wonderful thing and it is often difficult to make them understand that the roof should fall in the waste, in order to relieve the great weight on the pillars.

A timberman, say in each district, would generally save far more than his wages by seeing that the props were properly set and that enough and not too many timbers were stood. How seldom do we go into a place and find the props stood just where we would stand them. They are often too far away from the face, or too far apart. Sometimes, a man anxious to please the boss will stand his timbers so near the face that he cannot work. At times, the props will be set within a foot of the rib where under a good roof they can do no good.

It may not be generally known, but in Durham (England) the deputies (firebosses) set all the timbers, in the face. Each deputy has from 15 to 20 men to look after, and an accident from a fall of roof or coal is a rare occurrence. Of course, the men know enough to stand a prop to keep themselves safe, but it is only stood temporarily till the deputy gets around.

Accidents do not generally occur as frequently under a bad roof, as where the roof is fairly good, because the men are apt to trust a good roof too far. To illustrate this, we were drawing pillars where the roof was short and friable, about halfway up the rooms. Though the miners working there were good careful men we were anxious till they got under good roof again and we thought then all danger was passed, but a few days later a man was killed there by a fall of roof.

Examining the place after the accident, we found the props within 5 ft. of the pillar end, and a piece of rock about 5 ft. across had fallen out and crushed the man's head. No doubt, the rock would sound solid enough when tested, but it was loose. Any old miner can recall similar instances.

I often wonder why there is not more preserved (creosoted) timber used in this country. It lasts three or four times as long as ordinary timber. I have seen such timber still standing that I was told had been there 20 years. It was just as good as when first stood. No doubt it will cost a little more in the first place, but it is far cheaper in the end.

THOS. HOGARTH.

Heilwood, Penn.

Letter No. 9—One peculiar characteristic of the coal-mining industry is that, except in reference to purely mechanical features, no "hard and fast" rule can be given to overcome the various dangers that may arise from time to time. The greatest source of danger is the fall of roof and coal at the working face, which danger is usually met by some form of "posting."

While posting, however, is of prime importance, it is not the only consideration in maintaining a safe condition of the working face. It is equally essential that the development of the mine and the extraction of the coal should proceed in a systematic manner. In coal mining, as in every other industry, systematic work cannot be effective unless applied to all departments alike. The timber supply must be of uniform size and quality, and the timbers must be delivered promptly at the working face where they are required.

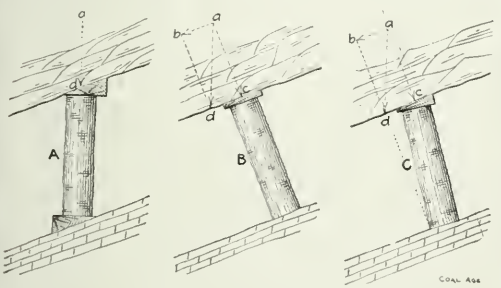
Posts are generally employed for three purposes, or to fulfill three conditions: 1. To make secure a bad and irregular condition of the roof. 2. To give warning of any movement in the roof strata or unsafe condition of the same. 3. To lend support to the roof strata over the opening and assist in the equal distribution of the load on the pillars. Each of these cases may be considered separately.

Before attempting to timber a particularly bad condition in the roof, or a bad piece of top, the place should be thoroughly examined to determine exactly its dangerous character. The person making the examination knows better where and how the several post timbers should be placed. I would not advocate the posting of a working place by men especially employed for that purpose. I believe greater safety can be secured by each miner timbering his own place under the instructions of a competent mine official, as this will make the miner himself responsible for his own safety and amenable to the mine regulations and discipline.

Under the present bituminous-mine law of Pennsylvania (Art. 4, Sec. 10), the foreman or his assistant must visit each working place "once each day while the employees are at work." In addition to this, in gaseous mines, the law requires (Art. 5) that each working place in the mine shall be examined twice each day, once before the men begin work and again during working hours. These several examinations of each working place should afford sufficient opportunity to give every miner the instruction he needs. My theory is that any ignorance on the part of the miner is best combated and overcome by careful inspection and patient instruction.

I consider the following points essential in post timbering: 1. In a level seam, a single post should be stood in a vertical position. 2. If the post is required for the support of the roof strata, it should not be wedged tight; and, in many cases where the roof or floor is hard, it will be necessary to set the post on a soft foot-piece, or a mound of dirt. In this case, the post should be twisted backward and forward to give it a solid bearing. 3. A cap-piece should always be placed above the post. 4. My personal preference is to stand the post with the large end down, as it grew in nature. The number of posts to be stood in a place and their arrangement, the distance apart, and the distance of the posts from the face of the coal, must be determined by the conditions in each place. My experience is that the use of long, heavy caps, or of crossbars, at the working face, will generally reduce the number of posts required.

I consider it generally a dangerous practice to set the first timbers so far from the face of the coal that the miner is unprotected. Under many conditions of the roof, it would be dangerous for the miner to be obliged to work between the posts and the face of the coal. Many accidents have resulted from this practice. Under particularly bad roof, places should be driven narrow and crossbarred. It may be often necessary to hitch the crossbars into the face of the coal, in order to give the miner the necessary protection.



Showing the Right and Wrong Way of Setting Posts In Steeply Inclined Seams

The use of posts for the second purpose mentioned; namely, to give the miner warning of any movement of the roof strata and enable him to escape the danger that threatens, arises in pillar work. When used for this purpose, the posts should be wedged tight, so that they will nip and crack upon the first movement of the roof. In neither of these first two cases can any regular system of setting posts be adopted. The arrangement must always be what the conditions require.

A systematic method of timbering can be adopted with advantage when, as stated in the third case, the purpose of setting posts is to lend support to the roof strata above the opening and distribute the pressure of the overburden evenly on the pillars. In this case, the system to be adopted must be determined by such conditions as the following: 1. The width of the opening. 2. The height of the coal. 3. The nature of the roof and floor. 4. The thickness of the pillars. 5. The location of the road in the room or working place. A system once adopted should be followed closely as long as the conditions remain unchanged.

Posting in an inclined seam differs materially from that in a level seam. In a level seam, the action of the weight of the overburden is vertical or perpendicular to the seam. In an inclined seam of coal, the action of gravity is still vertical; but, owing to the inclination of the seam, the vertical force *ad* is resolved into two resultant forces, the one *ab* parallel and the other *ac* perpendicular to the seam. In this case, the post must resist the action perpendicular to the seam; and, for this reason, must be set more or less at right angles to the floor and roof.

Referring to the figure, it would be obviously wrong to set a post vertical, as at *A*, when the seam is inclined, as in that position it could not be properly fastened but would slip out of place. Neither would it be right to set the post as at *B*, perpendicular to the roof and floor, although that would be in line with the force *ac*. But, the post in an inclined seam must be set, as at *C*, leaning slightly up the pitch, from a normal position.

J. C. Parfitt.

Jerome, Penn.

Letter No. 10—In the mining of coal, in Pennsylvania, the conditions often require a better class of labor than is found in the mines. The majority of miners who apply for work are unfamiliar with the conditions and often untrained. Owing to these facts and since about one-half of the fatal accidents in coal mines are known to be the result of falls of roof or coal, the question of timbering at the working face, is exceedingly important. Owing to the general lack of experience on the part of miners, it might seem best to have the timbering at the working face done by regular timbermen, whose knowledge of the conditions and whose experience would enable them to do the work more efficiently than the miners themselves.

As a matter of fact, however, it is generally better to have the miner do his own timbering, if for no other reason than to avoid his working under dangerous conditions while waiting for the timbermen to appear. Not only should the miner be made to timber his own place, but he ought to be taught to follow a *regular system* that experience has taught is best adapted to the conditions in that particular mine.

Since a general method of timbering that is applicable to one mine may be quite unsuited for another mine, each mine ought to have its own carefully worked-out system, modified to suit its own conditions. There are at least two reasons for not following a regular system of timbering: (1) The roof may be strong enough to require no timber; and, in that case, it would be a waste to set posts where experience has shown they are not needed. (2) Under certain conditions, the miners may be so well trained in timbering, as to render a regular system unnecessary. This latter case, however, is not common.

A regular system of post timbering, however, may be said to have the following advantages: (1) The roof strata are often cut by irregular slips, fault-lines or clay seams. These may draw back from the coal face in such a way that the trouble is invisible to the miner and little danger is anticipated. Under these conditions, the miner is prone to give little attention to the timbering of his place and is often caught by a sudden fall of roof, the break occurring at the face of the coal. Under such conditions, a regular system of timbering is absolutely necessary in order to make the place secure. (2) In a regular system of timbering, posts are set more promptly and

greater safety is secured. A regular system of timbering eliminates the judgment of the miner, and any delay on his part in setting posts is readily observed and condemned. (3) A regular system of timbering affords better opportunity for a rapid examination by the mine officials and inspectors, who can observe at a glance whether the system is being properly maintained. (4) The roof pressure is more evenly distributed and the coal breaks better after mining. (5) The timber is recovered in better shape and not so many posts are left behind in the gob.

M. D. Cooper, Mining Engineer.
Ellsworth Collieries Co.

Ellsworth, Penn.

Sudden Collapse of Working Places

I have been an interested reader of Coal Age from its first issue. The recent discussion on the timbering of the working face gives me the opportunity to mention what I am inclined to believe is one of the most dangerous conditions with which we have to contend in the work of mining coal. I refer to the sudden collapse of a working place without any premonition that would give the miner a chance for his life.

My attention has been attracted to this danger very forcibly by the second occurrence of such a disaster in the Connellsville region, in the last two months. In the first instance, two men were in the place; one was the miner who worked the place and the other a visiting miner, from another portion of the mine. The visitor was caught and killed by the falling roof, after a race for life of about 30 ft. The accident occurred in the rib workings of the mine, where they were drawing back the pillars.

The method adopted for working out the pillars was what is known as a "split." The pillar was supposed to be 31 ft. wide; and a 7-ft. roadway was driven up the center of the pillar, leaving 12 ft. of coal on each side of the road. This road or "split" was about 31 ft. in length and double-timbered from the place of beginning to where it cut through to the goaf or waste. It was the finishing up of an 80-ft. rib that had been crosscut halfway. The original pillar had goaf on its left side (inby) and goaf in front.

Starting at the rear end, the miners had cut through to the goaf in front and had started to make a cut over to the goaf on the left side. They had only gone a distance of 6 ft., carrying a working face or breast 10 ft. wide. In this distance they had set two double-timber frames, at the time the accident occured. The fireboss had examined the place at 3 a.m. and again at 7 a.m. and reported the timbers in good shape. The mine foreman had examined the place again at 10 a.m. and the driver had just loaded a wagon of coal about 30 min. before the accident occurred, which was 11:30 a.m. All these men reported that the place was apparently safe and in good condition, no timbers being broken and there being no indication of a fall.

The miner who was working the place and who escaped said that the only warning they had was the breaking of a post. When the post broke, the miner called to the visitor, "Run!" and they both ran for their lives, the one who escaped being only about 4 ft. in advance of the other man.

The question that presents itself is: What caused this place to suddenly collapse, and is there any way in which the danger can be foreseen and the accident avoided. If good, sound timbers, well set, cannot be depended on to give sufficient warning to allow a miner to make his escape, then what method or what means can be adopted to insure the safety of the workers.

I should have mentioned that the coal was 9 ft. thick, with a tender roof, and about 500 ft. of cover overlaid the coal. I mentioned the place was double-timbered, by which I mean that it was timbered with 5-in. round timbers, forming a three-piece set (two legs and a collar). These frames were set 3 ft. apart and lagged overhead to support the roof between the timbers. Each set of timbers was tightly wedged over the posts and the lagging fitted in snugly. The bottom, or floor, under the posts was hard. When the fall occurred, the timbers were not broken, but thrown out faster than a man could run, for a distance of 30 feet.

I have tried to explain, in detail, the conditions that existed at the time and place of this accident, hoping that some readers may be able to explain the possible cause of the accident and suggest a remedy or means for its prevention.

The second accident of this nature occurred recently in another mine. I am not so familiar with the conditions surrounding this accident, but I am told that the collapse of the roof was so sudden the rib boss and the miner were both killed. There was certainly no indication of immediate danger, in this place, or the rib boss would surely have gone out and taken the miner out with him, which would be his duty if he thought the place was unsafe.

J. H. Lane, Mining Supt.,
Oliver & Snyder Steel Co., No. 3 plant, Uniontown, Penn.

Our Future in the Export Trade

I have read with interest what has been said in Coal Age lately concerning our future in the export business and admit the question has been treated in a masterly way. But, so far, we have not yet heard what the people who might buy American coal have to say about it. American coals are not so unknown abroad that foreigners have not had a chance to form an opinion in the matter.

As a matter of fact, the foreign buyer is acquainted with the analysis, the heating value and the physical qualities of our coals. I was astonished some months ago, at the amount of information on American coal that could be found in some buyers' offices in Paris. As you well know, Paris is a large coal-buying center not only for France, but Spain, Italy, and the whole Mediterranean littoral. All the French railroads also have their headquarters in Paris.

They all agree, in Paris, that we have coals in America that will enable us to compete successfully with any coal coming out of either England, Belgium or Germany. But they complain of our unwillingness or inability to deliver the coal prepared just as they want it and as they have been used to receive it from the English, Germans and Belgians. They also complain of our insisting on being paid against bill of lading when the time-honored Continental custom is ninety days. Even the French Government pays at 90 days.

As far as I was able to ascertain, while on the other side lately, the complaint was general about preparation. There was also a great deal of comment about irregularity in quality, some cargoes having been received which contained coals of widely different analysis. In the same cargo a coal containing less than 20 per cent. volatile matter might sometimes be found in one of the compartments, while coal from another compartment showed 32 per cent. volatile matter.

A cargo of 6200 tons was given as an example of such irregularity. It had been ordered by a French railroad as a sample cargo. The specifications called for a coal with not less than 30 per cent. volatile matters. When the ship reached Marseilles, the coal was inspected on the surface. It was plain that the shipment was made up of two different coals varying widely in looks. One was more lumpy than the other. The more lumpy one was less glossy than the other. Samples were taken and analyzed in the railway's local laboratory. From 18 per cent. in the smaller kind of coal to 37 per cent. in the more lumpy coal, was the difference in volatile matters.

At about the same time, a cargo of American coal intended for some gas works reached a Spanish port. Less than one-half of it was up to the guarantee in volatile matter. The rest of the shipment contained 20 per cent. volatile matter. The sellers had guaranteed a minimum of 32 per cent. These unfortunate affairs were made much of and advertised broadcast. It was even said, probably by competitors' agents, that this was only a fair sample of American business methods and explained why Americans demand payment against bill of lading.

Wide difference in volatile matters is accounted for probably by the fact that the shippers have mines in different seams. It also happens that when a shipper is unable to complete a cargo within the specified time, he gets another shipper to help him make the cargo. In either case, it is carelessness. As to preparation, of which foreign buyers also complain, it may be due either to poor preparation at the mines, or to rough dumping at tidewater.

But, no matter how well a coal is prepared at the mines, it is bound to suffer to a considerable extent when dumped by means of such arrangements as they have at all our tidewater piers, where the aim is fast work. Whether the coal is pulverized or not while being dumped, does not seem to be taken into consideration. English shippers know well they have little to fear from us as long as we continue to load our coals into sea-going ships in the way we do now.

F. C. Cornet,
Mining Engineer.

Charleston, W. Va.

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Study Course in Coal Mining

By J. T. Beard

The Coal Age Pocket Book

THE ATMOSPHERE

The atmosphere is the aërial envelope surrounding the earth. The term is also used to describe the air or gaseous mixture filling any given space; as, for example, the mine atmosphere is the air and gases filling the mine or any portion of the workings.

Atmospheric Pressure—The weight of the air surrounding the earth causes a pressure, which decreases as the height above the surface increases; and the density of the air decreases in like manner, with the elevation above sea level.

Variation of Atmospheric Pressure—Atmospheric pressure varies irregularly with the condition of the atmosphere in respect to storms; the storm center being always an area of lower pressure than that surrounding the storm. In this country, a variation of 2 in. of mercury (say 1 lb. per sq.in.) in atmospheric pressure, in 48 hr., is not uncommon.

There is also a regular daily variation, the pressure attaining a maximum about 10 o'clock and a minimum at 4 o'clock, morning and evening. There is, likewise, a yearly variation, the general pressure reaching a maximum, in the northern hemisphere, in January and a minimum in July.

THE BAROMETER

The Mercurial Barometer—The pressure of the atmosphere is measured by the height of mercury column it will support against a vacuum. The mercurial barometer is a glass tube, about 36 in. long, closed at one end. This is first filled with mercury and then inverted, the open end being immersed in a basin of the same liquid, the mercury in the tube will fall to a height above the surface of that in the basin, such that the pressure of the atmosphere acting on the surface of the liquid in the basin will support.

Barometric Pressure—The pressure of the atmosphere expressed in inches of mercury is called the barometric pressure. For example, at sea level, the atmospheric pressure will commonly support 30 in. of mercury column, or is equivalent to a barometric pressure of 30 in.

Calculation of Barometric Pressure—One cubic inch of mercury (32° F.) weighs 0.49 lb. A barometric pressure of 30 in., therefore, indicates an atmospheric pressure of

$$0.49 \times 30 = 14.7 \text{ lb. per sq. in.}$$

which is the normal pressure at sea level.

Calculation of Water Column—The height of water column, in feet, the atmospheric pressure will support is found by multiplying the pressure (lb. per sq.in.) by 2.3, or dividing the same by 0.434. Or the barometric pressure, in inches, multiplied by one and one-eighth will give the equivalent water column, in feet. For example, at sea level,

$$14.7 \times 2.3 = 33.8, \text{ say } 34 \text{ ft.}$$

$$30 \times 1\tfrac{1}{8} = 33.75, \text{ say } 34 \text{ ft.}$$

The Coal Age Pocket Book

SPECIFIC GRAVITY

The specific gravity of a substance—solid, liquid, or gas—is the ratio of the weight of that substance to the weight of another substance taken as a standard, volume for volume;

$$Sp.gr. = \frac{wt.\ of\ unit\ vol.\ of\ substance}{wt.\ of\ unit\ vol.\ of\ standard}$$

Standard for Gases—The standard adopted for gases is air, of the same temperature and pressure as the gas.

Standard for Liquids and Solids—The standard adopted for liquids and solids is water at maximum density. Except where great accuracy is desired, the weight of 1 cu.ft. of water is taken as 62.5 lb. Exactly, 1 cu.ft. of pure water, at maximum density weighs 62.4283 lb.; or 1 cu.in. weighs 252.89 grains = 0.03613 lb.

Use of Specific Gravity—To find the weight of any volume of a substance, multiply the unit weight of the standard, by the specific gravity of the substance, and that product by the given volume, or, expressed as a formula,

$$Wt. = unit\ weight\ of\ standard \times sp.gr. \times vol.$$

For example, taking the average specific gravity of anthracite coal as 1.5 the weight of this coal underlying 1 acre (43,560 sq.ft.) of land for a thickness in the seam of 1 ft.; or, as we say, per foot-acre, in long tons (2240 lb.) is

$$\frac{62.5 \times 1.5 \times 43{,}560}{2240} = 1823\ long\ tons$$

Or, taking the weight of 1 cu.ft. of air (60° F., bar 30 in.) as 0.0766 lb., since the specific gravity of carbon dioxide (CO_2) is 1.529, the weight of 100 cu.ft. of this gas is

$$0.0766 \times 1.529 \times 100 = 11.712 + lb.$$

Calculation of the Specific Gravity of Gases—The specific gravity of a gas can be calculated by dividing one-half of its molecular weight by 14.4. For example, the molecular weight of carbon dioxide is 44; therefore, $44 \div 2 = 22$, and $22 \div 14.4 = 1.528$. The actual specific gravity is 1.529.

Finding Specific Gravity of Gases—A glass globe, any convenient size, is first weighed empty (air exhausted), w; then full of air, w_1; and, lastly, filled with the gas, w_2, the temperature and pressure remaining constant.

$$Sp.gr. = \frac{w_2 - w}{w_1 - w}$$

Finding Specific Gravity of Liquids—A glass-stoppered bottle is first weighed empty, w; then filled with water w_1; and, lastly, filled with the liquid, w_2. The specific gravity is then calculated by the above formula for gases. Or, the specific gravity is determined by a graduated float (hydrometer).

Finding Specific Gravity of Solids—Weight of the solid in air, w; weight immersed in water w_2. The weight of the water displaced is then $w - w_2$, which is the same volume as that of the solid

$$Sp.gr. = \frac{w}{w - w_1}$$

EXAMINATION QUESTIONS

Ventilation

Ques.—What is meant by the "equivalent orifice," in fan ventilation?

Ans.—The term "equivalent orifice" is used to describe an opening in a thin plate, that will allow the given quantity of air to pass under the same pressure as is producing that quantity in the mine. The area of this opening is called the equivalent orifice of the mine. In the same way, the equivalent orifice of the fan is the area of opening through which the given volume of air would pass under the pressure absorbed by the fan.

Ques.—Explain the meaning of the term manometrical efficiency, as used in fan ventilation in estimating the efficiency of the fan.

Ans.—The term, manometrical efficiency, has been used to describe the ratio of the actual water gage produced by a fan at a given speed, to the theoretical water gage calculated by the formula

$$w.g. = \frac{1.2 \times 1^2}{1000} \times \frac{u^2}{g} = 0.0144 \times \frac{u^2}{g}$$

The above formula merely expresses the theoretical water gage, which it is assumed a fan whose tip speed is u will produce. It must be remembered, however, that the water gage produced is determined by the mine resistance and not by the fan. Cut off the mine, and there is no resistance or water gage. On the other hand, increase the mine resistance and the water gage is increased, for the same size and speed of fan. For this reason, the term manometric efficiency has no particular value, with respect to the fan alone.

Ques.—If 60,000 cu.ft. of air per min. is passing through an airway, under a pressure of 6.954 lb. per sq.ft., what will be the size of the opening in a regulator placed in this airway, to reduce the volume of air to 15,000 cu.ft. per min.?

Ans.—It is first necessary to find the natural pressure, or the pressure due to friction when 15,000 cu.ft. of air are passing in this airway. Since, for the same airway, the pressure varies as the square of the quantity of air in circulation, the pressure ratio is equal to the square of the quantity ratio. Calling the required pressure x, we have

$$\frac{x}{6.954} = \left(\frac{15{,}000}{60{,}000}\right)^2 = \left(\frac{1}{4}\right)^2 = \frac{1}{16}$$

$$x = \frac{6.954}{16} = 0.434 \; lb. \; per \; sq.ft.$$

The pressure due to the regulator is now found by subtracting this natural pressure from the original pressure, which is assumed to remain constant; thus, 6.954 — 0.434 = 6.52 lb. per sq.ft. The opening required in the regulator to pass 15,000 cu.ft. of air per min. under a ventilating pressure of 6.52 lb. per sq.ft. is then

$$A = \frac{0.0004\,Q}{\sqrt{w.g.}} = \frac{0.0004 \times 15{,}000}{\sqrt{6.52 \div 5.2}} = 5.35 \; sq.ft.$$

Ques.—A fan is 16 ft. in diameter and, running at a speed of 150 r.p.m., is passing 16,500 cu.ft. of air per min., under a water gage of 4 in. What is the equivalent orifice of the fan?

Ans.—First find the tip-speed u of the fan; thus,

$$u = \frac{3.1416 \times 16 \times 150}{60} = 125.66 \; ft. \; per \; sec.$$

The theoretical water gage of this fan at the given speed, is then

$$w.g. = 0.0144 \frac{u^2}{g} = \frac{0.0144 \times 125.66^2}{32.15} = 7.07 \; in.$$

The manometric efficiency, under these conditions, is therefore

$$K = \frac{4 \times 100}{7.07} = 56.57 \; per \; cent.$$

Now find the equivalent orifice of the mine, thus

$$O_m = \frac{0.0004\,Q}{\sqrt{w.g.}} = \frac{0.0004 \times 16{,}500}{\sqrt{4}} = 3.3 \; sq.ft.$$

The equivalent orifice of the fan is then calculated by the formula

$$O_f = \sqrt{\frac{K}{1 - K}}\, O_m = \sqrt{\frac{0.5657}{0.4343}} \times 3.3 = 3.76 \; sq.ft.$$

Ques.—At a certain mine, there is installed a ventilating fan operated by an electric motor. The fan is producing 300,000 cu.ft. of air per minute, against a water gage of 4.2 in. The wattmeter registers 145 kw. for each of the two motors, or a total of 290 kw., in the fan house. At the power plant, one mile from the fan house, the meter registers 330 kw. What is the mechanical efficiency of the fan?

Ans.—The power lost in transmission is 330 — 290 = 40 kw.; or, 40 × 100 ÷ 330 = say, 12 per cent. of the power generated. At the fan house, it may be assumed that the efficiency of the motors is, say 95 per cent., which makes the power applied to the fan shaft, 0.95 × 290 = 275.5 kw.; or, 275.5 × 0.746 = 205.5 hp.

The horsepower on the air is

$$H = \frac{300{,}000 \times 4.2 \times 5.2}{33{,}000} = 198.5 \; hp.$$

According to these data, the mechanical efficiency of the fan is

$$\frac{198.5 \times 100}{205.5} = 96.5 \; per \; cent.$$

This is a very high efficiency for a ventilating fan. It may be that there were some factors assisting the ventilation in the mine that were unaccounted for, and that these operated to produce the high efficiency registered. It often happens, in conducting a fan test under mining conditions, that certain air columns, caused by the artificial heat of steam pipes in the shaft or slope, or the natural heat of the mine in dip workings, are powerful factors that must be considered in ascertaining the efficiency of the ventilator.

COAL AND COKE NEWS

Washington, D. C.

Under the present coal contracts made with the Isthmian Canal Commission, which have eighteen months to run from April, the present price of coal is about $4.09, plus the cost of discharging and other incidental items, the tidewater price being $2.70 and the transportation $1.39. The competitive price with the Government price will depend on the short haul from the United States, the proximity of supply to the canal and the means of getting it to the isthmus.

The efficiency of the uptodate vessels of the Government must be taken into consideration. It is understood that in the event of the free toll clause of the Panama act being repealed the Government may itself run a line of steamships through the Canal, which may act as a rate regulator against railway-owned steamship lines.

In this connection a memorandum recently issued by the Isthmian Canal Commission is of much significance as outlining the policy of the Government in regard to applications received from coal companies and fuel oil companies in reference to establishing private coal and oil depots on the Isthmus to supply shipping passing through the Panama Canal. The memorandum says, in part:

The act of Congress approved Aug. 24, 1912, authorized the establishment of Government plants for coal, fuel oil, etc., for supplying shipping, and steps are being actively taken to start the construction of the same. It is not, however, intended to prevent private interests doing business in the Canal Zone as regards selling coal and fuel oil to shipping.

Under the so called Taft agreement with Panama, coal and fuel oil may be brought into the Canal Zone by individuals and companies without the payment of duty to Panama.

It is estimated that oil can be, if required, transferred from one terminus of the canal to the other by pumping through a pipe line cheaper than by being carried across in oil vessels and paying canal tolls. Transportation of coal across the isthmus will probably be cheaper by vessel, including payment of tolls, than by railroad.

It will be the policy of the United States to retain complete control of the terminals, water frontage and transportation by land and water across the isthmus.

It will not be the policy of the United States to attempt to monopolize the fuel business, and every possible means will be taken to encourage the establishment of private coal and fuel-oil depots on the isthmus under proper conditions.

Under the conditions of a revocable license, it is doubtful whether an individual or company would be warranted from a business standpoint in making a large expenditure for dredging, wharf construction and similar improvements. From the standpoint of the canal, the duplication of such independent and separate improvements, the cost of which will have to be absorbed eventually by the selling price of coal and fuel oil, is not desirable whether suitable locations can be found and assigned for this purpose or not.

The Government plants are being laid out so as to afford ample wharf room and to provide ample modern coal-handling machinery for unloading colliers into the coal pile and reloading coal to lighters or barges. Likewise the Government fuel-oil plants will ultimately be combined with the Government coaling plants so far as wharfage is concerned. At Cristobal it is proposed to temporarily fit up docks 13 and 14, near the Cristobal dry-dock shops, with oil pipes and pumping plants in duplicate until the permanent combined coaling and oiling wharves are completed.

So far as coal is concerned, it has been decided to set aside a certain ground area that will be served by the coal-handling machinery with the same convenience as the area occupied by the Government coal pile for the storage of the different coal piles of individuals and companies.

This arrangement will obviate the necessity of any dredging, wharf construction, or purchase of coal-handling machinery by private owners and companies, and at the same time will enable them to obtain the benefits of the rapid coal-handling machinery to be purchased by the United States. It is expected that the Government coaling plant will be in operation before Jan. 1, 1915. Suitable temporary arrangements will be made to take care of any business originating before the permanent plant is completed.

With the large number of coal and fuel-oil lighters and barges at each terminus of the canal that will be maintained by the United States, the purchase and use of additional barges and lighters by individuals and companies will probably be unnecessary, for the United States will be in a position to make a price on lightering coal for individuals and companies in its own lighters that will result to the advantage of all parties concerned.

Any taxes levied in connection with private coal and oil depots will have two purposes in view for the interests of the canal: First, to reduce the unnecessary duplication of plant; and, second, to encourage the carrying of large stocks of coal and oil. To accomplish this, there will be a tax based upon the cost of improvements which would enable revenue to be derived in proportion to the investment made, which will probably be 1 per cent. per annum on the cost of improvements.

Inasmuch as the storage of large amounts of coal and oil on the isthmus should be encouraged, a tax similar to the present merchandise tax would not be satisfactory, as it would tend to discourage same. In lieu of a merchandise tax, therefore, a tax of about one per cent. on the sales of coal and fuel oil by individuals and companies within the limits of the canal will be levied. This tax will probably be 1¼c. per barrel of oil, and 5c. per ton of coal of 2000 lb.

Report on Coal Prices

The full text of the report on anthracite coal prices prepared by the Department of Commerce and Labor as the result of a House resolution passed some months ago, has just became available. In brief the most important of the results are as follows:

The increase in wholesale prices, as measured by the net receipts from sales of anthracite coal by the operators since the agreement of May 20, 1912, amounted to an average of 25.82c. per ton, if the prices existing in June, July, August and September, 1911, are compared with the prices realized during the same months of 1912. On this basis of comparison the average increase in the price of sizes of coal prepared for domestic consumption amounted to 31.23c. per ton and the average increase on pea coal and the smaller steam sizes amounted to 16.14c. per ton.

This increase was in part due to the unusually active demand for coal in the summer of 1912 and cannot properly be assumed to be a permanent increase. It seems to consider as the probable permanent increase the advances in the circular prices asked for coal. A weighted calculation of the average increase in the circular prices of the Philadelphia & Reading Coal & Iron Co. for the prepared sizes of white-ash coal shows that the average increase at tidewater was 34.3c. per ton and on sales for railroad shipments 23.2c. per ton. The average for all sales (allowing 25 per cent. of the total shipments for tide water sales in accordance with the results of 1911) was 26c. per ton on the prepared sizes. No similar calculation can be made for the steam sizes, since no circular prices are ordinarily issued to cover steam sizes at tidewater and even when issued have little significance.

Furthermore, the discounts on prepared sizes of 50 and 40c. a ton customarily allowed in April and May, respectively, were suspended in April and May, 1912. As a result the operators gained not only by selling their prepared sizes of coal during these two months at 40 or 50c. more per ton than during the corresponding months of 1911, but, in addition, the purchasers, who were unable to secure their customary supply of coal during April and May, were forced to buy it either during June, July or August, when the regular discounts were smaller, or in September and the later months when the full circular prices are charged.

The coal companies in 1912 received through the general increase in prices and through the suspension of discounts about $13,450,000 more than they would have received for the same tonnage at the prices previously existing. Of this amount about $10,900,000 was derived from the general increases in prices, and about $2,550,000 from the suspension of April and May discounts. In addition, a limited number of operators received immense sums through the sale of coal at premiums made possible by the shortage of shipments.

These amounts, it should be understood, do not represent the amount of increases in net profits to the operators, because out of these increased receipts had to be paid the cost of the six weeks' cessation of work in April and May, and also the increase in the wages of employees resulting from the settlement of May 20.

The reasons presented by the anthracite operators for these increases in prices are that they were necessary to cover (a) the advance in the wages of their employees resulting from the agreement of May 20, 1912, and (b) the various increases in the costs of production which have taken place between 1902, the date of the last general increase in prices, and 1912, largely as a result of increasingly difficult physical conditions of mining, increases in taxes and more stringent mine laws.

The anthracite mine workers were benefited by the agreement of May 20, 1912, not only through a net increase in their wage rates, which averaged 5.6 per cent., but through the concession of certain working conditions which were considered of importance, though they cannot be measured in terms of money. An additional item of importance to the miners was the partial recognition of their organization, both in the negotiations and in the form in which the agreement was signed. The advance of 5.6 per cent. in mine-workers' wages represents an average increase of 9c. per ton in the cost of producing coal, and on the basis of the shipments from June to December, 1912, amounted in round numbers to $4,000,000.

PENNSYLVANIA

Anthracite

Scranton—Suit has been commenced by the Lackawanna Coal Co. against the People's Coal Co. to restrain the latter from continuing to mine coal at the Oxford colliery. The grounds given are that the defendant company has been mining outside the boundaries of its lease and, further, that it is mining recklessly. It is charged that the People's company is taking out all the supporting pillars and endangering property in West Scranton is endangered.

Pottsville—Upward of 700 or 800 employees are on strike at the Philadelphia & Reading Coal & Iron Co.'s Otto colliery at Branchdale. Not a wheel is turning at the colliery and only those necessary to keep the fires and pumps going are on the job. The output is about 100 tons per day.

As a result of a mine accident, Mar. 20, at the Blackwood colliery three men were injured while working in the gangway. A loaded ear was pushed up the incline and somehow or other it got away and jumped the track.

Wilkes-Barre—The Avondale Colliery of the D. L. & W. Coal Co., which has been closed since Feb. 25, was opened on Wednesday, Mar. 26. The colliery was closed down on account of a strike among the workmen, and remained closed until repairs had been made by the company.

Thirty members of the Industrial Workers of the World, employed at Jermyn & Co. collieries at Old Forge, were notified by the company that they must join the United Mine Workers or quit their jobs. They have been given three weeks to comply with this order. The company officials say they will not stand for two rival unions.

Carrolltown—The coal tipple of the Blaine Coal Co. has been destroyed by fire. The blaze caused a $13,000 loss. It is expected that the mine will be tied up for six weeks. Four hundred men are idle.

Du Bois—On Mar. 24, the mines of the North-Western Mining Exchange Co., a corporation, subsidiary to the Erie R.R., were still idle, and were commencing their sixth week of inactivity. It will be recalled that they quit work on Feb. 10 because the company refused to make the dump pan self-cleaning. After two weeks' idleness, the men returned to work on an agreement. After four days the company, ascertaining that it was getting short weight, closed down to change the pan. This suspension was to last three weeks. The company repaired the mine but did not work on the pan till last week.

Brockwayville—The F. A. Lane mine is worked out. In 40 years it has never had an accident, but its production at no time was much over 100 tons per day. For many years it had no railroad connections. There is another seam and the company expects to open it and dump the coal over the present tipple.

Punxsutawney—L. M. Furniss, state mine inspector, caused the arrest of seven foreign miners in Indiana County, charging them with neglecting to use sprags under their coal and failing to make a proper examination after a blast. They were brought before James A. Crossman, justice of the peace, and fined $1 and costs in each instance.

WEST VIRGINIA

Moundsville—One hundred and fifty miners spent the night of Mar. 20 in the mine of the Mound Coal Co. because of a breakdown in the shaft. The shutdown was caused by the dropping of the cage, which put the hoisting machinery out of commission. Since this shaft is the only entrance to the mine the men were forced to remain below until the necessary repairs could be made.

The Parrs Run Coal Co.'s mine was partially destroyed by fire, Mar 19. The loss will probably reach the $5000 mark, and is fully covered by insurance. Officials of the company state that it will probably be two months before the mine will again be put in operation. The cage fell a distance of over 400 ft. When the new cables arrive this will be raised and repaired. The mine employs about 100 men. Many of these have secured employment in the various mines of this section, but the remainder, in all probability, will be out of employment until the mine resumes.

Fairmont—Considerable damage was caused at the Middletown operations of the Consolidation Coal Co. when four company houses were destroyed by fire. The loss is estimated at about $7000. The houses were all insured and it is announced that they will be rebuilt at once. The fire was caused by sparks from a passing engine.

Charleston—Governor Hatfield has ordered the unconditional release of 10 of the 49 prisoners before the military commission. "Mother" Jones and other leaders were not released.

The Black Cat coal tipple, near Crown Hill, and a tipple at the Maban mine on Paint Creek were burned Mar. 16. It is supposed that the fires were of incendiary origin.

KENTUCKY

Henderson—One hundred and thirty miners were imprisoned Mar. 18 in a coal mine of the Pittsburgh Coal Co. at Basketts because of a cave-in which clogged the mouth of the shaft. Reports state that there were no fatalities.

Louisville—A terrific wind storm passed over this city Friday, Mar. 2. The Consolidated Coal Co. suffered the loss of fourteen barges, tied up at Port Fulton, on the Ohio river near Louisville, which were blown loose and sunk by the storm. Each was loaded with 17,000 bushels of coal, worth about $10,000. The company also lost a pump boat valued at $2500. It may be possible to recover some of the coal by dredging, and perhaps to raise the barges. A number of other barges on the river were torn from their moorings, but were recovered without damage.

VIRGINIA

Norton—The Norton Coal Co.'s store in the coalfields which adjoin the Harlan and other eastern and southeastern Kentucky coalfields, was recently destroyed by a fire. The total loss was about $25,000, and of this only $8000 was covered by insurance. The coal company's store is to be rebuilt at once.

OHIO

Columbus—A bill has been introduced in the Ohio senate by Senator Moore of Jefferson County proposing to relieve a situation said to prevail extensively in mining sections of the state. The situation has to do with the instances wherein a farmer may have coal under his land, but finds himself completely surrounded by big interests that have bought up all the holdings. The farmer often finds himself unable to market his coal because of inability to get an outlet and thus is forced to sell his lands at a sacrifice. The Moore Bill would permit the owner of the land in such a circumstance, to condemn an outlet and pay for the appraised damages.

INDIANA

Brazil—Two hundred and fifty miners of Coal Bluff, together with sympathizers from surrounding towns attempted to mob John Beck, mine boss at the Monkey mine of the Clay County Block Coal Co. recently. Beck's alleged preference for Brazil miners is given as the cause of the outbreak.

Princeton—A temporary agreement has been made on the powder question at the Ft. Branch mine, where an explosion occurred recently. The state mine inspectors demanded that a new patent explosive be used instead of black powder. The company opposed the order and the mine was shut down. The new explosive is to be given a thirty-days' trial.

Dugger—Nine men were injured, four seriously, in an explosion of gas, Mar. 22, in Superior Mine No. 10. The mine belongs to the Vandalia Coal Co. Only 14 men were at work, cleaning up in preparation for opening again Monday. Usually there are 300 to 400 at work. The men injured suffered from burns and inhalation of flames and poisonous fumes. Two of them were taken to the hospital at Terre Haute.

ILLINOIS

Auburn—Two explosions in separate parts of the Solomon mine on Mar. 11 caused a serious injury to four miners. Officials of the mine are at a loss to find an explanation for the twin accidents, which occured a mile apart. The explosion extinguished the men's lamps and left them in the dark. It was some time before the rescuing party was able to locate the injured men and bring them to the surface.

OREGON

Portland—According to a newspaper article from Fossil, Ore., Anthony Mohr was at that place about a week ago and secured leases on coal lands wanted by the Pennsylvania Coal Co. The clipping from a Fossil newspaper says that Mr. Mohr is of the opinion that the fields he has leased are the most extensive in the West. The report also states that he has spent months in exploring them.

FOREIGN NEWS

A new company, of which Sir Owen Phillips, chairman of the Royal Mail Steam Packet Co. is a director, intends to establish a fueling station at Colon where the steamship company owns a pier, this property having been granted to it 60 years ago. The Packet Co. also owns an island not more than one hour's sail from Panama in the Pacific Ocean.

Bochum Germany—A sudden fire broke out, Mar. 19, in the President colliery cutting off the superintendent of the mine and an unknown number of miners. The fire started close to the main shaft and spread rapidly. Gangs of rescuers found the dead body of the superintendent at the bottom of the shaft. Later in the day they brought out all the miners alive and unhurt.

London, Eng.—It is understood that on behalf of a powerful syndicate D. A. Thomas, chairman of the Cambrian Trust, will soon proceed to the United States in order to complete the negotiations for the purchase of coal mines there, which he entered into during his visit to several American coaling centers in January last. It is feared here that the opening of the Panama Canal will to some extent decrease the export movement from the United Kingdom, particularly from South Wales to ports on the west coast of North and South America, but by the acquisition of coal fields on the other side of the Atlantic Mr. Thomas and those associated with him will be in a position to secure a big share of the supply.

PERSONALS

D. A. Thomas has completed in South Wales, since his recent visit here, a combination of several collieries, capitalized at $10,000,000. These mines produce nearly four million tons, and the output will be increased to six million.

Arthur E. Nelson has been appointed district sales agent of the Consolidated Indiana Coal Co., with headquarters at 403 Traction Terminal Building, Indianapolis. Mr. Nelson is in general charge of the sale of the company's coal in the State of Indiana, vice Frank Ragan, resigned.

J. G. Smyth, manager of the Consolidation Coal Co.'s operations at Jenkins, Ky., has been appointed chief engineer and expects to leave for Fairmont, W. Va., to take up his new work. E. Drennen, who has been superintendent of the power and mechanical department, at Jenkins, will become manager.

J. W. White, engineering salesman for the Jeffrey Mfg. Co., located until recently at their Athens, Ohio, offices, has been transferred to Duluth, Minn. Mr. White will look after the sales work of the above company in eastern Minnesota, northern Wisconsin, and the entire Upper Peninsula of Michigan. His headquarters will be 1905 East Superior St., Duluth, Minn.

CONSTRUCTION NEWS

Pottsville, Penn.—The Locust Mountain Coal Co. has awarded the contract for the erection of a new breaker.

Birmingham, Ala.—The Tennessee Coal, Iron & R.R. Co. has made an appropriation of $100,000 for the opening of a new coal mine near Blocton.

Punxsutawney, Penn.—The coming summer will see the work of building two hundred new coke ovens at Sykesville by the Cascade Coal & Coke Co. completed.

Erie, Penn.—The Pennsylvania R.R. Co. will build a dry dock, coal and ore docks and track extensions at the harbor of Erie. It is said that these improvements will cost in the neighborhood of $1,000,000.

Duluth, Minn.—The fourth immense coal dock to be constructed in Duluth will be erected this summer by the Berwind Coal Co., at a cost of $500,000. The dock will have a storage capacity for about 500,000 tons of coal.

Pittsburgh, Penn.—The Erie & Northern R.R., of Ontario, Canada, is perfecting plans for a new and more direct route for bituminous coal into the Canadian markets. New lines of car ferries from Erie, Penn., to the north shore of Lake Erie are planned.

Uniontown, Penn.—The W. Harry Brown Coke Co. is arranging for the erection of several hundred ovens on the Weltner farm, just opposite Masontown in Greene County. Some six weeks ago the Brown company purchased about 1000 acres of coal from J. V. Thompson.

Vger, Calif.—The Vreka Development Co. is proceeding systematically with the work of opening up its vast field of lignite coal near here. The company has 3000 acres of coal beds. J. E. Gamble, general manager, is prospecting the whole area thoroughly. W. W Barham is president of the company.

Johnstown, Penn. The Atlantic Coal Co., which has extensive operations in the Boswell field, is sinking test holes in an entirely new field in Black township and it is expected will start a new operation this year. Wilson Creek branch of the Baltimore & Ohio R.R. is to be extended into the territory that will be developed.

Lima, Ohio—Ground has been broken for the erection of a modern $25,000 coaling station for the Lake Erie & Western R.R. The work of completion will be pushed with all possible rapidity and will be completed not later than Sept. 1. Only steel and concrete will be used in the construction work. Steam hoisting engines will be installed.

Cincinnati, Ohio—A syndicate headed by John B. Farwell, of Chicago, is to build a railroad between Tucumcari, N. M., and Rotan, Tex., with a branch line to the Dawson coal fields in New Mexico. Ohio and Pennsylvania coal men and capitalists are interested in the project and have bought up more than one million acres of land in western Texas.

Tamaqua, Penn.—The Kaska William colliery of the Alliance Coal Co., has closed down for extensive repairs both inside and out. It is expected that these will require about a month to complete. The improvements which have been under way at this colliery are progressing satisfactorily and within a short time the output will be greatly increased.

Huntington, W. Va.—Work on the Beaver Creek extension of the Big Sandy division of the Chesapeake & Ohio railroad must begin not later than Apr. 1 under the terms of a contract entered into by the Chesapeake & Ohio with the Beaver Creek Consolidated Coal Co., before the holdings of that corporation were taken over by the Elkhorn Fuel Co.

Pittsburgh, Penn.—The Miller Construction Co. has commenced the construction of a two-mile branch of the Buffalo, Rochester & Pittsburgh R.R., from Craigsville, Penn., into Butler County. The purpose of the line is to tap the limestone and coal fields along Buffalo Creek and the lower part of Butler County. The line will be completed this summer.

Columbus, Ohio—The Hocking Valley Ry. Co. has awarded the contract for the extension of a branch line through Kerr's Run into what is known as Nease settlement in the Pomeroy Bend mining district. The work will be started at once unless obstructed in obtaining the right-of-way. The proposed line will open a large coal area east of Hamden, Ohio.

Kittanning, Penn.—The Allegheny River Mining Co. one of the Shawmut interests is about to build 100 new dwellings for miners on Furnace Run, three miles above this town on the right bank of the Allegheny. The new tipple is rapidly nearing completion and within 30 days it is hoped that coal will be dumped over it. Two new motors will be taken into the mine on Saturday.

Grafton, W. Va.—Work was started recently to construct a second coaling plant near Independence, that will develop the large tract of valuable coal land owned by Madame DeBiliers. Messrs. Late, of Clarksburg, and Irving, of Pittsburgh, have now leased the DeBiliers property and have been working for several weeks making tests of the coal and preparing for beginning active construction of a coal plant.

Superior, Wis.—Work has been started on the improvements at the Hanna dock. When completed this work will represent an outlay of $500,000. A contract for the superstructure has been awarded to the Mead-Morrison Construction Co. of Chicago. Other contracts calling for dredging and crib work are pending. The improvements will be made on a 12-acre tract recently acquired by the Hanna company at a cost of several thousand dollars. When all improvements have been completed the dock will have a handling capacity of over one million tons annually, an increase of 350,000 tons.

NEW INCORPORATIONS

Donaldsonville, La.—The Consumers Coal Yard & Supply Co.; capital stock, $10,000. President, R. N. Sims.

Clarksburg, W. Va.—Fifty-foot Fuel Co., was incorporated with a capital stock of $25,000 to develop coal lands.

St. Louis, Mo.—The Imperial Coal Co.; capital stock, $8000. Incorporators: D. G. Jackson, F. S. Suerer, and B. E. Hefter.

Hopkinsville, Ky.—The West Kentucky Fuel Co., capital stock, $5000. Incorporators Paul Winn, Sam Winn and James Breathitt.

St. Louis, Mo.—The Universal Smokeless Fuel Co.; capital stock, $50,000. Incorporators Jas. M. Moran, Asa A. Loudon, and Alfred Mueller.

Vadalusia, Ala.—The Black Warrior Mill Co. has been incorporated with a capital stock of $100,000 to install sawmills and develop coal and timber lands.

Cincinnati, Ohio—The Cleveland & West Virginia Coal Co.; D. F. Bevington, C. F. Becker, L. E. Bevington, A. C. Becker and J. E. Matthews, all of Cleveland, Ohio.

Montgomery, Ala—Cahaba Central Coal Co. of West Blocton was incorporated by the Secretary of State, Mar. 12.

Capital stock, $20,000. Incorporators: W. R. Young and G. W. Randall.

Pueblo, Colo.—The Cañon City Coal & Development Co.; capital stock, $100,000; to mine coal and develop coal properties. Incorporators: Joseph Walton, Mrs. Joseph Walton and L. A. Wieland.

Chattanooga, Tenn.—The Tennessee Coal & Coke Co.; capital stock, $100,000; to mine coal in Hamilton County. Incorporators: J. F. Walters, L. N. Spears, W. D. Spears, G. D. Lancaster and M. O. Cates.

Nashville, Tenn.—The Hazel Creek Coal Co.; capital stock, $120,000; to mine, sell and deal in coal, ore and minerals; to bore for oil, etc. Incorporators: C. C. Christopher Lee Brock, John H. Carpenter, A. R. Hill and L. A. Powers.

Philippi, W. Va.—The Meriden Coal & Coke Co.; capital stock, $3,500,000. Incorporators: William P. Hurst, Harvey R. Hurst, Richard H. Parker, James R. Hurst, of Scottsdale, Penn., and Fuller Hoggsett, of Uniontown, Penn.

Logan, W. Va.—The Island Creek Colliery Co.; mining coal; capital stock, $50,000. Incorporators: H. M. Vest, Welch, W. Va., P. A. Grady, Roderfield, W. Va., Fred C. Prichard, Rufus Switzer and Thomas A. Wiatt, of Huntington, W. Va.

INDUSTRIAL NEWS

Rich Hill, Mo.—F. A. Griffin will develop 1000 acres of coal property, and is preparing to sink a shaft.

Toledo, Ohio—It is rumored that a gas well, estimated to flow more than 30,000,000 cu.ft. per day, has been drilled near Butler, Penn. The well started with 700,000 cu.ft. daily but after it had been cleaned out the great flow began.

Coshocton, Ohio—A bed of coal seven feet in thickness has been discovered on the Leander McVey farm in the Mohawk-Walhonding vicinity. Work of developing will be begun at once.

Pittsburgh, Penn.—It is reported that J. P. Morgan & Co. have concluded negotiations with Col. J. M. Guffey for the purchase of 100,000 acres of West Virginia coal land. The price paid is said to be $10,000,000.

Connellsville, Penn.—A mine, which has been operated until 1909 by the Ashville Coal & Coke Co., has been reopened under the direction of C. P. Burtner, of Altoona, and is now producing coal.

Reading, Penn.—The Philadelphia & Reading Coal & Iron Co. has started storing coal at Landingville. About 200 carloads are dumped daily. This is the first attempt to store coal for nearly a year.

Chicago, Ill.—The Susquehanna Coal Co. of Pennsylvania has acquired a tract of 24 acres of land at the corner of Muskegon Ave. and 116 St. which is to be used eventually as a coalyard. The price paid is said to have been in the neighborhood of $75,000.

Birmingham, Ala.—Judge Grubb has taken under advisement the petition filed by the trustees of the Alabama Consolidated Coal & Iron Co. asking for an order of sale for the properties of the company. It is probable that his decision will be announced Mar. 22.

Brownsville, Penn.—The Pike mine, owned by the People's Coal Co., will be sold to the Jones & Laughlin interests. This mine, which is located close to the Brownsville borough line, has been idle for nearly three years. The mine will employ about 200 men.

Birmingham, Ala.—The Tennessee Coal, Iron & R.R. Co. has struck coal in the slope sunk for the development of their No. 16 Pratt mine, on the Birmingham Southern R.R., about 10 miles northwest of Birmingham. The town at this point will be called Bayview.

Batavia, N. Y.—Within the last few days there has been considerable talk about prospecting for coal in this vicinity and making another effort to finance a project to continue work on the shaft which was sunk 40 years ago on the Gayton farm, a mile east of Stafford.

Shamokin, Penn.—Three large Cochrane feed-water heaters have been received by the Philadelphia & Rading Coal & Iron Co. for service at the Henry Clay, Burnside and Bear Valley collieries. The first Cochrane heater was tried out at the Locust Gap colliery and proved to be entirely satisfactory.

Jenkins, Ky.—The Consolidation Coal Co. has completed its big electric power plant, and will hereafter operate its mines with its own power. The plant will also supply current to the surrounding mining towns of Dunham, Burdine and McRoberts, as it possesses five power units, with an aggregate capacity of 13,000 horsepower.

Fayette, Ia.—A deal has just been closed by which the Big Joe Co. gets the Big Four mine on the Milwaukee, eight miles west of Centerville. The company has also leased 500 acres of coal land near Jerome and expects to sink a new shaft. Two hundred men will be employed by fall. Robert Hunter is the superintendent.

Clinton, Ind.—A visit of Clay F. Lynch, general manager of the Bunsen Coal Co., a United States Steel Corporation subsidiary, to the Miami Coal Co.'s two mines south of here, has led to a report that the Bunsen company is going to buy the Miami mines. It is said to own the coal lands surrounding the tract of the Miami company.

Charleston, W. Va.—The appointment of receivers to take charge of the properties of the New River Co. and its 17 subsidiary companies has been denied by the Supreme Court of Appeals of West Virginia. This reverses the decision of the Circuit Court of Fayette County. The New River Company, is a $30,000,000 coal corporation.

Morgantown, W. Va.—Holdings of the Kingwood Coal & Coke Co., situated on the West Virginia Northern and the Morgantown & Kingwood railroads, in the vicinity of Kingwood, have been sold to Cleveland capitalists. The consideration named in the sale of the property is $60,000. It is understood that the Cleveland purchasers will develop the properties.

Brazil, Ind.—At the Schrepfman Coal Co.'s mine No. 1 two seams of block coal are worked. Several hundred yards from the main shaft another shaft rises from the bottom seam to the top or rider vein. The coal mined in this seam is lowered to the bottom and thence hoisted by cages in the main shaft. This gives rise to the peculiar situation of two mines in one.

Pineville, Ky.—A deal has been consummated by which the Lick Branch Coal Co. has leased the mining plant of the Harlan Coal Mining Co. at Croxton. The minimum royalty for the first five years amounts to approximately $100,000. The Harlan Coal Mining Co. is composed of Barbourville and Louisville capitalists and will begin at once the development of other property which it owns in southeastern Kentucky.

Taylor, Ky.—An effort is being made by the Taylor Mining Co., which operates mines in Ohio County, in the western Kentucky coal field, to induce its employees to improve the appearance of their houses by the cultivation of gardens and lawns. To this end the company is offering a prize of $10 in gold for the best garden, with a second prize of $5, and a first prize of $7.50 in gold for the best lawn, with a second prize of $2.50.

Pottsville, Penn.—The Philadelphia & Reading Coal & Iron Co. at Shamokin has let a contract for a tunnel to be driven from the No. 5 seam which will cut Nos. 6, 7 and 8. All of these have been tested and found to be of excellent quality and of minable thickness. The recent improvements at Sterling and Burnside collieries will make the twin colliery one of the most valuable in this section of the anthracite region.

Cincinnati, Ohio—It is expected that plans for the dissolution of the Sunday Creek and other coal mining companies of eastern Ohio and West Virginia and coal carrying roads will be presented to the U. S. District Court Mar. 29. The railroads named in the dissolution order which was filed at Columbus include the Lake Shore, the Toledo & Ohio Central, the Hocking Valley, the Chesapeake & Ohio and the Kanawha & Michigan.

Charleston, W. Va.—Negotiations for the sale of the Dickson Pocahontas Coal Co.'s properties in the Pocahontas field have been completed. The purchasing company is the Lake Superior Corporation which owns the Cannelton coal properties in the Kanawha district, and has its principal headquarters at Sault Ste. Marie. The consideration is said to have been $500,000 and it is reported that the purchasing company has set aside $200,000 for development work

Pottsville, Penn.—The Lehigh Valley Coal Co. has equipped several additional fire cars for fighting fires in its mines. They consist of the truck of a mine car upon which is mounted an electric pump which is capable of delivering 300 gal. of water per min. In addition to this they each carry two large 30-gal. chemical extinguishers to be used where water is not available and a number of smaller extinguishers. Axes, buckets and complete first-aid outfits also figure in the equipment. These cars are kept above ground near the mouth of the shafts and can be lowered in a few seconds to be taken to any point of the mine where the track is laid.

COAL TRADE REVIEWS

GENERAL REVIEW

While there has been an occasional order for hard coal during the week, buying has been pretty definitely concluded, pending the arrival of spring prices on Tuesday next. April orders are not coming in as promptly as usual, and there is not much enthusiasm in the trade over the prospects for that month. Of course, dealers will lay in some stocks, but the disposition is to go slow. However, most of the hard-coal business automatically renews itself, and wholesalers are not seriously worried over the outlook, although the market is at a standstill and suspensions are the rule.

There is quite a volume of coal moving on spot orders in the Eastern bituminous trade, and also on contracts expiring Apr. 1. Consumers are obviously endeavoring to stock sufficiently to carry them over for some time. Shippers are inclined to hold off on April business, but are endeavoring to place prompt tonnages, while orders for same are not plentiful. The situation hinges to a greater or less extent on the West Virginia labor troubles; even in event of a general lockout, it is not probable there will be any great shortage of coal.

Shipments to the Northern markets are still heavy, but few companies are able to place their full output, and many mines are working short time. Still there is a large consumption due to considerable industrial activity, and prices as a rule are being well maintained, although quotations are uncertain and at times conflicting. Production continues to increase in the Pittsburgh district, due to the opening of the Lake trade; prices are fairly steady, but they may experience a break at any time, due to considerable shading of quotations in other fields. Large producers are holding especially firm, and although there is some price cutting on the part of the smaller operators, it is not regarded as of a serious nature.

Preparations are being made in Ohio for a heavy Lake tonnage, and business is fairly active; there has been some falling off in domestic, but prices continue firm. Steam business has also been restricted somewhat, but there is considerable activity in railroad contracts and production for the week has been fairly strong.

In the Middlewestern market, production is at a low point, the mines working half time or less; however, it is stated that orders as a rule are in excess of those for the same period last year, and the new contracts are being closed at the same figures. Contracting is the only active branch of the business at the moment. There was some increased demand for Illinois coal, but operators over-shipped the market and caused another break; it is stated that there is a movement under way to curtail production in this district. Demand in the Rocky Mountains has slowed down quite materially, due to warmer weather.

BOSTON, MASS.

Bituminous—The bituminous situation turns on the probability of strike troubles in the New River district. There is a dearth of anything like definite news on the subject but the same shippers who are striving to place spot coal at current prices are holding back on business after Apr. 1. The spot market, if anything, is a shade weaker and all the agencies have an abundance of coal at the Virginia terminals. Quite a volume has been fed to this market, either at prices considerably off the contract figure for the coming season or else shipments are being liberally applied to contracts expiring Mar. 31. Even if there should be a cessation of work in New River this market would probably get on for some months without any pronounced price movement. And if there is no trouble we are almost certain to have a dull spring followed by a summer not unlike that of 1911. What yearly business has been closed has been with the usual strike clause and the now customary protection against a decline in the market.

The shippers of Georges Creek have named a tentative price of $2.85 f.o.b. Baltimore, or $1.60 at the mine, but the trade is not taking it very seriously as a year-round price. Orders for this grade are plentiful now but this is early in the season. The Pennsylvania coals are mulling along on about the same basis as previously reported. There are signs of slightly lower prices here and there as operators find orders getting scarce. It may be said that for better grades from the Clearfield district, prices at the mine are about 5c. off from a week ago and the demand is more spasmodic. In the all-rail territory consumers are guarded in making purchases. There is no snap to the business in any quarter and the prospect is not particularly good for the prices set a few weeks ago.

Water Freights are also off, 70@80c. having been accepted for the largest vessels, Hampton Roads to Boston; 40c. is about the rate from New York to points on Long Island sound.

Anthracite—There is not much enthusiasm on the part of the anthracite dealers for early April shipment. Most of them will lay in a fair stock at April prices but the disposition is to go slow. The companies who are the largest distributors to this market are understood to have a fair amount of spring business in hand. Those, however, who did little for New England in 1912 are meeting with rather a cool reception, and buyers rather than sellers are drawing the lines this year. It is expected that retail prices in Boston will be reduced on or around Apr. 1 from $8 to $7.50 for stove and chestnut, with 25c. less for egg.

Current wholesale quotations on bituminous are about as follows:

Clearfields, f.o.b. mine	$1 00@ 1 35
Clearfields, f.o.b. Philadelphia	2 25@ 2 60
Clearfields, f.o.b. New York	2 55@ 2 90
Cambrias, Somersets, f.o.b. mines	1 25@ 1 50
Cambrias, Somersets, f.o.b. Philadelphia	2 50@ 2 75
Cambrias, Somersets, f.o.b. New York	2 80@ 3 10
Pocahontas, New River, f.o.b. Hampton Roads	2 60@ 2 80
Pocahontas, New River, on cars Boston	3 65@ 3 85
Pocahontas, New River, on cars Providence	3 45@ 3 75

NEW YORK

Bituminous—The local soft-coal market continues at the same relatively low ebb prevailing over the last few weeks. Interest is concentrated entirely on contracting, which is becoming more active as the season advances. In fact, the business became quite active on small contracts during the week, but it might be stated that this was the result of the most persistent endeavors on the part of the sales agencies. The large contracts are still hanging fire, the buyers being firm in the belief that plenty of tonnages will be available at last year's figures. What the ultimate result will be is more or less problematical, but present indications are that both sides will ultimately grant concessions.

Stocks at tidewater are about normal or a little low approximately the same as last week. Production in the mining regions continues at a good pace and is much more steady than in hard coal. The spot demand is rather slow with prices weak, particularly on the off qualities, there being a fairly steady demand for the high-grade fuels, and prices firm. The local market is not changed from last week, which we quote as follows: West Virginia steam $2.55@2.60 fair grades, Pennsylvanias, $2.65@2.70, good grades of Pennsylvanias, $2.75@2.80; best Miller, Pennsylvania, $3.05@3.15; Georges Creek, $3.25@3.30.

Anthracite—Production at the hard-coal mines is only about 50 per cent. capacity, and the trade is absolutely devoid of interest; the demand is scarce with the exception of pea size, for which there seems to be a fairly steady consumption. However, the large companies are most optimistic about the future. The Western stocks are well cleaned up, and a strong healthy demand is expected to develop when the April discounts go into effect on next Tuesday. So firm are some companies in this belief that they have issued instructions to the operating departments that, effective Apr. 1, the mines would work continuously. It seems reasonable to believe that such will be the case for two or three months at any rate, after which it is difficult to say what the conditions will be. Some dealers are of the belief that consumers were left with enough coal on hand to carry them over to next spring, because of the unusually mild winter. Also the comparatively long suspension last spring forced many hard-coal consumers to use bituminous, which they have continued with since.

Prices are quite easy on the following basis.

	Individual		
	Circular	Lehigh	Scranton
Broken	$5 00	$4 50 @ $5 00	$4 50
Egg	5 25	4 50 @ 4 70	4 55 @ 4 75
Stove	5 25	4 50 @ 4 70	4 55 @ 4 75
Chestnut	5 50	4 70 @ 4 95	4 75 @ 5 00
Pea	3 50	3.35 @ 3 45	3 45 @ 3.55
Buckwheat	2 75	1 95 @ 2 45	2 50 @ 2 75
Rice	2 25	1.80 @ 1 95	2 10 @ 2 25
Barley	1.75	1.25 @ 1.55	1.55 @ 1 75

PHILADELPHIA, PENN.

Coal yards are not a particularly lively asset at the present time as dealers are simply waiting for the opening prices. Occasional orders are being received, but most of them are employing their time in making needed repairs to yards, and getting things in shape to handle the April business. While orders for April delivery are not coming in rapidly, the dealers are looking forward to a good business at least during the coming month. Most if not all of them have a class of business which renews itself automatically during April, year after year. Large residences, churches, etc., with generous storage capacities, try to get as much of their winter supplies as possible, when quotations are the lowest, and it is this class of business that will keep the trade moving.

The wholesale market is almost at a standstill, at least, as far as the large companies are concerned. Suspension was universal over the Easter holidays, but operations were resumed at most collieries Monday, and will doubtless continue until April, surplus coal, being placed in storage. It is understood that many of the companies are already starting coal toward their shipping ports on the lakes, and will load vessels, as promptly as they can be secured. Ice conditions on the Lakes are such that the movement is not likely to become effective for a week or more at the least, and, of course, shipments in that direction are limited to the number of vessels available.

The bituminous market is still sluggish. Higher prices are still talked about for new contracts, and it is understood that more than one large buyer is holding off for this reason. The resumption of work in the West Virginia fields is not likely to improve conditions to any extent, and the advance in price may have been founded on the assumption that these fields were no longer a factor.

PITTSBURGH, PENN.

Bituminous—Mine operations in the Pittsburgh district at the increased rate in last report have continued, but the slight gain is due only to the starting of shipments in the Lake trade, since general demand has been far from good, owing to warm weather. Prices are fairly steady for Pittsburgh district coal, but are under fire on account of shading in other fields. Large producers are adhering to their regular prices more tenaciously than for a long while, and the shading by small interests is not regarded as of much moment. The market is generally quotable at regular prices, subject to occasional shading by small interests. Slack rarely brings a premium now, on account of heavier production through the shipping of Lake coal. We quote regular prices: Slack, 90c.; nut and slack, $1.05; nut, $1.25; mine-run, $1.30; $^3/_4$-in., $1.40; $1^1/_4$-in., $1.55, per ton at mine, Pittsburgh district.

Connellsville Coke—A little light has been thrown upon the condition as to contract-furnace coke, which had for some time been nominally quoted at about $2.50, in the absence of sales or serious inquiry. A furnace company in Cleveland has closed a contract for 5000 tons a month for four months to July 1 at $2.25, ovens, it being understood that coke, standard in every respect, was secured. The majority of operators, however, would not touch this figure either for early shipment or for the second half. There is tentative inquiry for the later delivery, but no serious negotiations. Sales of standard coke for prompt shipment have been made at $2.43, while off coke continues to be offered at relatively low prices, a fairly well known grade running about 1.2 per cent. sulphur being freely offered at $2.15. We quote the market as follows: Prompt furnace, $2.45@2.50; contract furnace, $2.25@2.50, prompt foundry, $3@3.50; contract foundry, $3@3.50 per ton at ovens.

Production and shipments of Connellsville coke continues at record rate, although there may be a slight decrease this week from after effects of the Easter celebration. The labor supply, however, has been good in the past few weeks and no shortage may be experienced. Some operators are surprised at the maintenance of prices, for precedent shows anything above $2 to be above average, when the tonnage moved is so large, but consumption is likewise at record rate, since the country is making pig iron at the rate of about 34,000,000 tons annually and no serious decrease is likely in the near future

BALTIMORE, MD.

Although consumers have hesitated about renewing contracts because of the advanced prices asked by the trade, it is believed that practically all of them will have closed for their fuel requirements over the next year by Apr. 1. More complaint has been heard regarding the higher price which the trade is demanding for the better grades. A number have endeavored to procure coal at last years figures, but they have not succeeded, except in a few cases, where the operator thought that the price gave a pretty good profit in the first place. In order to get the best possible results from coal several consumers have conducted a series of tests for the purpose of ascertaining if the low-grade coals could be substituted for the more expensive product which they had been using.

The market was well stocked with fuel during the week, especially with good coking coals, due to the decrease in the output of coke.

BUFFALO, N. Y.

In anthracite the consumers and retailers are waiting for April prices, and the output of bituminous is now so large that only the expert salesman is able to sell up to full capacity. On this account a good many bituminous mines are again running on part time.

It is hard to say what the summer market is going to be. The Pittsburgh district operators are holding to their specified prices and Buffalo dealers who handle that coal or Youghiogheny agree that there has been no discounts offered yet. Still there is plenty of coal offering at less than $1, mine-run, at the mines, some of doubtful quality and some fair. Just how these conflicting prices are to be reconciled is not settled yet; it is not easy to see how both can be maintained. Some mines can put out coal at less than $1 but a great many cannot. The consumer is able to pay the full price, but he will, of course, buy as low as he can and this conflict in prices will be pretty sure to take up the entire season.

This section is consuming a large amount of coal and will continue to do so, as all industries are active and the number and capacity is steadily increasing. The territory east and north covered by Buffalo dealers in bituminous is well maintained, more coal being sold every year. The market for Pittsburg coal is steady, though not active at $2.80 for lump, $2.65 for three-quarter, $2.55 for mine-run and $2.15 for slack, with Allegheny Valley selling at about 30c. less. The coke market is still pretty slack, best Connellsville foundry selling at $5.

Anthracite will be dull till the April reduction of price is in effect. There is quite a large surplus now and the companies are loading lake vessels at a good rate, having about 100,000 tons afloat here now. Retailers are doing little business.

COLUMBUS, OHIO

Conditions in Ohio have been fairly good during the past week. The steam trade is moving along smoothly and preparations are being made for a record-breaking Lake movement. Taking it all in all the coal trade is as active as could be expected at this time of the year and the tone is satisfactory.

Prices have ruled firm dispite the falling off in the domestic demand. Only small orders are being received from retailers and not a great deal is expected from that source until the stocking up season starts. Steam business has been fairly large although some of the plants have curtailed their requirements. This is especially true of iron and steel concerns. Other lines of manufacturing are running full and the fuel requirements are normal.

Coal men generally believe that the slight falling off in the demand for steam grades on the part of manufacturing establishments is only temporary. They believe that industrial conditions will remain active and that many large users will be in the market for a greater tonnage in the near future. Outside of the railroad fuel contracts there is considerable activity shown in renewing steam contracts, many of which expire around Apr. 1.

Chartering of lake boats is now on in full sway. All of the operators which usually enter the lake trade have secured bottoms and some of the larger producers have started to load vessels. There will be a large tonnage ready for shipment just as soon as the ice is out of the Soo which it is believed will be around Apr. 15, but may possibly be earlier.

Production has been only fair during the week. In the Pomeroy Bend field the output is estimated at 70 per cent. and the Hocking Valley produced about 65 per cent. of normal. In Eastern Ohio the production has been about 65 per cent. also. In the purely domestic fields the output has been small.

Quotations in the Ohio fields are as follows:

	Hocking	Pittsburgh	Pomeroy	Kanawh
Domestic lump	$1 45		$1 50	$1.40
¾-inch	1.35	$1 20	1 35	1.30
Nut	1.30	...	1.30	...
Mine-run	1 15	1.10	1.15	1.10
Nut, pea and slack	0 80	..	0 75	0.80
Coarse slack	0.70	0 80	0.65	0.70

HAMPTON ROADS, VA.

There is a distinct feeling of a coming improvement in conditions and contract prices for the new year are being closely adhered to, notwithstanding the fact that many large buyers are still holding off. Few, if any, of the large contracts have been closed; none of the Chesapeake Bay transportation lines, who use the greater part of the local product, have definitely arranged for their coal yet.

BIRMINGHAM, ALA.

Inquiries are now coming in from many of the railroads and specifications, as a rule, call for heavier tonnages than were bought during the year ending June 30, 1913. Most of the railroads are using more than the maximum of their contracts at the present time. One of the largest railroad inquiries is for approximately 300,000 tons for delivery over one year beginning July 1, 1913. A number of the roads have expressed a willingness to pay higher prices than heretofore if better prepared coal can be obtained.

There is no material change in the steam or domestic market, although prices are not as high as during March of last year on account of the unusual conditions prevailing at that time. Several new mines will be put into operation during the summer and a larger bid than ever will be made by the Alabama operators for export business. The foundry coke market is holding its own quite well indeed when it is considered that the pig-iron melt is somewhat below normal at the present time.

LOUISVILLE, KY.

Prices on Eastern Kentucky domestic grades are quoted almost without reference to market conditions. With best block at $1.50, lump and block at $1.40, and round at $1.15, it may be gathered that the demand is nothing brisk. Mine-run can be had at 85c., although there are quotations as high as $1.05. Whether these would yield to a bona fide offer of a substantially lower figure is another question. Firstclass nut and slack is in demand at 90c. to $1, and second grades at 75 and 80c. Pea and slack, from both sections of the state, is quoted at 45c.; western Kentucky lump at $1.25 and nut at $1.10 are not moving to any extent.

INDIANAPOLIS, IND.

With the movement of coal at the low ebb, operators are concerning themselves in renewing the expiring contracts. Notwithstanding the low prices prevailing in the open market, the companies say they are having little trouble in closing at the old figures. In domestic, buying is practically over for the winter, large retailers still having enough on hand or coming in to fill all probable needs. They believe they will sell some coal yet, though the periods of cold weather may be short. Mine-run, No. 4 is selling anywhere from $1.05 to $1.20. Screenings are strong at 90c. to $1 and scarce on account of the small demand for domestic.

Some of the larger mines are running better than half-time but the smaller companies do well to get in three days a week. The weather generally is spring-like but there is still an occasional day or two of winter; these cold spells bring a good sprinkling of coal wagons on the streets. Local retail prices still hold to the high winter schedule.

DETROIT, MICH.

Several large coal operators declare that their orders are greater than for the same period last year, by as much as 10 per cent., and also that the price basis per ton is approximately from 5 to 10c. better than were the figures obtained last season.

The prevailing prices on the local market are as follows.

	W. Va.	Ga.	Hocking	Cambridge	Ohio No. 8	Pocahontas	Jackson Hill
Domestic lump	$1 [illegible]					$1 65	$1 75
Egg	1 10					1 65	1 75
1½-in. lump	1 20					...	
2-in. lump	1 00	$1 10	$1 00	$1 00	$1 00	...	...
Mine-run	0 90	0 90	0 90	0 90	0 90	1 15	...
Slack	0.80	0 85	0 80	0.80	0 80	0.95	...

Anthracite conditions have not changed much in the past few weeks. The usual light end-season demand is being handled with ease from stocks on hand, and shipments from the East to this point, have been comparatively insignificant.

CHICAGO

A large number of contracts are being negotiated in the Chicago market and this is, practically, the only activity. If operators were compelled to rely upon spot sales they would soon be out of business. There have been an unusually large number of sales of screenings and mine-run on contract. In all instances the operators have obtained what they call fair prices.

Chicago dealers have been participating, in a large measure, in the closing of contracts for Lake shipments. It is expected that a big tonnage will be moved at prices higher than those prevailing a year ago. The coke market is dull. Hocking Valley operators are not shipping any coal into this market and are reserving what free coal they have for the Lake movement.

Prevailing prices in Chicago are:

	Springfield	Franklin Co.	Clinton	W. Va.
Domestic lump	$2.07@2 22	$2 45@2.55	$2 27	
Egg		2.45@2.55		$3.95
Steam lump	1 92@1 97		2 17	
Mine-run	1.87@1 92	2 20@2 30	1.97	3 30
Screenings	1.57@1 62	1.90@1.95	1.67	

Coke—Connellsville and Wise County, $5.75@6; byproduct, egg, stove and nut, $4.75@5.35; gas house, $4.75@5.35.

ST. LOUIS, MO.

There has been some little encouragement to the retail coal man, inasmuch as there was a good demand for very small lots of coal, but on the whole this did not affect the shipping market in the least. As a matter of fact, if anything, it created a disturbance that brought prices lower than they have been thus far this season, and especially was this so on the better grade coals.

Over-production still continues, but there is hope now that conditions will improve, inasmuch as some of the operators are in a movement to suspend operations for the next three or four months. Washed coals are in fairly good demand, and from this time on these grades will continue to get better.

The prevailing circular is:

	Carterville and Franklin Co.	Big Muddy	Mt. Olive	Standard
2-in. lump	...	...	...	$0 85 @ 0.90
3-in. lump	...	...	$1 25	...
6-in. lump	$1 20 @ 1 25		1.35	1.10
Lump and egg	1 25	$2 25	...	...
No. 1 nut	1 10 @ 1 15		...	...
Screenings	0 90 @ 0 95		...	0 65
Mine-run	1 05 @ 1 15		...	0 85
No. 1 washed nut	1 10 @ 1 50			...
No. 2 washed nut	1 35 @ 1 45			...
No. 3 washed nut	1 25 @ 1 30			...
No. 4 washed nut	1 15 @ 1 20			...
No. 5 washed nut	1 00 @ 1 05			...

MINNEAPOLIS—ST. PAUL

Steam business is reported rather lax as industrial concerns seem to be content with only enough stocks to run them a short period. It is generally thought that the early summer months will be slow for the wholesaler and jobber as conditions point to low prices at least up until the latter part of July or the first part of August. After that, with the oncoming of winter, business ought to be good with healthy prices prevailing. Then after the first of next year, wholesalers should find business exceptionally good in view of the fact that the present aggreements with the soft-coal miners will be drawing to a close.

PORTLAND, ORE.

Just as the people of the Pacific Northwest were beginning to believe that spring had come with sunshine and balmy breezes, a cold wave swept over the country with from two to eight inches of snow. The effect has been a revival in the coal business, giving the dealers their second inning this season; however, prices are unchanged and the present cool spell will have no effect on values.

OGDEN, UTAH

The Wyoming and Utah mines have had a great many idle days, due to lack of lump or nut orders. There have been flurries of storms and cold weather in various parts of the territory, but these have not been of long enough duration to effect shipments materially. The Wyoming operators have been watching the storm in Nebraska for the past week but to date the effect has not reached the mines.

Wyoming operators have announced April and May quotations for Nebraska shipment as follows: Lump, $2.25; nut, $2; mine-run, $1.75; slack, $1. This will have a tendency to decrease shipments during the latter part of March, but should increase the movement of coal in April.

While quotation of the various grades have not changed, the selling price on nut and slack has been fluctuating. Nut coal has varied $1.75 to $2.25 per ton, while slack is selling from 50c. to $1, according to the demand. Lump coal in the Northwest remained firm at winter quotations and will probably not be changed until summer storage prices are encountered.

PRODUCTION AND TRANSPORTATION STATISTICS

NORFOLK & WESTERN RY.

The following is a comparative statement of the coal and coke shipments over the lines of the N. & W. Ry. for the months of February and the first 2 months of 1912 and 1913 in short tons:

	February		2 Months	
Destination	1912	1913	1912	1913
Coal				
Tidewater, foreign	107,689	122,944	219,893	267,006
Tidewater, coastwise	287,724	337,202	535,943	646,120
Domestic	1,388,888	1,413,398	2,716,413	3,030,292
Coke				
Tidewater, foreign	3,988	4,909	8,544	9,964
Domestic	133,936	147,938	261,020	291,134
Total	1,922,225	2,026,391	3,741,813	4,244,516

SOUTHWESTERN TONNAGE

The following is a comparative statement of the Southwestern production for September and October, 1911 and 1912:

	September			October		
State	1911	1912	Change	1911	1912	Change
Missouri	202,404	242,871	+40,467	228,248	315,419	+87,171
Kaosas	401,536	424,329	+22,793	447,699	524,315	+76,616
Arkansas	133,238	169,325	+36,087	147,409	205,031	+57,622
Oklahoma	229,300	249,604	+20,304	274,858	369,717	+44,859
Totals	966,478	1,086,129	119,651	1,098,214	1,364,482	+266,268

This statement only covers the tonnage of members of the Association which we estimate to be at least 95% of the entire tonnage produced in the four States.

IMPORTS AND EXPORTS

The following is a comparative statement of imports and exports in the United States for January 1912-13 and for the 7 months ending January 1911-12-13, in long tons:

	7 Months			January	
Imports from:	1911	1912	1913	1912	1913
United Kingdom	10,199	5,644	7,218	1,445	1,168
Canada	1,001,018	513,369	843,962	100,744	109,520
Japan	6,313	7,057	30,004		5,494
Australia & Tasmania	190,157	143,140	98,308	21,903	10,113
Other countries	4,709	915	448	696	
Total	1,212,396	670,325	979,940	124,788	126,295
Exports:					
Anthracite	1,691,981	2,069,493	2,863,111	221,638	305,569
Bituminous,					
Canada	5,164,428	7,079,617	7,002,875	402,966	565,196
Panama	291,134	250,273	269,759	19,588	64,567
Mexico	373,148	185,302	155,216	31,639	43,778
Cuba	523,237	638,032	706,776	78,789	117,109
West Indies	302,214	375,620	329,436	77,151	72,233
Other countries	348,240	439,717	563,114	57,346	113,080
Total	7,002,401	8,968,561	9,027,176	667,479	975,963
Bunker coal	3,692,418	3,913,684	4,480,343	553,140	612,689

COAL MOVEMENT IN 1912

The following is a summary of the combined coal and coke movement over various railroads for December and the years noted, in short tons:

	December		Year	
	1911	1912	1911	1912
Bal & Ohio[1]	3,113,295	3,392,925	35,321,771	40,525,280
Buf Roch & P[1 2]	725,880	773,194	8,223,617	8,839,732
Buf & Susq[2]	183,147	164,235	1,951,256	1,810,930
Chesp & Ohio[2]	1,548,881	1,290,588	16,488,024	17,296,185
Hunt & Br'd T. M.[1 2]	692,427	688,248	8,031,163	7,803,773
N Y C & H R R R[2]	136,564	150,771	1,148,675	1,277,180
N. & W. R.R[1 2]	757,636	833,454	8,108,738	8,396,018
Penn R R[1 3]	1,931,313	1,832,251	20,954,839	24,112,787
Pitts & Lake Erie[2]	6,107,262	6,551,301	65,015,701	70,117,880
Pitts. Sha. & Nort.[2]	1,243,926	1,517,651	16,090,905	17,745,835
Southern	136,448	212,477	1,459,637	2,033,169
Virginian[2]	328,257	292,824	4,826,794	4,062,363
Western Md	258,869	317,508	2,817,201	3,584,202
	260,277	201,029	2,673,183	2,838,331

(1) Includes coal received from connecting lines.
(2) Includes company's coal.
(3) Does not include company's coal hauled free.

PENNSYLVANIA RAILROAD

The following is a statement of shipments over the P. R.R. Co.'s lines east of Pittsburgh and Erie for Feb. and first two months of this year and last year in short tons:

	February		Two Months	
	1913	1912	1913	1912
Anthracite	988,036	1,107,226	2,002,295	2,147,761
Bituminous	3,857,304	4,086,917	8,067,500	6,668,282
Coke	1,220,360	1,023,253	2,508,874	1,964,184
	6,065,700	6,217,396	12,578,669	11,780,227

FOREIGN MARKETS

GREAT BRITAIN

March 14—New business is of a quiet character, owing to the fullness of colliery order-books and the difficulty of getting loading berths.

Prices are approximately as follows:

Best Welsh steam	$4.62@4.68	Best Monmouthshires	$4 20@4 26
Best seconds	4.50@4.56	Seconds	4.08@4.14
Seconds	4.38@4 44	Best Cardiff smalls	3 78@3.84
Best dry coals	4 44@4.50	Seconds	3.54@3.60

The prices for Cardiff coals are f.o.b. Cardiff, Penarth or Barry, while those for Monmouthshire descriptions are f.o.b. Newport; both exclusive of warfage, and for cash in 30 days—less 2½%.

GERMANY

The following is a comparative statement of German production, imports and exports for January of 1912-13:

	Exports		Imports		Production	
	1912	1913	1912	1913	1912	1913
Coal	2,452,695	2,386,249	759,501	663,319	13,365,606	16,536,115
Lignite	5,246	7,238	591,830	503,704	6,805,208	7,375,566
Coke	425,812	628,164	50,171	49,853	2,340,366	2,724,871
Coal briquettes	156,485	207,053	3,324	2,590	424,961	498,288
Lignite briquettes	59,613	129,129	13,223	9,294	1,497,060	1,771,187

COAL SECURITIES

The following table gives the range of various active coal securities and dividends paid during the week ending March 22:

Stocks	Week's Range High	Low	Last	Year's Range High	Low
American Coal Products	90	90	90	87	87
American Coal Products Pref.	109¼	109¼	109¼	109¼	109¼
Colorado Fuel & Iron	33	31	32	41½	31
Colorado Fuel & Iron Pref			155	155	150
Consolidation Coal of Maryland	102½	102½	102½	102½	102½
Island Creek Coal Pref.	86	85	85		
Lehigh Valley Coal Sales	240	204	204		
Pittsburgh Coal	19¾	19	19	24¾	19
Pittsburgh Coal Pref.	84½	80¾	82	95	80¾
Pond Creek	23¾	22	23½	28½	22
Reading	156¼	153¾	155½	168¾	152½
Reading 1st Pref	90½	90	90½	91½	89½
Reading 2nd Pref	90	90	90	93	87¾
Virginia Iron, Coal & Coke	50	50	50	54	44½

Bonds	Closing Bid	Asked	Week's Range or Last Sale		Year's Range	
Colo. F. & I. gen. s.f.g 5s	98	99	98	Mar. '13	98	99½
Colo. F. & I. gen. 6s			107½	June '12		
Col. Ind. 1st & coll. 5s. gu	78¾	Sale	78½	79	78½	85
Cons. Ind. Coal Mc. 1st 5s		80	85	June '11		
Cons. Coal 1st and ref. 5s		94	93	Oct. '12		
Gr. Riv. Coal & C. 1st g 6s	96	102½	102½	Apr. '06		
K. & H. C. & C. 1st s f g 5s		98	Jan. '13		98	98
Pocah. Con. Coll. 1st s f 5s	85	87½	87½	87½	87½	87½
St. L. Rky. Mt. & Pac. 1st 5s	76	Sale	76	76	76	80
Tenn. Coal gen. 5s	101	102½	100¾	Mar. '13	100¾	103
Birm. Div. 1st consol. 6s	101½	102½	101½	Mar. '13	101½	103
Tenn. Div. 1st g 6s		103¾	102	Feb. '13	102	102
Cah. C. M. Co. 1st g 6s			110	Jan. '09		
Utah Fuel 1st g 5s						
Victor Fuel 1st s f 5s		84	79½	Feb. '13	79½	79½
Va. I. Coal & Coke 1st g 5s	94½	Sale	94½	95	94½	98

Reading Co.—Regular quarterly dividend on the common stock of 2%, payable May 8, to holders of record Apr. 21.

St. Louis, Rocky Mountain & Pacific Co.—Regular quarterly dividend of 1¾% on the preferred, payable Apr. 5, to holders of record, Mar. 27.

Central Coal & Coke Co.—Regular quarterly dividends of 1½% on the common, and 1¾% on the preferred, payable Apr. 15 to holders of record Apr. 1.

Pittsburgh Coal Co—Regular quarterly dividend on the preferred of 1¾, payable Apr. 25, to holders of record, Apr. 15.

COAL AGE

Vol. 3 NEW YORK, APRIL 5, 1913 No. 14

NO matter what our present station in life may be, we are all prone to believe that we are striving for one thing—self-satisfaction.

However, that is the one state of existence we must not enter. When we are pleased with ourselves, there we will abide. It is only when we are dissatisfied with what we are that we desire to attain to what we are not.

In all the world nothing stands still—we either advance or retreat. To stop is to go backward, and to be satisfied is to stop.

"Be content but not satisfied" is a wise injunction. A man may aspire and yet be quite content until it is time to rise.

We, ourselves, must be and do, and not rest satisfied merely with reading and meditating over what other men have been and done.

Satisfaction is conclusion. A man who is gratified with himself will achieve no more. It is a case of arrested development—stagnation has set in.

The men who have performed the bulk of the world's work were always dissatisfied with anything short of an unattainable perfection. Contentment, therefore, with them was out of the question. They would not have been able to recognize it had it come their way.

Any man who is satisfied with his efforts to win success does not merit it. The wiser he is, the more clearly he knows how far his best falls below the best possible.

It is a lack of personal contentment that has made America great, while an excess of mental ease and self-satisfaction has made Spain humble. Her citizens are filled with self-approval, which leads to idleness, and an idle man is like a watch without hands—useless whether running or not.

True, there is some ambition which knows no gorge but the grave. It jumps at the stars, only to fall in the mud.

The man who would rise in the world must veil his ambition in the forms of humanity. He must not cut above his height, or he will get chips in his eye.

Nothing should be more humble than ambition when it is about to climb. And, when the topmost rung of the ladder is reached, we should not gaze off into the clouds and scorn to look again at the means whereby we did ascend.

It is also worth remembering that wealth is no more a crime than poverty is a virtue, and although we should prefer great principles to a great bank account, we need feel no shame in the possession of riches which come as an honest reward for toil.

Let us live in deeds, not years; in feelings, not figures on a calendar. 'Tis our actions, not our posterity, that will perpetuate our memory.

If contentment means absolute indifference, stupid slumber, or meek submission to circumstances, then no man has a right to be contented this side of death.

The Ethics of Organized Labor

Editorial Correspondence

SYNOPSIS—A local press, subserrient to the opinions of the mass of its readers, has greatly minimized what is developing into a serious situation in the anthracite fields. The labor organization, taking advantage of its irresponsibilities for its own acts, has consistently and repeatedly violated one of the basic principles of its agreement with the operators. Officials of the unions declare themselves powerless to control the situation; however, a suggested remedy is offered here.

Less than a year ago, a formal agreement was entered into between the anthracite operators and mine workers, binding employers and employees alike, for a period of four years. This was signed by ten coal-company officials and ten officers of the mine-workers organization, all duly authorized. It constitutes a binding agreement that should be scrupulously observed by every self-respecting employer and employee having the least conception of business ethics. In spite of this, the agreement has been violated, by the mine workers, openly, wilfully, knowingly and shamelessly, no less than 200 times, as reference to the files of the press will show.

In 1903, the Anthracite Coal Strike Commission, appointed by President Roosevelt, made an award in settlement of the great 1902 strike, containing the following excerpt:

IV. The Commission Adjudges and Awards—That any difficulty or disagreement arising under this award, either as to its interpretation or application, or in any way growing out of the relations of the employers and employed, which cannot be settled or adjusted by consultation between the superintendent or manager of the mine or mines, and the miner or miners directly interested, or is of a scope too large to be so settled or adjusted, shall be referred to a permanent joint committee, to be called a Board of Conciliation, to consist of six persons, appointed as hereinafter provided.

* * * * * * * *

The Board of Conciliation thus constituted, shall take up and consider any question referred to it as aforesaid, hearing both parties to the controversy, and such evidence as may be laid before it by either party; and any award made by a majority of such Board of Conciliation shall be final and binding on all parties.

* * * * * * * *

The membership of said Board shall at all times be kept complete, either the operators' or miners' organizations having the right, at any time when a controversy is not pending, to change their representation thereon.

At all hearings before said Board the parties may be represented by such person or persons as they may respectively select.

No suspension of work shall take place, by lockout or strike, pending the adjudication of nay matter so taken up for adjustment.

The subsequent agreement, Apr. 29, 1909, provided as follows:

4th—Any dispute arising at a colliery under the terms of this agreement must first be taken up with the mine foreman and superintendent by the employee, or committee of employees directly interested, before it can be taken up with the Conciliation Board for final adjustment.

And the agreement of May 20, 1912, further provides:

(d) At each mine there shall be a grievance committee consisting of not more than three employees, and such committee shall under the terms of this agreement take up for adjustment with the proper officials of the company all grievances referred to them by employees who have first taken up said grievance with the foreman and failed to effect proper settlement of the same. It is also understood that the member of the Board of Conciliation elected by the Mine Workers' organization or his representative may meet with the mine committee and company officials in adjusting disputes. In the event of the mine committee failing to adjust with the company officials any grievance properly referred to them they may refer the grievance to the members of the Board of Conciliation in their district for adjustment, and in case of their failure to adjust the same they shall refer the grievance to the Board of Conciliation for final settlement, as provided in the Award of the Anthracite Coal Strike Commission and the agreements subsequent thereto, and whatever settlement is made shall date from the time the grievance is raised.

The Irresponsibility of the Miners

These provide in a definite, fixed, unequivocal manner that: "No suspension of work shall take place, by lockout or strike, *pending* the adjudication of any matter so taken up for adjustment. Yet this latter clause has been violated wilfully, knowingly, even wantonly on no less than 200 occasions in the short space of ten months. Strikes have occurred weekly, and have been winked at, excused and even ordered by the union officials. They have also been condoned by the press of the country when such a flagrant violation of business ethics would have ordinarily resulted in the most bitter denunciation and an entire loss of prestige for the offender. The press may be able to justify its subserviency on the specious business reason—dictated by the circulation manager—that it must cater to the majority of its readers. With one eye upon the subscription list and an ear to the ground for the first sound of partisan disapproval from its interested and biased readers, it feebly reports the existence of another strike. If, perchance, it should express any opinion at all, it does not even straddle the fence but looks through a knot hole from the employees' side and explains away and condones the strike (a violation of a sacred agreement) by means of some absurd reasons advanced by the circulation manager. Perhaps a fair, unbiased, fearless press would have few readers. Possibly it might acquire many.

Why should these violations and strikes occur? Nearly every mine worker in the anthracite region is now a member of the union, and as such he is subject to its rules and regulations and represented by its officers. If, then, the miners violate an agreement entered into by their officers, they evidently do so with or without the consent of these officers. If with their consent, then the organization is guilty and irresponsible; if without it, then the union is irresponsible as to its obligations and agreements and its officers inefficient and incompetent. The miners' organization is not incorporated and cannot be sued. It is unwilling to incorporate so as to be, as the employers are, responsible legally as well as morally for its acts. An agreement between a body of incorporated, responsible employers with an army of unincorporated, irresponsible employees, must depend for its very existence upon the honor of the contracting parties.

The agreement of 1912 carries with it no penalties for violation. *Herein lies its fatal weakness!* Under the anthracite agreement there is no monetary penalty imposed upon either party for a violation. Here is the real cause of all the trouble, for obviously a law without a penalty is ineffective—a deadletter. Violations of many laws are punishable by fines; business agreements by forfeiture. Why not a penalty of fines in this case? Why not forfeiture in whole or in part of the benefits of this

agreement? If the labor leaders and officials were fair and sincere in the matter, they would discipline and punish members and groups of members who violate the agreement. Only by the strictest, almost military discipline can they hope to control the majority of the mine workers who make up their cosmopolitan army.

The anthracite agreement provides a means of adjustment for every possible dispute. There can be no dispute or action on the part of either party to justify a suspension of work upon any pretext. A walkout, concerted action in remaining away from work, or any other wilful suspension is a strike and a strike cannot occur without violation of the anthracite agreement. Yet there have been over two hundred!

A Remedy

In past agreements the operators have given an increase in wages or its equivalent. In return their employees agreed to do certain things. The employers have faithfully met every condition imposed upon them, while the employees have violated the agreement repeatedly and with no provocation whatever. If the operators ever again enter an agreement with the miners, they should demand a heavy bond to assure the latter acting in good faith. Or, if the agreement is violated by the employees, let there be a clause providing for an automatic suspension of certain conditions imposed upon the employers.

It is safe to say that if the last 10 per cent. increase in wages had been made contingent upon the employees living up to their agreement, there would not have been a single strike! To allay the fears that a strike might possibly be forced upon the men by unjust acts on the part of the operators, the Board of Conciliation, or the Umpire, could pass impartially upon the merits of such a case and the last vestige of an excuse for not accepting a penalizing clause disappears.

The bad faith, the lack of discipline, the failure to control its members, has placed the mine workers' officials in such a position that they are now technically obligated to call for a reassembling of the committee of twenty and offer to accept such a penalty for future violations. If they are acting in good faith, if they are sincere in their efforts to keep their agreement and maintain discipline in their organization they will suffer no unjust penalty and may still regain a reputation for business integrity which they do not now possess and without which they are a menace to society. In the name of industrial peace and business ethics, let the miners call for a reassembling of the committee.

National President John P. White, publicly and privately deprecates and denounces, but has not succeeded in preventing petty strikes. If he will advise, recommend and offer on behalf of his organization the enactment of an amendment or supplemental agreement along the lines suggested, he will insure the results he has, apparently, been so earnestly but futilly seeking. His sincerity is not in question, but his authority is. The business honor of his organization is at stake. It is badly shattered and likely to be lost. A practical solution is offered here and the miners' officials may some time be called upon to explain why they did not act upon it.

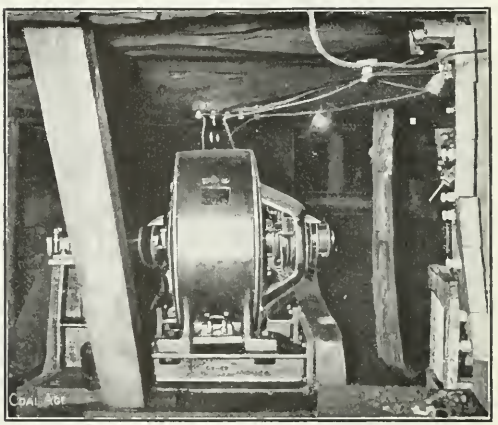
❖

The English Rescue Apparatus Commission reached the conclusion that liquid air was unsuitable for use in mine-rescue apparatus, as it did not meet the demands made upon it when excessive exertion was necessary.

Self-Starting Direct-Current Motors for Driving Mine Pumps and Fans

The electric motor has proved so thoroughly satisfactory for driving mine pumps and fans that it seems almost impossible to improve it. It can be placed wherever a pump or a fan can be located; a couple of wires supply it with the requisite power; and when running it requires no attention whatever beyond occasional inspection and oiling. In fact, motors have proved themselves so useful and economical that they are rapidly displacing all other forms of power for fan and pump service wherever electricity is available.

An improvement has, however, been recently developed by the Westinghouse Electric & Manufacturing Co. which increases the value of these machines for mine work. This improvement consists in making the direct-current motor self-starting.



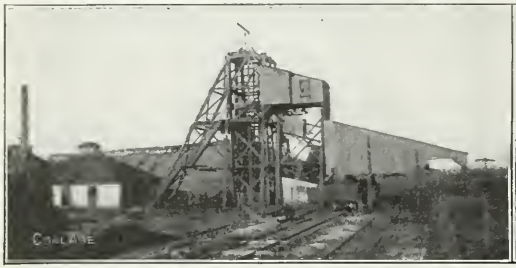
Self-Starting Motor in Place Underground

Heretofore, while it has been possible under some conditions to control them from the power house, most motors driving mine pumps and fans had to be started by hand. Hence, if the power went off temporarily for any reason, the motors stopped, necessitating an attendant going to each station to start them again.

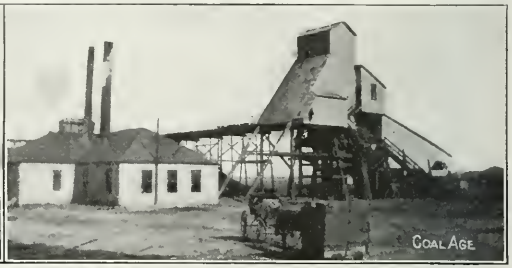
With the new self-starting machines, this inconvenience is done away with. When the power fails, the motors stop, it is true, but as soon as the power comes on again, they start automatically and settle down to work as though nothing had happened. Moreover, starting boxes are rendered unnecessary, and the wiring is of the simplest possible character. An occasional visit of inspection is all that is required by these motors. Otherwise they can be left entirely to themselves.

These motors have been thoroughly tried out in practical service and their advantages are commending them highly. Their electrical characteristics differ but little from those of the usual type, the only alteration being in the use of a heavier compounding winding, which reduces the flow of current when starting. Mechanically, there is no change. They are built in ratings up to 20 hp. for the voltages usually employed in mine work.

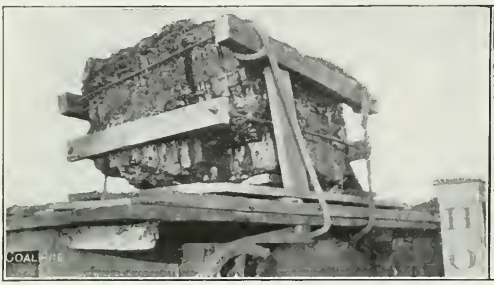
SNAP SHOTS IN COAL MINING



Western Coal & Mining Co.'s No. 15 Tipple at Franklin, Kan.

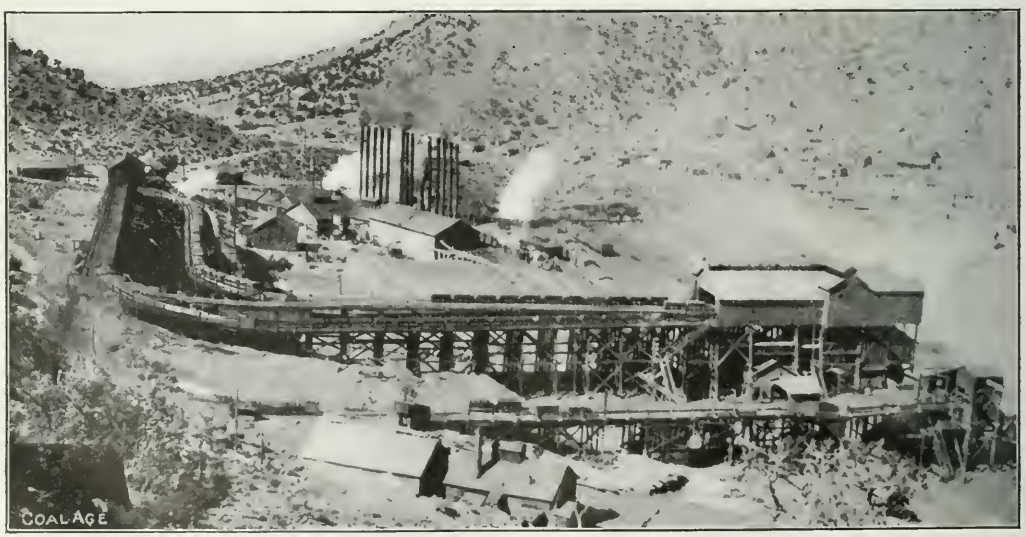


Tipple No. 17 of Western Coal & Mining Co., at Minden, Mo.



Lump of Coal Taken Out of Mine of the Canada West Coal Co., Taber, Alberta, Can. The Chunk Weighs 5965 Lb., and Was Exhibited at the Lethbridge Farming Congress

Residence of Gen. Mgr. Shoemaker of the Va.-Lee Co., St. Charles, Va. This Photo Was Taken at Midnight by Moonlight; Exposure, 35 Min. Note Light in Window



Sunnyside Mine, Utah Fuel Co. Daily Output 2400 Tons. Most of Which Is Crushed Coke

Tipple at No. 13 Mine, Western Coal & Mining Co. Yale, Kan.

Bar-Screen Chutes, No. 9 Mine of St. Bernard Mining Co., Furnishes Town of Earlington, Ky., with Coal

Power House, Tipple and Headframe at the Allison Plant of the W. J. Rainey Co., Allison, Penn.

Jeffry Steel Tipple and Retarding Conveyor, Roanoake Coal & Coke Co., Bear Hollow, W. Va.

Electric Motors for Driving Mine Pumps

By W. H. Easton

SYNOPSIS—In this article the advantages, relative economy and reliability of the electric pump are compared with those of the steam and compressed-air driven machines. The types of motors available for such work are also enumerated and their relative merits discussed.

It is safe to say that unless electric power had proven thoroughly satisfactory for driving pumps, it would not be enjoying its present extensive and increasing use in coal mines. In most mines pumping is essential for successful operation and no power could be used that did not adequately fill the requirements of mine-pump drive. But electricity is not only satisfactory for this purpose, but has also shown itself to be in general superior to either steam or compressed air.

Advantages of Electrically Driven Pumps

The advantages of the electric motor-driven pump can be summed up under (a) ease of installation and control, (b) reliability, and (c) economy. In all three of these points it is at least the equal, and for the most part the superior, of its competitors.

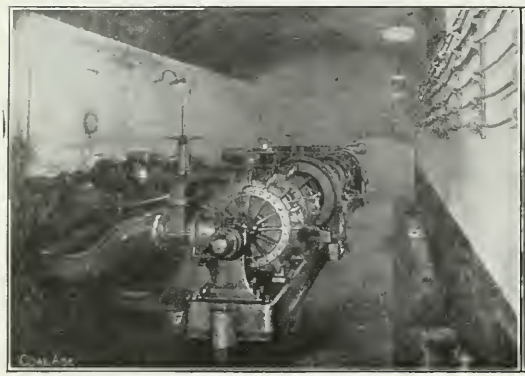
As to ease of installation, the unit formed by motor and pump is as compact and easily handled as the steam or air pump and can be placed wherever the others can be. It gets its power from wires, which are much more easily installed, altered and removed than are steam or air lines. There is no exhaust to consider, and the wires give off no heat as do steam pipes. It is therefore a comparatively simple matter to install an electric pump in the most out-of-the-way location, so that it is especially suitable for draining swamps. For the same reasons, motor drive is much the best for track and sinking pumps, the flexibility of the cables readily permitting the machine to follow the receding water level.

The adaptability of electricity is so great that the electric pump can be controlled in almost any desired manner. Many such machines are arranged to be started and stopped from the power house, even though they may be located miles away. Others are automatically started when the water level reaches a certain height and are stopped when the level is lowered to a predetermined point. The self-starting pump motor has been extensively employed of late. When one of these machines has been stopped because of a temporary failure of power, it will start automatically on the return of the current. This motor eliminates one of the principal objections to the electric pump, viz., that when no provision for remote control was made, a man had to visit each machine to start it after a shutdown of power.

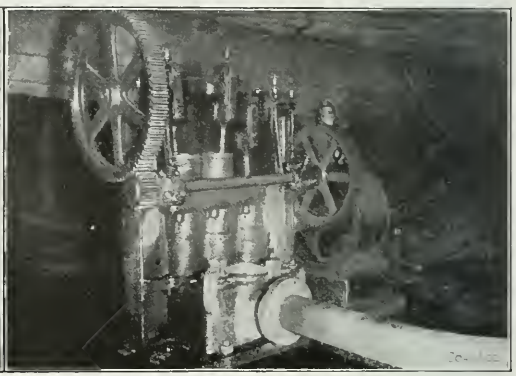
In reliability the motor is at least the equal of either the steam or air engine. The modern motor is so designed that it requires practically no attendance beyond an occasional inspection and oiling. A properly installed pump motor will run continuously for many years with no renewals or repairs beyond a few extra brushes.

The Economy of Electric Pumps

In regard to economy the small steam pump is notoriously inefficient, whereas the small motor has a high efficiency. That is to say, it will take less coal to run a half dozen small electric pumps than to run the same number of steam-driven machines of similar capacity. In large sizes, the economy of the steam pumping engine is greatly improved, but the motor keeps pace with it and is at least as good.



Centrifugal Pumps Underground



A Westinghouse Motor Driving a Plunger Pump

Air pumps are extremely uneconomical. In one installation in the central Pennsylvania bituminous field, it required 11 boiler-horsepower to obtain 1 water-horsepower from large air-driven pumps emptying a sump. Electric motors were substituted for the engines and it then required about 2 boiler-horsepower for the 1 water-horsepower. Since the load was large and continuous this increase in efficiency meant a great saving in the course of a year.

The efficiency with which electric power can be transmitted over great distances is of special importance in coal mining. The loss in electric wires is comparatively small, while the losses due to leakage of air or steam or the condensing of steam are always large and often prohibitive, especially in long lines.

For the most part, direct-current motors are used in

coal mines, it being the best for haulage. Alternating machines are, however, used in many instances, and motors of either kind can be obtained for driving any size or type of pump.

In applying direct-current motors to centrifugal pumps, and to reciprocating pumps starting with a by-pass, shunt field windings will usually be found most suitable. Such motors have better speed regulation than compound-wound machines, and will start under considerably more than full load.

For reciprocating pumps starting under full head, or where heavy initial effort is required, the compound-wound motor will prove more suitable, owing to its ability to exert greater power during the starting period.

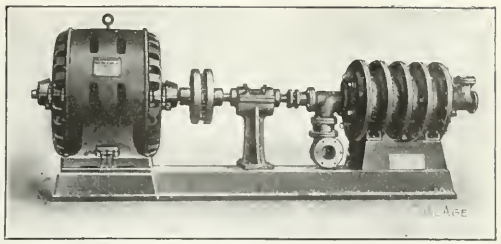
The Two Types of Motors

There are two types of alternating-current induction motors in general use, viz., squirrel-cage and wound-rotor machines. The squirrel-cage type of motor is the simpler

A Vertical Centrifugal Pump

and less expensive of the two designs. It is also easier to start and control. It is undoubtedly the most suitable and popular alternating-current motor for centrifugal pumps and is at the same time the one most advantageously employed for piston or plunger pumps which may be started with a by-pass; but if any such reciprocating machine must be set in motion against the full static head, more starting effort is needed and a wound-rotor motor will better fill the requirements.

After either a squirrel-cage or wound-rotor motor has been brought up to speed, there is no difference in operation; they will have approximately the same efficiencies, power factors and overload capacities and will also have the same speed regulation between no load and full load.



A Motor-Driven Multi-Stage Centrifugal Pump

Both types are essentially constant-speed machines, but if furnished with a special controller the wound-rotor motor may be used for variable-speed operation with a sacrifice in efficiency and regulation at reduced speeds.

The ordinary horizontal shaft motor is used for driving reciprocating and horizontal centrifugal pumps; for vertical centrifugals, a vertical shaft motor, which can be coupled directly to the pump shaft, is used.

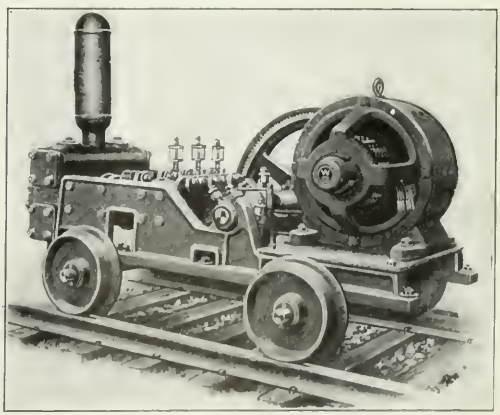
Special Machines Are Necessary

The conditions in coal mines are unusually severe on electrical machinery, so that a motor that would give perfect satisfaction in a factory would be out of commission in a short time in a mine. Hence motors especially constructed to meet the conditions should be used in underground installations.

Moisture-proof windings are of special importance. The insulation of the ordinary motor would soon become saturated with moisture in a mine and cause trouble, hence some manufacturers supply machines with specially treated windings which resist dampness indefinitely. Where the motor is subjected to drip, it should be protected by shields or inclosed in water-tight covers.

Motors are sometimes made for total immersion. One of the simplest methods is to place the machine in a kind of diving bell, closed above and open below; the air in the upper part of the bell keeps the water from contact with the motor even though the level should rise high enough to submerge the whole outfit.

Good commutation is especially desirable in mine-pump motors. Sparking at the commutator wears away both it



Westinghouse Motor Driving a Track Pump

and the brushes and makes renewals necessary. But by using commutating poles and designing the motor carefully, all sparking can be eliminated, so that the commutator's life is indefinite, brush renewals are rarely required, and the reliability of the motor is greatly increased.

Direct-current self-starting motors, previously mentioned, form a special class. Ordinary motors are sometimes used for this purpose but it is not considered good practice, as the stresses arising in starting a motor, not specially designed, without the interposition of a starting box, are quite severe and are sure to cause deterioration. In the self-starting type of machine, special coils are provided which keep within safe limits the rush of current at starting; such a motor will, therefore, not only give better service, but will cost less to operate than the non-special machine. These direct-current motors are built in capacities up to 20 hp. Almost any good alternating-current, squirrel-cage induction motor up to 20 hp. in capacity or even larger can be started directly from the line without injury.

Auxiliaries Should Be Specially Constructed

When a starting box is used in connection with a motor, it should also be of special design in order to withstand dampness. One manufacturer supplies a box in which the low-voltage release coil is made moisture proof and the resistance is embedded in a moisture-proof cement. This construction prevents the corrosion and deterioration that is apt to take place in unprotected apparatus.

In ordering an electric pump it is always advisable to specify a motor made by a reputable firm with extensive experience in mine work. Such a motor may cost a trifle more than one of inferior make, but will more than make up the difference by the better service it will give. Similarly, in buying motors to drive pumps already installed, it is advisable to consult such a manufacturer; the characteristics of different pumps and the requirements of different services vary so greatly that only an expert is qualified to select the proper motor for any given case, and if a wrong selection is made, trouble may result.

In order to secure the advantages of electric pumping it is not now always necessary for the mine to install its own electric plant. In many parts of the country central-station power is being used for driving part or all of the mine machinery. Where such power is available, it will nearly always pay to install electric pumps and in many cases the entire mine can be economically operated in this manner. At all events, the subject should be investigated carefully as an increasing number of mines are finding it profitable to buy their power.

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A Pump for Breaker Refuse Disposal

Special Correspondence

SYNOPSIS—A vertical, triplex, single-acting, cement-lined, motor-driven, plunger pump has been installed recently at an anthracite breaker to replace a bucket elevator and sluice system of refuse disposal. So far as can be judged at present, this machine will cut the cost of getting rid of the slush from the breaker to about one-half its former magnitude.

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The disposal of refuse and unmarketable sizes of coal from anthracite breakers is frequently a somewhat perplexing problem. If flushed into streams or rivers, as was once the custom, it soon fills up and clogs the channel, causing complications in time of high water, for which no mining company would care to be held responsible.

There are in general three methods of disposal for such refuse. (a) It may be flushed or otherwise stowed in the old workings of the mine. (b) It may be heaped or piled by cars or conveyors at some point close to the breaker, or (c) it may be flushed or conveyed to some point more or less remote from the breaker and where its likelihood of being washed into the neighboring larger water courses is reduced to a minimum.

The method to be employed in any particular case will be determined either wholly or in part by the location of the breaker and the topography of its immediate surroundings, as well as the conditions underground.

For several years past the practice at a certain anthracite colliery has been to dispose of the breaker refuse by elevating and flushing to a location considerably above the point of preparation, where it was allowed to settle and drain off in a depression beyond the first ridge in rear of the breaker.

This was accomplished by means of a system of bucket elevators discharging into sluices. And, altogether this method was efficacious, so far as the refuse disposal was concerned, it was decidedly unsatisfactory, both from a power-consuming and an operating standpoint.

Recently, therefore, a special slush pump and pipeline has been installed which does the work of the former system, occupies much less space and has thus far been vastly more satisfactory in operation.

The water carrying the refuse from the breaker passes through a steel plate filled with $\frac{7}{16}$-in. circular perforations into a vat or tank. What particles of slate, etc., remain on the screen are removed and disposed of by hauling away. From this tank the water passes to the suction of the pump and since the latter is considerably below the level of the water in the tank, it is provided with an air chamber.

The pump which has a capacity of 1000 gal. per min., is of the vertical-triplex variety driven by a 50-hp. open type slip-ring induction motor operating upon a 440-volt 25-cycle 3-phase circuit. The full load speed of the motor is 360 r.p.m., while the speed reduction, which is accomplished by means of a cut-steel herringbone gear meshing with a forged-steel pinion is in the ratio of 12½ to 1, making the full-load speed of the pump 29 r.p.m.

Bronze plungers 14 in. in diameter with a 16-in. stroke are employed. These are, of course, outside packed. The cylinders, valve chests and all parts of the piping are cement lined to resist the action of the acid and also the abrasion of the gritty slush.

The valves of this pump are unique. They consist of 5½-in. bronze balls operating within a cage, which is also of bronze, upon 3½-in. ports. The spherical form

of the valve renders it far less liable to uneven wear than were it flat while its composition possesses strong capacity for resisting corrosion.

A bypass is provided from the discharge to the suction pipe and drain cocks are so located as to thoroughly rid the pump and pipeline of all water. The apparatus must be thus drained not only to prevent freezing in cold weather but to rid the pump and discharge pipe of all slush when no water is flowing, as otherwise this material would settle in a compact mass effectually clogging the pipe. Relief valves are also provided in case of any contingency.

The liquid handled contains from 30 to 50 per cent. of solid matter by weight, as well as about $\frac{1}{10}$ of 1 per cent. of sulphuric acid. This is delivered against an actual vertical head of 109 ft. through an extra heavy cast-iron pipeline 12 in. in diameter and about 500 ft. long. The actual pressure against which the pump works, due to the increased weight and resistance of the liquid in the pipeline, is 65 lb. This, of course, includes the friction.

The power required to handle this slush is approximately 63 amp. at 440-volts tension. When pumping clean water, the current required at the same voltage was only 45 amp. The motor is mounted on top of the pump frame, where it takes up no floor space and requires no guarding of gears.

As stated above the slush was formerly disposed of by means of elevator towers and sluices. For some time before the installation of the pump, the operation, maintenance and repairs on this system cost approximately $600 per month. As nearly as can be foretold at the present time, the pump attendance, maintenance, power and repairs, in short, all items of expense connected with this latter system, will be approximately $300. The installation of this equipment has, therefore, cut the expense entailed in the disposal of slush at this colliery exactly in half.

Small Pumps for Hard Service

SPECIAL CORRESPONDENCE

The lover of horses is prone to discourse enthusiastically upon the speed, endurance or beauty of the genus equus, forgetting meanwhile the draft animal, which is the real servant of man, bearing his burdens, transporting his goods, drawing his agricultural implements; in short, performing much of the work and drudgery which renders our modern civilization possible.

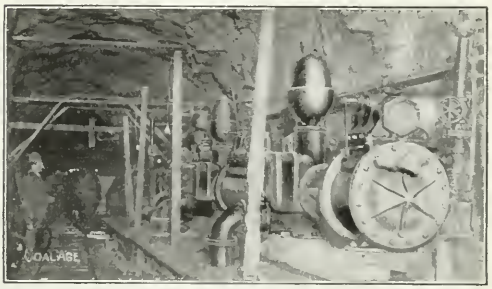
In like manner the operator or engineer familiar with mine drainage and the problems incident thereto, will persistently speak only of those pumps which have been purchased and installed to perform some special service, or those which occupy some conspicuous position, forgetting utterly the machines which are scattered about through the workings, each doing its share, even though that share be but small, toward enabling the underground worker to perform day by day his allotted task and thus securing to the mine its rated output.

The capacity of such pumps is not ordinarily great. The conditions under which they are called upon to work are usually far from advantageous. The fluid which they must handle is frequently aciduous and often carries more or less solid matter and grit in suspension.

Any pump which can successfully meet and cope with these conditions must be simple in design, constructed of the best materials, sufficiently heavy to withstand not only a considerable amount of abuse, neglect and rough handling, but also to retain a large percentage of its original efficiency over long periods of hard and continuous service. But above all other things, such a machine must be first, last and always absolutely dependable.

The A. S. Cameron Steam Pump Works have long produced machines to meet the exacting conditions of mining work. From the mechanical standpoint the most interesting feature of these pumps is the steam-valve mechanism. This is entirely inclosed and is in no way dependent upon the movement of any exterior cams, levers or contacts. The piston near the end of its stroke operates a small auxiliary or pilot valve which, through the action of the steam, causes the main valve to shift, thus reversing the direction of travel of the plunger. The advantages of this inclosed valve mechanism for use underground are too self-evident to require comment.

Another distinctive feature of this pump is the easy ac-



A REMOTE UNDERGROUND PUMPING STATION. THREE DUPLICATE MACHINES

cess to the water chamber. By merely removing the side cover or bonnet, the valves, guards, seats, stems and springs are in plain sight. This is an advantage that is much appreciated by the experienced engineer or pumpman.

It should also be noted that these parts are made heavier than those found in the average pump. There are no threads on the seats or stems, which project through the top of the water-valve chest, these being made fast by a cap nut and setscrew on the outside.

All the rubber valves in these pumps above the size 7x3½x12 in. are covered with heavy cast-brass cap plates, or guards, which are finished inside and permit the valve to fit snug. This preserves the upper side of the valve for use when the underside becomes worn.

Another special advantage in this valve-chest construction is that it is close to the ground and alongside the water piston instead of above the water cylinder as in some other makes. The valves are therefore just so much nearer the water and the suction lift is reduced accordingly. Furthermore, every water cylinder is made to withstand a pressure equivalent to a 400-ft. head.

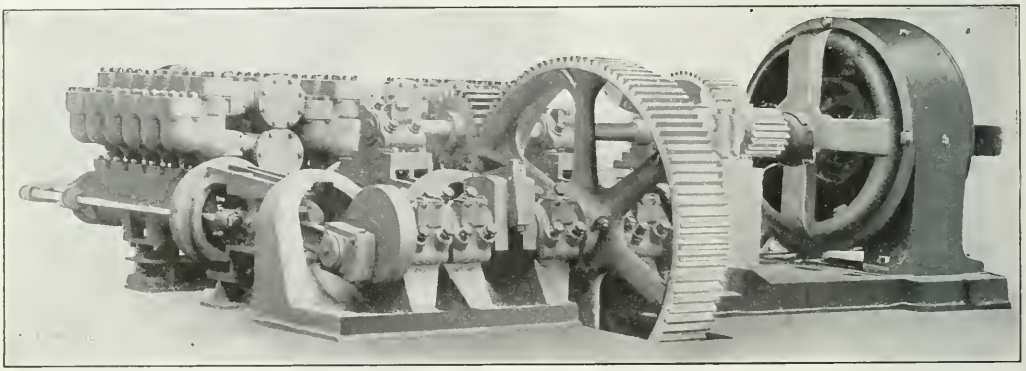
These distinctive features make the Cameron pump unusually strong and reliable throughout, which accounts in large measure at least for its remarkable record of long and severe service in coal mines all over the world.

The Advantages of Electric Pumps

By J. W. Matthews

SYNOPSIS—The electric system of power distribution is much more flexible than either steam or compressed air and electrically driven pumps are more efficient than those employing either of the above mentioned working fluids. There are other advantages also, such as portability and the space required, to say nothing of air vitiation or dry rot in mine timbers.

Electric pumps are now sold under guarantee to operate under water if flooded. They have been flooded by water at 165 deg. F. for twenty-four hours and have come out unhurt, have pumped themselves dry when flooded even after weeks of submersion, and have stood up under the attack of sulphuretted hydrogen for years in locations where attendants could not endure the gas. Add to this brief review a statement that the operating cost of electric pumps is generally less than that of any other power-driven pump, the efficiency frequently 20 to 40 per cent. greater than steam- or air-operated machines, and the reliability of operation supreme and some idea can be gained of the reasons which have caused widespread interest and adoption of electricity as a motive power for mine pumping.



A Horizontal Plunger Pump, Driven by a G. E. Motor through Double-Reduction Spur Gearing

Any statement of the principal advantages of electric power for mine pumps should include the general advantages of electricity as a motive power for mines, which also applies to the pumping-power system as a whole. A brief review of these, with a few remarks on the selection and application of motors followed by the experiences of some operators with electric pumps will be interesting.

Advantages of Electric Power

One power plant can be used instead of several. This means greater efficiency because of larger average load, larger size and less attendance and supervising. To assure continuity of operation, a smaller margin of reserve apparatus is necessary than the total provided at the several small plants.

The central station can be located solely with reference to the generation of power, the supply of boiler and condensing water, the handling of fuel and disposal of waste, etc., practically regardless of the relative location of the various points at which the power is to be applied.

The use of electricity eliminates the necessity for long lines of steam and air piping which are expensive to install and maintain and with which the danger of breakdown and the difficulty of obtaining the necessary working pressures increase with every extension of the service. For these conditions electricity substitutes a simple and thoroughly flexible system of transmitting power by means of conductors, which can be easily run and rapidly extended to meet changes involved in the progress of development, which are not affected by temperature variation and are not liable to mechanical injury or breakage due to floods or shifting ground.

They can be safely used in places where steam lines would introduce an element of danger, and finally they can, in many instances, be run in shafts or bore holes already in use for other purposes without occupying room that could otherwise be utilized. Many coal companies are at present economically transmitting or distributing current from central stations over lines more than 10 miles long and in some cases twice that distance.

A large percentage of the friction losses and repair charges can be eliminated by directly connecting the motor to the pump, as the modern types of both alternating- and direct-current motors lend themselves to this method of connection in the majority of cases with the assistance of a single gear reduction.

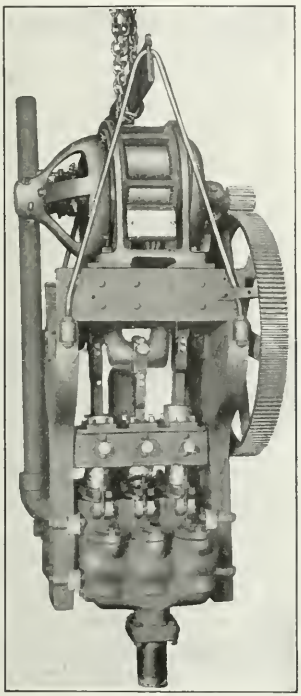
With electric power only a small part of the generating plant need be operated during a shutdown for the pumps, ventilating fans, etc., which must be kept in operation. This intelligent subdivision of the total power-generating equipment into units which can be operated at or near their full capacity during anticipated mining conditions, is a valuable intrinsic feature of electric power.

Electric Machines Have Higher Efficiencies

The efficiencies of electric pumps are 25 to 40 per cent. greater than steam or air, the centrifugal pumps in one case operating at 61 per cent. or 5.6 lb. of coal per i.hp.-hr., and in some cases efficiencies as high as 80 per cent.

are claimed for these machines. A few extreme examples of the extravagance of air pumps which have an efficiency of only about 15% under quite favorable conditions are known.

Steam pumps, of the compound condensing type, 20 and 38x13x36 in., require 10 lb. of coal per i.hp.-hr., including boiler loss, condensation, etc. Where air pressure



A Motor-Driven Sinking Pump

must be maintained outside of working hours, the efficiency of air pumps may be as low as 1 per cent.

The meters used in electric circuits show at a glance any abnormal operating conditions, and efficiency can therefore be maintained at all times and there is no possibility of undetected leaks as in the case of steam or air.

Economies in operating cost and maintenance greater by 15 to 40 per cent. are claimed for electric pumps over steam or air. In the case of the latter, pipes are not as quickly repaired as wires and the many joints are hard to keep tight.

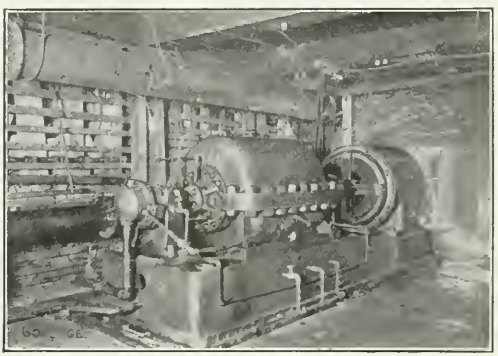
Electric pumps occupy from a fourth to a half less space than steam or air pumps, are easily moved and quickly put into operation without loss of time, can be controlled from a distance and can be arranged to maintain high pumping efficiency under widely varying loads.

Electric pumps are desirable in many cases because they do not vitiate the air nor cause dry rot in mine timbering, as is the case with steam, which also warms the water in sumps, so that its value for condensing purposes is lessened.

Both high- and low-lift centrifugal pumps, three-throw pumps, and special positive-valve pumps have been driven successfully with electric motors.

Electric track pumps can be moved with the greatest ease and can be operated from the nearest trolley or lighting circuit available. They are usually driven with a double-gear reduction, which can be made practically noiseless with cloth pinions.

Either compound- or shunt-wound direct-current or slip-ring or squirrel-cage alternating-current induction motors are suitable for the operation of pumps. Where varying voltage is encountered a compound-wound motor is better adapted to pump operation than the shunt machine. The shunt motors are satisfactory where a little increase in speed, due to their field heating up, is not objectionable, but the induction motor is most highly recommended because there is no electrical connection between its operating and stationary parts which, together with its insulation, renders it waterproof. Beside this its speed is constant and its efficiency high. These motors can be controlled from any convenient point, as by a float in the sump for automatic starting and stopping. They can also be controlled from a distant point, which may be



A Horizontally Split Motor-Driven Centrifugal Pump

miles away, and stopped or started by simply pressing a button.

The weight of the water pumped, multiplied by the height plus the loss in head due to pipe friction, divided by 33,000, should be divided by the efficiency of the pump to get the horsepower of the motor required. Excess power is needed for starting a column of water and for overcoming silt or sand in the intake pipes, but all liberally designed motors will take care of this.

When operating a number of alternating-current motor-driven pumps from one generating station, they should be kept well loaded or it may be necessary to install synchronous motors or rotary converters to improve the power factor.

The power factor is the ratio of the useful power in watts to the product of volts and amperes. The difference is lost in magnetising current and in charging conductors, but must be generated as well as the useful power. Fortunately this is very low, say 5 or 10 per cent. of the generated power, on a well loaded system, and is more than made up by the great economies in transmitting electric current and its possibilities for direct applica-

tion without countershafts or belts for mine machinery. The power factor can be better understood by considering a few examples of electric equipment.

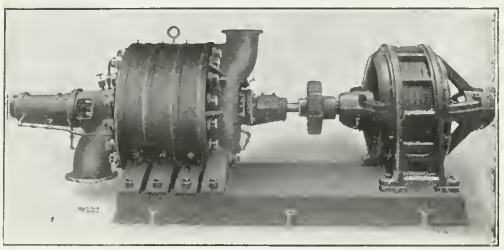
Some Examples of Electric Installations

At the Windber plant of the Berwind-White Coal Mining Co. there were installed seven 400- and two 150-kw. rotary converters, three 300- and two 225-hp. synchronous motors, totaling over 4000 kw. in synchronous apparatus. The inductive apparatus includes, in addition to 300 kw. in transformers, about 3000 hp. in induction motors. The power factor on the system is usually just at unity, that is, there is no so called useless power.

At the York Run plant of the H. C. Frick Coke Co., the synchronous load connected is 1200 kw., all rotary converters, while the inductive apparatus amounted to 2200 kw., consisting of 1350 kw. in transformers for the rotaries and the balance in induction motors from 50 to 400 hp. The induction motors are fairly well loaded and the power factor is over 90 per cent.

To illustrate the waterproof qualities of squirrel-cage induction motors, two examples will be instructive.

During a heavy thaw a 20-hp. induction motor, driving a mine pump at the bottom of a shaft at the mines of the Richmond Iron Works, was flooded, the top of the motor being two feet under water. The machine continued in operation and at the end of two hours had pumped itself clear. It was then stopped, cleaned and oiled and put into service again. This pump has been operating about twenty hours a day ever since and has apparently suffered no injury.



A Vertically-Split Centrifugal Pump Direct-Connected to Motor

The most remarkable motor-driven pumps in existence are probably those at the Comstock mines, where, during a changeover, water at 165 deg. F. submerged the pumps for twenty-four hours. The motors were dried out with voltages of 38, 110 and 440 and in a few hours were put to work. Although the motors were not damaged, a telephone receiver was melted out of shape and warts were raised upon it.

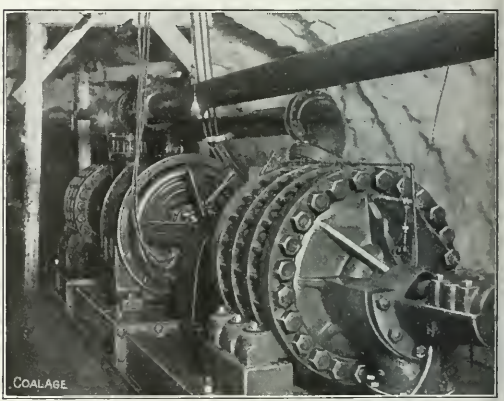
Whenever the air supply is insufficient the contractors on the Catskill Aqueduct stop the air pumps and rely entirely on the electric pumps. This is done where the compressor capacity makes it advisable to use the air pumps when demands are light, but wherever possible the air pumps are removed and electric ones substituted. In one case three air-driven pumps were displaced at the Hudson River Siphon by one 500-gal. per min. (1200-ft. head) centrifugal pump, driven by a 275-hp. ball-bearing water- and air-cooled squirrel-cage induction motor. This motor can be turned over with the little finger when disconnected from the pump and the air cooling has never been necessary.

Part of the government's test for the new dry-dock pumps recently purchased was to submerge the motors for three weeks and then turn on the current until they had pumped themselves dry. The water was 30 ft. deep in a well at the drydock, and was, I believe, sea water.

❋

A High Head Centrifugal Pump

Although many centrifugal pumps may be found in coal mines throughout the country, the vast majority of them operate against heads considerably below 1000 ft. Several installations exist, however, wherein this head is greatly exceeded. The Prescott turbine pump shown in the accompanying illustration and located in the Penn Iron Mining Co.'s mine at Vulcan, Mich., is an 8-in. 8-stage, composed of two 4-stage machines operated in series, one located on either side of a 500-hp., 2200-volt, 60-cycle, 3-phase induction motor, operating at 1200 r.p.m.



An Eight-Stage Centrifugal Pump Working under a 1300-Ft. Head

The shafts of the pumps are direct-connected to the motor shaft by compression couplings. The discharge from the first half is carried around the motor to the suction of the second half. The direction of flow of the water in the two parts of the pump being thus opposed tends to balance the end thrust on the impeller shaft. In addition to this, however, there is furnished a disk thrust bearing with oil cushions which completely takes up the thrust and maintains the impellers in their proper positions with respect to the diffusion vanes and prevents excessive wear on one side. As may be seen in the photograph, the discharge heads and pressure rings are of cast steel, split vertically and held in position by heavy external through bolts. The impellers and diffusion vanes are of cast bronze. The bearings are of the ring-oiling type and separate from the pump casings. The pumps and motor are mounted on and securely bolted to the cast-iron bedplate extending under the entire unit.

This machine delivers 1000 gallons per minute against a vertical head of 1300 ft. and has been in continuous and successful operation for over two years.

The Evolution of the Mine Pump

By Frank H. Kneeland

SYNOPSIS—Like most other pieces of mechanism employed in present-day arts and industries, the modern mine pump is the outcome of a gradual development. The early stages of its growth are linked inseparably with the names of such inventors as Worcester, Savery, Newcomen and Watt. However, during the past century, many other men have introduced various alterations and refinements.

Neglecting the experiments of Hiero, of Alexandria, who lived and flourished about the year 200 B.C., the real history of the steam engine and pump began with Edward Somerset, second Marquis of Worcester, about the year 1663. This inventor designed and built a device somewhat simila. in principle to the present-day pulsometer, lacking, however, the latter's automatic-valve feature.

That the pump should be the first successful heat engine developed and that it should find its primary application in ridding mines of water is not strange. Great difficulty had been experienced in satisfactorily draining British mines, particularly those of Cornwall, and the operators were, therefore, extremely anxious to make use of any device for lifting the water which might prove more economical than the horses then employed.

It is a strange but notable fact that many, if not most of the real improvements in coal mining, have come from men who were not themselves practical miners. The mine pump was no exception to this rule.

The First Steam-Driven Pump

The first steam-driven water-lifting machine to be successfully employed in mining was what was known as Savery's "fire engine." This was not altogether dissimilar to the Marquis of Worcester's device in principle. The main difference was that surface condensation was employed to hasten the insuck of water to the operating vessel. A safety valve was also employed as was a second or auxiliary boiler to force water into the main or working boiler without interfering with its operation.

The next great forward step in pump development was the invention of the famous Newcomen engine. In this machine a heavy vertical pump rod was attached by a chain to one end of a walking beam provided with a quadrant. To the other end of this beam, also provided with a quadrant, was similarly fastened the piston, which worked vertically in a cylinder. Steam was led from the boiler to the cylinder equalizing the pressure of the air and allowing the heavy pump rod to fall, thus raising the piston. The steam supply was then cut off and a jet of cold water introduced into the cylinder. This condensed the steam beneath the piston, which descended under the pressure of the air, thus raising the pump rod. Several improvements in this device were introduced from time to time, chief among which was an automatic valve gear, a fairly efficient method of packing the piston with leather or rope and its lubrication with tallow.

This machine was received with considerable favor throughout the mining districts. From about 1758 until the introduction of the engines of Watt, the Newcomen pump was the standard, and all but universal means of raising water from the mines. Some of these machines have been in use up to the present day.

The next improvement of the pumping engine came from James Watt, who added, first the separate condenser and later other improvements. This inventor also built the first successful rotary-motion engine or machine suitable for driving industrial plants.

The coal-producing industry as an industry is perhaps rather conservative. The operator finds it difficult to discard any piece of machinery that is in even fair working order and pay out good cash for new apparatus even though he is convinced that money would be saved thereby in the long run. Just as the older mining companies in the United States are clinging tenaciously to distribution of power by means of extravagant steam lines, so the English have stuck to walking-beam and bell-crank pumps with their long and heavy wooden pump rods.

Of course, these machines have their advantages and may be so constructed as to be economical in their use of steam. They are, however, extremely heavy for their power, clumsy, and require a special shaft or compartment within which the pump rods oscillate.

The direct-acting piston or outside packed plunger pump, either simplex or duplex, simple, compound or triple-expansion, has always been a great favorite in this country. And although some economical flywheel machines are in use at American collieries and have been for some years past, yet the great majority of our pumps, those which handle by far the largest percentage of the mine water encountered, are of the direct-acting type.

With the electrification of mines and the adoption of this form of energy, for various mining problems, has come the duplex, triplex and quintuplex electrically driven, geared pumps. These are frequently small machines, capable of being mounted upon a truck which can be run along any mine track, to be used wherever a dip or swamp is encountered.

The Centrifugal Pump Is a Favorite with Many

In comparatively recent years also another type of pump, known as the centrifugal, has been developed. This is as radically different from the older varieties as is a steam turbine from a reciprocating engine. Although the centrifugal pump is not popular for use underground with some operators, it is a great favorite with others. Its utility for this service seems to depend largely upon the size and shape of the impeller passages and the quantity and size of the pieces of foreign matter (chips, coal, rocks, etc.) suspended in or otherwise carried by the water. It cannot be wood lined and thus proofed against the action of acid, as may be the plunger pump. All parts subject to the action of the water may, however, be made of bronze, the corrosion resisting qualities of which are well known.

The great simplicity, light weight, large capacity and ease with which this type of pump may be connected to a motor or other driving apparatus, as well as a total lack of vibration or water hammer on the connected pipeline, due to the closure of valves, are all considerations which have greatly influenced the favorable reception of this type of water-handling apparatus.

A New Type of Centrifugal Pump

SYNOPSIS—The striking features of this pump are the absence of diffusion vanes and the use of double-inlet impellers. Since the shaft is theoretically in hydraulic balance, there is little or no tendency for it to move endwise, and the multi-collar bearings provided serve rather to keep the rotating parts in alignment than to resist excessive end thrust.

Practically ever since the beginning of coal mining as we know it today, the reciprocating pump has held a supremacy over all other forms which has been all but absolute. In many localities, however, the centrifugal mining pump is now rapidly encroaching upon the domain of the older and perhaps better known type. This is due not to any one particular point of excellence, but to a combination of reasons.

Throughout the entire field of mechanical engineering, almost without exception it has been found easier and more convenient to govern, control and lubricate a continuous rotary motion, than one which is reciprocatory or oscillating in its nature. The moving, or working parts of the centrifugal pump may be considered as a unit, revolving about a common shaft. The problems of operation have, therefore, reduced themselves to their lowest possible terms.

One of the principal difficulties which has heretofore confronted the designers or users of this type of pump has been the tendency of the shaft to move endwise in the casing and bearings, due to the reaction of the water handled upon the impeller. This has been counteracted or taken care of by the employment of ball thrust-bearings, or a bearing of the marine multi-collar thrust type upon one or both ends of the pump shaft. In many instances these have not been altogether satisfactory in service.

Another but less fruitful source of trouble has been the tendency of the pump to suck in air through the gland, or stuffing-box, on the suction or intake of the pump, thus destroying the vacuum and rendering it difficult to raise the water.

As an industry, mining presents problems peculiar to itself, no matter what may be the type, or kind or purpose of the apparatus under consideration. Particularly, if a pump be small, it is likely to be shifted about from place to place in the mine and therefore subjected to lifts and heads which are decidedly variable. Furthermore, it will frequently be placed in a poorly lighted and often cramped position. Add to this the fact that the labor available both for installation and operation is usually unskilled, or at best only semi-skilled, and it will be readily appreciated that the work which the mine pump has to perform is in most cases at least severe, if not exacting.

To meet these varying and strenuous requirements the Epping-Carpenter Co., of Pittsburgh, Penn., have recently designed a type of pump which contains many novel features. It is built either single or multi-stage depending upon the service required. A three-stage pump of this design is illustrated in Fig. 1.

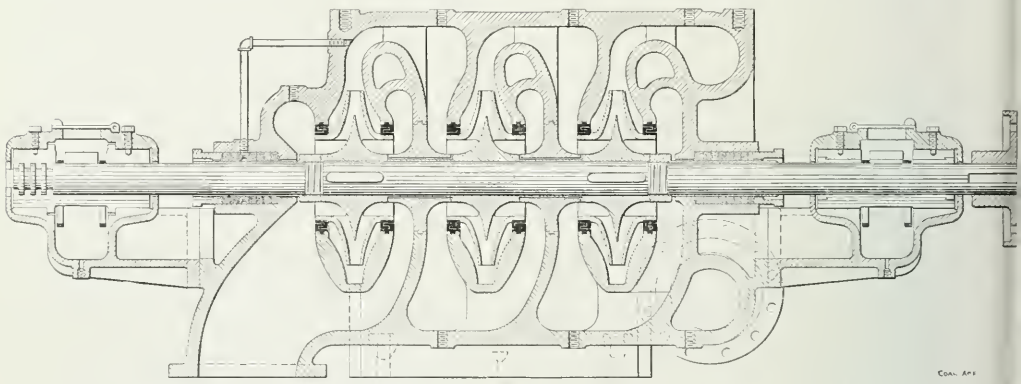


FIG. 1. CROSS-SECTION OF 3-STAGE PUMP. NOTE ABSENCE OF DIFFUSION VANES

To those familiar with this type of apparatus, two distinctive features in the construction of this pump are at once apparent. These are, first, the entire absence of diffusion vanes and, second, the double-suction impeller. The water entering the suction pipe, which is here shown to the left of the drawing, has easy access to both sides of the impeller of the first stage. After passing the first stage it is conducted to the second impeller which it enters in precisely the same way as the first and so on throughout the remainder of the stages.

The pump is so designed as to give as nearly as possible a uniform velocity of flow to the water throughout the various pump passages with the exception of the impellers, this condition being conducive to the maximum of efficiency.

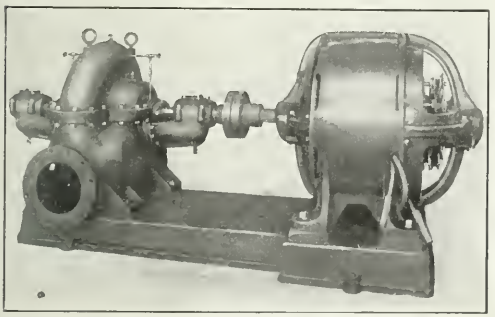
As will be noted from the drawings, the steel shaft upon which the impellers are pressed and keyed is incased from gland to gland of the stuffing boxes either by bronze sleeves or by the pump impellers themselves. It is thus entirely removed from the corroding action of the liquid handled.

As has been stated above, in pumps of this character there is a tendency for the air to creep or leak along the shaft through the stuffing box on the suction end of the pump. In this particular design, to avoid this leakage

of air an open "lantern" or frame work somewhat resembling the retainers of the ordinary ball bearing, is placed in the stuffing box in such a way that water may be conducted from the terminus of the first stage of the pump into this opening. A water seal is thus provided at a pressure which at all times exceeds that of the atmosphere and renders impossible any air leakage along the shaft.

The main bearings of the pump are of the vertically split ring-oiling type. On the suction end, as will be observed, a three-collar marine thrust is provided. Since the impellers are, however, hydraulically balanced the function of this marine thrust is rather more one of alignment—that is, keeping the impellers of the pump constantly in their proper position—than the taking care of any excessive end thrust which may come upon the shaft.

On the opposite, or discharge end of the shaft, a flanged or other coupling may be provided for attachment to motor, steam turbine or other driving apparatus. In order to take care of the rough usage and neglect to which these pumps are frequently subjected, all parts are made heavy. The casing is split horizontally and



Single-Stage Pump and Motor on Common Base

the entire pump may be dismantled for inspection or repairs without disturbing the base or foundation.

The single-stage pump is exactly similar to the multistage except, of course, that it has but the one impeller. A water seal is provided in both stuffing boxes, and a collar upon either end of the shaft takes care of any slight end thrust which may exist.

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Some of the features of a new electrical pumping installation at the Dover collieries, England, are more or less novel in mining work. Among these are the variation of output of the centrifugal pumps, the increase of the load on the alternators by means of air blades, and the fool-proof combination of switchgear for the starting of two motors coupled to the same pump. The high-tension motors are dried by means of a low-tension current.

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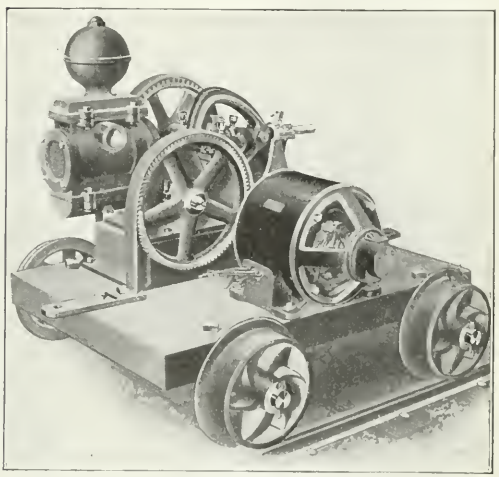
The Manor Powis coal field, Stirling, Scotland, presents a very interesting geological formation. The Carboniferous limestone series are underlaid by a great sheet of basalt, and the degree of anthracitization is determined, to a greater or less extent, by the distance of the seams from this basalt. At the time this sheet was thrust up it was intensely hot, so that its effect on the coal above was to reduce some of these seams to graphite and materially change the character of the others. The six seams of the horizon show, in regular gradation, the effects of this intense heat. The lowest are burned beyond anthracite, the next are anthracite, the middle seams, coking coal, and the upper, bituminous.

A Small Portable Electric Pump

The accompanying illustration shows a new type of portable electric mine pump which has recently been placed upon the market and is now carried in stock by the Harris Pump and Supply Co. of Pittsburgh, Penn. This machine is designed particularly for dips and entries or for follow-up work where but small amounts of water are encountered, and the head against which it is to be raised is not great.

The construction is such that air entering the suction even in considerable amount does not stop the operation, neither do small quantities of solid matter such as sand or mud clog or seriously interfere with the proper action of the valves.

The pump is ordinarily built for handling pure water



Pump and Motor Mounted upon a Truck

but the substitution of a solid bronze water end renders the machine capable of coping with water which is strongly sulphurous.

A valuable feature of this pump as illustrated is that the motor can be and regularly is made self-starting. One wire is grounded through the truck while the other may be hooked over the trolley wire which starts the pump instantly.

The cylinders of this machine are five inches in diameter while the stroke is four inches, the rated capacity being 30 gal. per minute while the maximum head against which the pump is intended to work is 100 ft. Connections are provided for a 2½-in. suction and a 2-in. discharge. The truck wheels are 12 in. in diameter and the height over all is consequently only 12 in.

This pump is usually made in from 39-in. to 44-in. track gage but if sufficient head room is available it may be raised up so as to accommodate any gage smaller than those above mentioned.

The motors ordinarily furnished with these pumps are either 230 or 500 volts direct current. Any other kind or type of motor of suitable power and speed could, however, be employed, the above being merely the voltages most commonly encountered.

A Large Triple-Expansion Pump

The general appearance and characteristics of operation of the ordinary duplex plunger steam pump are familiar to almost all mining men. Whatever may be the merits of such machines as concerns durability and reliability, they are notoriously extravagant in their consumption of steam. If such machines are, however, made triple expanding and such refinements as steam-jacketed cylinders, rotary valves, etc., are introduced the high rate of steam consumption may be decidedly reduced and the efficiency of the unit correspondingly increased.

The Goyne Steam Pump Co., of Ashland, Penn., which manufactures mine pumps exclusively, has just completed a large triple-expansion condensing pump for the Exeter colliery of the Lehigh Valley Coal Co. As the installation of this machine has not yet been completed, it has not, of course, been put in operation and no data are available from the operating standpoint.

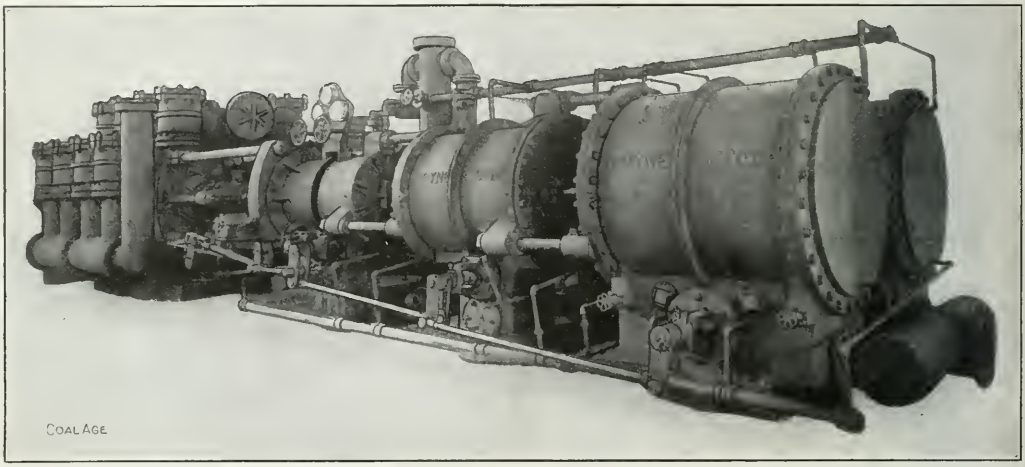
This machine was, however, designed to work against a vertical head of 650 ft. and to deliver 2,000 gallons of water per minute. The high-, intermediate- and low-pressure cylinders are 20 in., 30 in. and 45 in. in diameter respectively. The plungers are 14 in. in diameter and the stroke is 36 in. Both the high and intermediate steam-pressure cylinders and their heads as well as the heads of the low-pressure cylinders are steam jacketed.

The steam valves are of the semi-rotative type and the high-pressure cylinders are fitted with the Goyne adjustable cutoff, which is capable of alteration while the pump is at work. Each of the six steam cylinders is lubricated by a power-driven oil pump and a record of operation is made by a six-figure revolution counter.

The steam separator and cylinder jackets are drained by separate traps and steam is supplied to operate the condenser from the discharge end of the cylinder-jacket main drain pipe, which assures dry steam in the jacket. The arrangement of cylinders, cylinder heads and piston rods is such as to give the easiest possible access to the internal parts. The total weight of the pump, exclusive of condenser, is 160,000 pounds.

As this pump will be called upon to handle water which is strongly aciduous the water end is entirely wood and bronze lined as a protection against the corrosive action of such liquid.

Owing to the varying circumstances in colliery operation it is not always possible to maintain a steam pressure which is even approximately constant. Should a condition arise whereby the steam would drop to a pressure that would not give the required piston speed to meet the water conditions, this pump is fitted with an appliance such that by the manipulation of a valve (which can be accomplished in a fraction of a minute) the high-pressure cylinders may be thrown out of service and the pump for the time being operated as a compound machine.



A 2000-Gal. Triple-Expansion Pump for Use in an Anthracite Colliery. Note Rotary Steam Valves

It might be mentioned also that the manufacturers of this pump are now engaged in building four other large station pumps of practically the same type except that these latter will be compound instead of triple expansion.

A Filtration and Pumping Plant

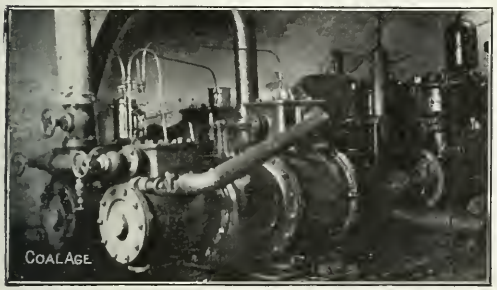
The problem of providing an adequate and suitable house-water supply at many of the larger mining operations, especially those which are isolated from any town of considerable size, is one which requires careful consideration upon the part of the designer in laying out the plant.

As the pumps supplying such a domestic water system will probably be called upon in the contingency of fire, they should be selected with a view to a large overload or emergency capacity.

The Pittsburgh-Buffalo Co., at their mine at Marianna, Penn., have such a plant installed. The machines selected for this purpose are two Jeansville compound duplex direct-acting plunger pumps which are duplicates of each other. The high- and low-pressure steam cylinders are 12 and 24 in. in diameter respectively. The

plungers are 8 in. in diameter and the stroke is 18 in. The suction and discharge of these pumps are each 10 in. These have, however, been bushed down to 8 in. in both cases. The steam supply pipes are 3 in. in diameter and the exhaust 6 in. The pumps are provided with rubber pot valves, 10 in. in diameter.

Steam is supplied to these machines at about 140 lb.



ONE OF THE TWO COMPOUND PUMPS HANDLING HOUSE WATER

pressure per sq.in., while the exhaust is made to the atmosphere. Both pumps are lubricated by means of a forced-feed oil pump. They are set upon solid concrete foundations in a brick pump house, with concrete floor about 6 ft. below the ground level. They ordinarily operate at approximately 50 strokes per minute. Each machine is provided with all necessary priming and drain pipes on both steam and water cylinders.

Under ordinary operating conditions, one of these pumps draws raw water from Ten-Mile Creek, and discharges it into a tank. From here the water flows to the treating plant where it is subjected to the action of a solution of alum to effect purification. After being thus treated chemically, the water passes through a filter from whence it is conducted to the suction of the second pump.

This machine draws its supply of filtered water from the purification plant, and discharges it into a house-supply tank located on a hill at an elevation of approximately 600 ft. above the pump. This tank is about 200 ft. above the highest point where water might be needed for fire purposes.

In case of emergency, provision is made so that both pumps may draw their water supply direct from the creek and deliver it to the reservoir through two separate 8-in. pipe lines. This places an abundant supply of water at a pressure equivalent to at least a 200-ft. head at the disposal of the company in case of fire or any other emergency.

A New Stripping Company

The exchange of big coal holdings and the organization of new mining companies are frequent occurrences in Pittsburg, Kan., and the surrounding coal fields. This is especially true of the strip pit mining industry. The most recent corporation to be formed is the Moka Coal Co., with Thomas W. Caffey, George Williams, William Williams, A. L. Blair and Oliver T. Jones as the members. Mr. Jones is the practical coal man of the group, he having had considerable experience in various phases of the business. The new company, capitalized at $30,000, has leased 165 acres of land with a shallow lying vein from Miller Bros., of Mulberry, toward the north end of the coal field and on the Missouri-Kansas line, from which fact the name "Moka" is derived. A big steam shovel will be put to work in the near future, and it is said $35,000 will be necessary to start operations.

Options on coal lands are being taken up or renewed all over the district, both in shallow and deep-vein tracts. The shallow coal is mined by stripping off 10 to 20 ft. of earth with steam shovels. The Southwestern Development Co., which is known as a subsidiary of the M. K. & T. Ry. Co., and George K. Mackie, of Scammon, a well known operator, recently have been buying options and renewing old ones to the south and west of the present prospected district, in Crawford and Cherokee counties. Miller Bros., coal-land dealers of Mulberry, have just completed buying options and renewing others on 3700 acres on the north edge of the district. Much of the territory has not been prospected, but great confidence is felt because of showings made on part of the holdings.

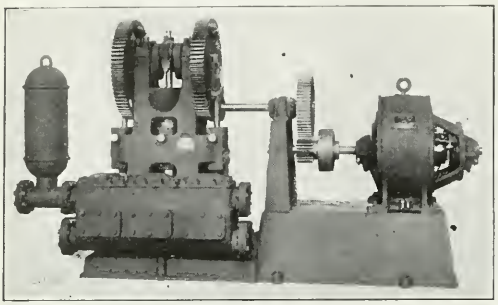
EXTERIOR VIEW OF FILTRATION PLANT, HOISTING PLANT AND BOILER HOUSE IN BACKGROUND

The United States Government still owns over 70 million acres of coal land in the West. Some parts of this immense acreage contain beds of high-grade coal ranging from 30 to 80 ft. in thickness.

An Electric Water Supply Pump

At many mining plants by no means all of the pumping which is done, is for the purpose of mine drainage. Power plants must be supplied, dwelling houses must be provided with drinking water, and provision must be made for fire protection.

At the Crescent mine, of the Monongahela River Coal & Coke Co., near California, Penn., there is installed an 8x10-in. Deming vertical triplex pump in a sump under the tipple. This machine is geared to and driven as to drive the crankshaft of the pump at approximately 47 r.p.m. when the motor is running at full speed.



THE PUMP, SHOWING HOW IT IS GEARED TO THE MOTOR

The pump and motor bases are separate, but are bolted securely together, thus forming practically one base plate. The motor is raised a sufficient height from the floor to largely obviate any danger from water which frequently accumulates upon pumphouse floors.

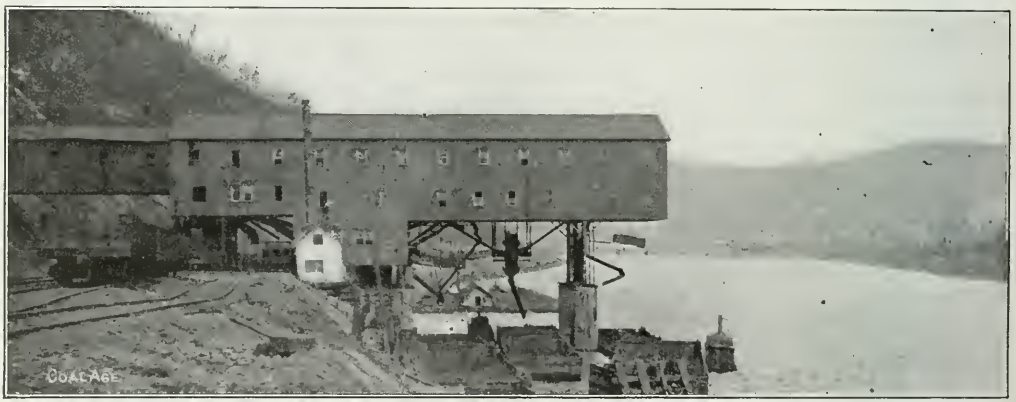
The pump is provided with a 6-in. suction and a 5-in. discharge. Both of these openings have, however, been bushed down to 4 inches.

The unit as a whole is compact and all parts are readily accessible. The plungers are of bronze, single acting, and the pump chambers are all wood lined.

This machine draws water from the Monongahela River, and forces it through about 2½ miles of pipeline to the town and power plant, at Crescent.

Panel Board Lightning Arresters

A great many railway, lighting, mine and industrial properties have certain "spots" where lightning conditions are particularly severe, and where it is difficult to secure thoroughly efficient and reliable protection. In other cases, particularly in central stations, there is certain electrical apparatus that needs, what may be termed, one hundred per cent. protection, as, for instance, power



THE CRESCENT TIPPLE OF THE MONONGAHELA RIVER COAL & COKE CO., BENEATH WHICH PUMP IS LOCATED

by a Westinghouse 25-hp. interpole motor, which operates at 685 r.p.m. upon a current of 500 volts.

The rawhide motor pinion is keyed to an extension of the motor shaft, which is attached thereto by means of a flexible coupling of the flange and rubber buffer type. This extension shaft is provided with an outboard bearing outside of the pinion.

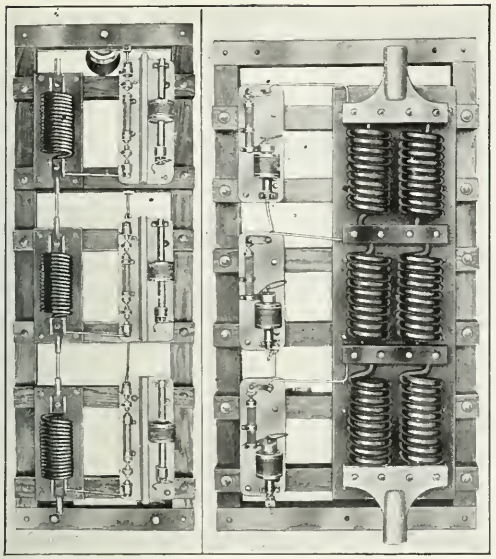
Meshing with the motor pinion there is a gear upon a countershaft, which extends across the frame of the pump. This shaft carries two pinions, which engage the main or driving gears upon the pump shaft.

The two gears above mentioned serve not only to drive the crankshaft, but are themselves crank disks, pins being provided to drive the two outer plungers of the pump. A center crank is also located between the two main pump bearings, which drives the middle plunger.

All gears are cut and the ratio of reduction is such for the fans and pumps. For the protection of these important installations, the Electric Service Supplies Co., Philadelphia, has placed on the market a line of panel-board lightning arresters, for both direct- and alternating-current service; illustrations of typical boards for both are shown herewith.

These boards are built on the well known law that no matter how efficient a lightning arrester may be, it will never carry off the entire discharge from a given line; some small portion will always find its way past an arrester and into the apparatus to be protected. With an efficient lightning arrester, however, and a suitably designed choke coil, this leakage will be small and usually not enough to damage the apparatus, but with heavy induced strokes, and under certain other conditions, this is not the case.

The arresters here described effectually take care of



Direct- and Alternating-Current Arresters

this leakage by interpoling additional choke coils between the line and the apparatus to be protected, and by connecting lightning-arrester units ahead of these coils. Any leakage passing the first arrester unit, for instance, in a triple board, must pass through three choke coils and by two additional units before it can get into the apparatus.

With but a single choke coil and a single arrester unit, and assuming that nine-tenths of the discharge goes to ground through the arrester, it is seen that one-tenth will be left to enter the apparatus. If an additional choke coil and a second arrester unit be placed back of the first, and assuming that the second unit takes nine-tenths of the one-tenth leakage to ground, obviously only one-one hundredth of the original charge remains to flow into the apparatus. Similarly with a third choke coil and a third arrester unit, but one-one thousandth of the original charge will leak through. In other words, by the addition of extra arrester units and extra choke coils, the protection has been increased ten times by a double panel board, a hundred times by a triple board and a thousand times by a quadruple board.

These arresters are not new by any means, having been furnished numerous companies all over the country for the protection of apparatus under unusally severe conditions. The boards are regularly furnished in station type, mounted on heavy impregnated oak framework and are furnished complete with insulators for attaching to any suitable support. The arresters are furnished with highly polished and lacquered metal work. Choke coils are of copper, black enameled and baked.

They are designed especially for the protection of apparatus up to 6600 volts alternating current, 2500 volts direct-current railway and 6000 volts direct-current arc circuits, and are furnished in any ampere capacity for voltages within this range.

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Recovery of Mine Timber

By J. W. Powell.*

SYNOPSIS—The need of drawing timber in all worked-out places is emphasized by the fact that timbers left standing in the waste cause a loss of coal by throwing undue weight on the pillars and crushing them, and by making it necessary to build packwalls, etc., that would not otherwise be required. The Sylvester machine for drawing timber is described.

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The timber needed daily in the operation of a colliery often exceeds the cost of any other kind of material or supplies. Any means, therefore, of reducing the heavy expenditure should be at once welcomed. Although mine props and sets of timber are often broken a short time after being set, the broken ends are valuable as they can still be utilized for the purpose of cap-pieces, wedges, track ties, or for the building of "cogs" or "chocks." Also, post timber broken in a thick seam can often be used again, in a thinner seam at the same colliery.

In some mines there is a considerable loss of timber, through the carelessness of miners who will let them lie in the waste where they are finally buried. By keeping a careful watch in their daily rounds through the mine, the mine officials can do much toward reducing this loss or waste of timber.

I want to emphasize the importance of drawing all kinds of timber, as the work proceeds, using, if necessary, some suitable appliance for this purpose. Timbers left standing in the waste often cause a loss greater than

Fig. 1. Drawing a Post in the Third Row from the Face of an Advancing Room

*Mine Manager, Columbia Coal & Coke Co., Coalmont, B. C., Canada.

their own value, by preventing the roof from caving and frequently making it necessary to build extra packwalls or timber cogs to keep the roads open. The material for these packwalls often has to be transported a considerable distance; whereas, if the timber was drawn and the roof allowed to fall, there would be plenty of material for the building of all necessary packwalls in most cases.

Again, under many conditions, when the roof does not fall but a large standing area is kept open a great weight is thrown on the timbers standing next to the face of the coal, with the result that these timbers are broken more quickly, or they kick out and the roof is ruptured at the face. When this occurs, the condition is bad, as the influence of the roof in breaking the coal after the latter is undermined, is destroyed. When the roof is of such a nature that it breaks readily, I believe it is a good policy to set a line of large breaking posts, with good sized cap-pieces, on one side of the track, which should be carried along the straight rib of the room.

Under these conditions, when the timbers are drawn

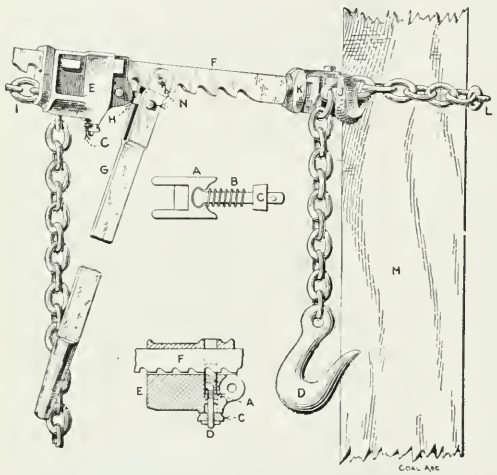


Fig. 2. Showing Detail of the Sylvester Machine for Drawing Post Timbers

in the waste, as the face of the room advances, up to the last crosscut, there is not only a saving of timber, but the caving of the roof prevents the crushing of the pillar coal when the roof "weights" and cannot fall. In heavy-pitching seams, the recovery of timbers is much more difficult and dangerous than in flat seams; because the worked-out portion, from which the timbers are drawn, is located up the pitch, and any loose pieces of rock that fall when the post is drawn are liable to roll or slide down upon the men engaged in drawing the timber who are unprotected.

The danger may be avoided, in part or wholly, by using a long ½-in. steel cable or chain that will reach from the timbers to the first crosscut, in which the drawing machine should be placed. This will not only afford the necessary protection for the men, but will enable them to recover a larger percentage of timbers. The cost of timber in pitching seams is much greater than in flat seams, owing to the labor required in handling the timber on steep pitches. In a seam pitching 35 deg. I have found the cost of timber to amount to an average of about 5½c. per ton of coal mined. This was in a mine where the roof conditions were fairly good.

Although most mine managers are, no doubt, familiar with the appliances in use for drawing timber, a brief description of the Sylvester machine, which I have found is the best for that purpose, will be of interest. The general method of using this machine in a flat seam is seen in Fig. 1, which shows a miner in the act of drawing a post, in a thick seam of coal. In general, the head of the post resting on a cap-piece will be dislodged more quickly than the foot of the other post to which the machine is anchored, especially if the bottom is rough or soft. Caution, however, is always necessary to see that the machine is properly anchored before attempting to drawn another post. If this is not done the post to which the machine is anchored may be dislodged and the miner operating the machine be caught by the falling slate and killed or severely injured.

The Sylvester machine is very simple in construction, and is shown in detail in Fig. 2. It consists of a notched bar *F*, 3 ft. long, 1½ in. deep and 5 in. wide. The notches are cut 1 in. apart and ½ in. deep and shaped as shown in the figure. To one end of the bar is attached a 3-ft. chain *L* which is passed around the post *M* and fastened or held by the chain block *J*. Sliding on the rack is a heavy block *E*, to which a 3-ft. hand lever *G* is attached by the link *H*, and by which the block *E* is worked along the bar, from notch to notch.

One end of the long chain *I*, having been attached to the post that is to be drawn, the chain is attached to the block *E*, by slipping a link into a recess in the side of the block. The bolts *N* in the end of the hand lever are 1 in. apart, which gives a leverage on the block *E* of practically thirty times the force applied to the lever. As the block *E* is moved along the notched bar, it is held by the pawl shown in detail below, in the same figure. The pawl *A* is actuated by the spring *B*. A detailed section of the block showing the operation of the pawl is shown also below. When it is desired to release the block *E* the lever *G* is moved forward slightly to relieve the pressure on the pawl, which is then drawn out by pulling on the crossbar head *C* and giving it a half turn, to place it crosswise of its recess. This holds the pawl back, and the block *E* can be moved in any direction. The large hook *D* on the end of the chain *L* is for use, if needed for attachment in another manner than what is shown in the figure.

Limiting Coal Profits in France

On Mar. 4 the French Chamber adopted an amendment to the Finance Bill, which has the support of the government. It takes the form of a tax on each ton of coal shipped or sold, on all mines whose net earnings amount to 20c. or more per ton. The tax, it is understood, will become operative on Oct. 1. In the case of mines whose net profit is quoted as from 20c. to 30c. per ton, the tax imposed will be equal to the excess in the value over 20c. As reckoned, the tax will therefore amount to 10c. or more per ton when the profit is 30c. or over. The estimate of the finance minister is that the tax will bring in $2,800,000.

A Pump Designed for Acid Water

SYNOPSIS—A mine pump should be sectionalized to facilitate transportation and erection underground. It should be as nearly acid-proof and as efficient as possible, but above all it should be dependable. This article describes a pump which has been designed with all of these points kept constantly in mind.

In different sections of the country and even in various mines in the same district, the conditions under which the pumps operate vary to a considerable degree. In some instances, the pump rooms are large, well lighted, comparatively dry, and the water free from acid. The engineer, or pump runner, is a competent man supplied with the necessary tools and equipment for properly taking care of and getting the best results from the apparatus placed under his charge. In such cases, standard pumps similar to those used in stations on the surface will often meet all requirements.

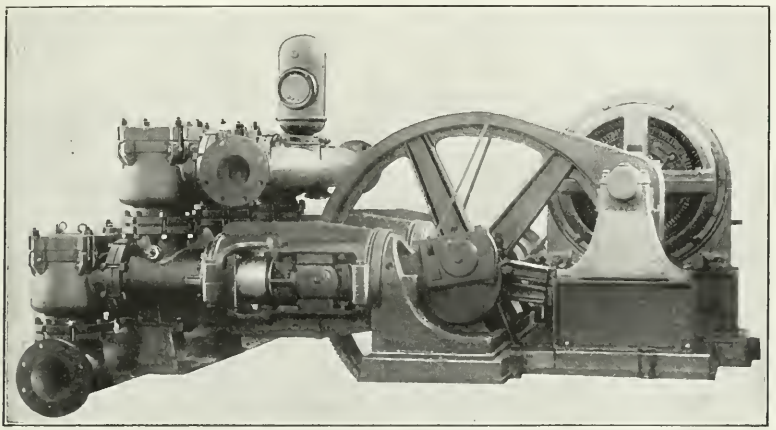
Frequently, however, the conditions are quite different, and special construction is necessary to satisfactorily cope with the exacting service, and a careful study of the actual operating conditions is essential in order to provide reliable and efficient machinery.

In general, a mine pump must have the following characteristics embodied in its design, together with any special features that may be necessary to meet local conditions. The various parts must be sectionalized to such an extent as to permit their being lowered through shafts of limited dimensions, and the separate castings must be of such size and weight as to be readily handled in limited quarters without the use of a crane. Furthermore, in order to lessen the liability of flooding the mine, the pump must be as reliable as possible, extra heavy in all its parts, provided with large wearing surfaces, protected from corrosion, and of such construction that replacement and repairs can be made in a minimum of time.

While reliability is a primary consideration, yet the cost of power must by no means be forgotten. Many pumps, particularly in coal mines, have to handle water containing such a percentage of acid that it will attack and quickly eat out cast iron. The water ends of such machines must be so protected, that none of the iron castings come in contact with the water.

The accompanying illustration shows a pump designed and built by the Dean Steam Pump Co., Holyoke, Mass., which is intended to meet the severe conditions of coal-mining service.

The pump is of the triplex type maintaining a practically constant and uniform flow in the discharge column. It is fitted with one air chamber on the suction pipe located directly in the line of the suction flow and with three air chambers on the discharge so located that one is directly over the outlet from each cylinder, thus tending to take the peak of the discharge and overcome any tendency to acceleration or retardation in the flow of the discharge column.



Triplex Pump Geared to Motor

A uniform rate of flow makes the load on the motor constant and tends toward a high efficiency. The plungers which operate horizontally are 12 in. in diameter with a 12-in. stroke giving at 18 r.p.m. of the crankshaft a capacity of 800 gal. The total head is equivalent to 400 ft., making 81 hp. in the discharge column. The mechanical efficiency of the pump is approximately 85 per cent. so that the 125-hp. motor used for driving has an ample surplus capacity.

The speed of the driving motor is 365 r.p.m. and the crankshaft is driven through single reduction herringbone gears, protected by a sheet-steel guard.

The motor is placed on a heavy base plate securely attached to the pump base and is raised a sufficient amount to prevent damage in case of water on the pump-room floor. A heavy outboard bearing on the armature shaft maintains the alignment of the pinion with the gear.

The main gear is mounted on the crankshaft of the pump between two of the main bearings and is thus rigidly supported upon either side. Perfect alignment of herringbone gears, which is essential to their proper op-

eration, is thus secured by the ample supports provided for both members of the train.

The crankshaft is a steel forging carried in four babbitted bearings each provided with chain oilers. An open-hearth annealed steel casting disk with a large crank-pin made as an integral part thereof is pressed upon the crankshaft at either end. A center crank is also provided which drives the middle plunger. The connecting-rods are steel forgings fitted with wedge and screw adjustments on each end. The crossheads operate in bored guides and are fitted with adjustable shoes both top and bottom. They carry large engine-type taper-fit steel wristpins.

All parts are readily accessible for adjustment, a particular feature being the split cradle or yoke which permits the removal of the upper half without disturbing the other parts of the machine. The enlargement of the yoke at the water end offers ample facilities for access to the glands and stuffing boxes.

Provision against Grit and Acid

All waterways are made large, thus avoiding the high velocities which are so detrimental to pumps carrying acid or sand in the water. As these machines are designed for use where the fluid handled is aciduous, it is necessary that the whole water end be protected against the corrosive action encountered. The cylinders, valve pots, suction and discharge pipes are therefore carefully lined with soft wood, and the valve details and plunger coverings are of acid-resisting bronze.

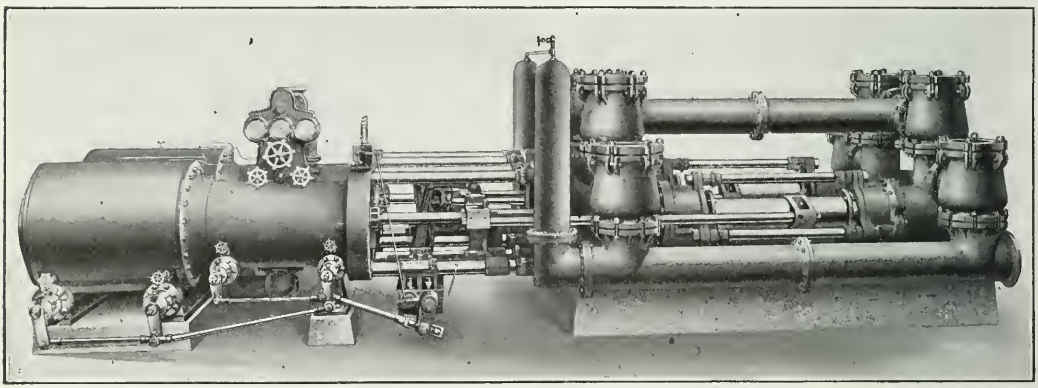
The valve seats are securely held in place by a flange bolted between the valve pots and the adjacent castings. The wood lining is fitted around the valve seats in such a manner that no water can gain access to the valve pot casting. Each pot contains a single large bronze valve with rubber face of the double-port type giving an ample area and unrestricted flow. All valves are readily accessible through large covers secured by swing bolts making inspection quick and easy.

The valve pots, which are all duplicates of each other, are held by through bolts in slotted holes on both flanges so that the replacement of a complete pot is easily accomplished. A large by-pass connection made of bronze pipe and fitted with a gate valve of similar material is provided to relieve the load when starting. Connections which may be used either for priming or washing out are made on all the cylinders and valve chambers. In the design of the entire water end of this pump, one of the principal objects in view has been to secure permanency and reliability, while at the same time providing means for making any necessary repairs or replacements in the shortest possible time.

A Steam Pump at an Anthracite Colliery

In many coal operations throughout the country, particularly those where adequate power facilities were installed a number of years ago, or where the mines are so gaseous as to render electric power distribution dangerous, the steam pump is still largely employed. In the majority of such cases, not only is the steam consumption of the machine important, but the accessibility of all parts is a feature which must be carefully taken into account.

The accompanying illustration shows a compound, condensing, direct-acting, duplex, Jeanesville mine pump built for the Lehigh Valley Coal Co., and installed at the Dorrance Colliery, at Wilkes-Barre, Penn.



Compound Pumping Engine. Note Arrangement of Crossheads

This pumping engine has a capacity of 1500 gal. per min. and operates against a head of 650 ft. with 80 lb. steam pressure at the throttle. It is supplied with an independent steam-operated jet condenser. The steam end of the pump is of the standard compound type with high- and low-pressure cylinders, 22 in. and 34 in. in diameter, respectively, while the stroke is 36 in. Each cylinder is provided with two semi-rotative steam valves placed below the cylinders.

The pump end of the machine is of an improved design. It is of the four-plunger outside center-packed type in which the front and rear pump plungers are coupled to the cross head located between the pump cylinders. This plunger cross head is connected to the main cross head by two side rods placed upon either side of the pump-water cylinder.

This arrangement eliminates internal rod or plunger connections and thereby assures perfect accessibility to the plunger stuffing boxes. As the water to be handled is strongly aciduous, the pump end, its valve pots and pipes are wood lined and bronze fitted.

Safety First

By J. E. Jones*

Written expressly for "Coal Age"

In the morn on your way to work,
Safety first.
In the darkness, dangers lurk,
Safety first.
Be cautious as you pass along,
Life's not all a cheerful song;
Watch; you may find something wrong.
Safety first.

As you reach your place of toil,
Safety first.
Lest some mishap your welfare spoil;
Safety first.
Sound your roof for fear it might
Have been weakened through the night,
Then test it often; don't trust sight:
Safety first.

If it's hard to keep the turn;
Safety first.
Don't chance your life, you'd better learn
Safety first.
A minute's risk will sometimes mar
An entire life, so better far
Be careful; rather miss a car.
Safety first.

If you have to ride a trip,
Safety first:
Take precaution lest you slip,
Safety first.
"Riding in between's" a crime
Against yourself; against your mine:
Ride where safe and take your time.
Safety first.

When making "dope," take off your lamp;
Safety first.
Be very careful while you tamp;
Safety first.
Fuse it so there'll be no fear
Of firing until all is clear:
Don't fail to use good judgment here.
Safety first.

If the mine is making gas,
Safety first.
Use great care or you may pass
(Safety first.)
Into realms beyond the sky
In the twinkling of an eye
If you do not heed the cry
Safety first.

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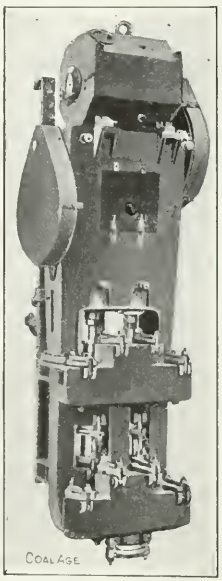
Firebosses, who must necessarily go their rounds alone by the dim light of a safety lamp, should insist that the miners make good manways, especially on steep pitches, in order that their work be as safe and easy as possible. Unless this has been done, compel the miners to stop work until the defect is remedied.

*505 West Madison St., Danville, Ill.

An Electric Shaft Sinking Pump

The sinking of a shaft has been one of the mining processes which up until recently has usually called for some kind of a steam pump to rid the opening of water as rapidly as it was encountered. Recently, however, electric machines have been introduced which will compare favorably with those driven by steam.

The accompanying illustration shows an electric mine-sinking pump which had been placed upon the market by the Goulds Manufacturing Co., of Seneca Falls, N. Y. It is of the quadruplex outside-packed plunger type. The four plungers, operated by connecting rods from the 2-throw crankshaft, produce an almost continuous flow of water, the cranks being set at 90°. All exposed working parts are protected by iron casings so the pump cannot be injured by coming in contact with the sides or framing of the shaft or from falling rocks.



Electric Sinking Pump and Motor

The main frame and guides are cast in one piece and provided with hand-hole openings for examination of working parts. Wrought-iron hanging bars and clamps are also provided. The gear wheel is of charcoal iron, meshing with a bronze motor pinion, both being cut from the solid and fully protected by gear covers. The cylinders and valve boxes are of charcoal iron made in one casting. The four cylinders are each fitted with a bronze lining.

The plungers are of cast iron and are operated by steel plunger rods. The valves are rubber disks on bronze grid seats with cylindrically wound springs. Any type of motor may be used on this type of pump, the power ranging from 10 to 30 hp. while the capacity varies from 75 to 205 gal. per min., according to size, all of the pumps being designed for a working pressure of 130 lb.

WHO'S WHO—IN COAL MINING

Hitherto we have not recorded the lives and characters of those who are changing the face of the South by opening up its coal deposits. When we begin to describe a Southern operator, we are impressed immediately with a new atmosphere. The Southern planter has always had a paternal interest in his farm hands and the activity of the Southern coal operators and managers in studying hygienic conditions, in engaging others to aid them in that study and their willingness to put into expensive operation such improvements as their inquiry shows to be necessary, reflects the generous spirit of the South.

In this respect, W. C. Tucker, "father of Benham," and bred in the South and hoping ever to make it his home, is typical. To him, the coal plant he manages at Benham, Harlan County, Ky., is no mere industrial venture, it is a community development and it is destined to set a number of valuable precedents like those of the other steel-plant collieries throughout the States.

W. C. TUCKER

W. C. Tucker was born at Columbus, Miss., in 1864. Had it not been for the Civil War and the consequent impoverishment of the South, Mr. Tucker would have been a lawyer and planter, for his leaning was toward the law and the call of the land is strong in the South.

His father's failure in '79 permitted him to stay but two more years at school and at 17 years of age he started work with an engineer corps on railroad construction. The work finished, he entered the coal industry by assisting in the survey of several coal lands in Walker County, Ala., then newly opened. Some knowledge of the underground operations was obtained by the monthly "measuring up" in which he took part.

This work being finished, he returned to the farm but the free yet strenuous life of the engineering corps appealed insistently and another railroad survey being started in the vicinity, he entered the corps as a rodman. Returning to the farm at the completion of this work, he filled in an interval by farming, teaching school and getting married.

But he soon returned to railroad construction, being promoted this time to assistant resident engineer, in charge of the completion of 13 miles of track. This work done he left for another road with promotion to assistant chief engineer. Leaving this position because a promised leave of absence was withheld, he entered business life for a brief period as a partner of a cotton broker.

A serious illness of his wife caused him to withdraw from all activities for several months and he then entered the real practice of coal mining as a weighman. He left this company to act as a surveyor for another coal corporation. A little later he entered the office of which he was soon put in charge.

A change of management, and Tucker was back again on the farm, but the mine life seemed more exciting and he was soon employed in prospecting a number of coal properties. These condemned, he went to a furnace at Middlesboro, Ky., staying there a year and being transferred by the same concern to be manager of their mines in Tennessee and North Carolina. This first independent command was held for several years, each year being signalized by an increase in salary.

He resigned this position to go as chief surveyor and prospector for a large acreage in Kentucky, a portion of this land covering the site of the present town of Benham. The land was purchased by a Northern syndicate, and although left undeveloped for a number of years, Mr. Tucker was retained as engineer in charge.

Tiring of the trivial duties of managing an undeveloped land holding, he crossed into Virginia to accept a position as superintendent of the Imboden Coal & Coke Co., and in two years was made manager. He held the position for a year and resigned to be division superintendent of the Southern Iron & Steel Co., with his headquarters at Chattanooga. He was in full charge of that division, including its coal and ore mines, quarries, coking plants and furnaces. His work was appreciated, but after a few months the panic of 1907 caused the company's failure.

Then followed a small coal plant in Kentucky which he managed for friends. Money being scarce and the market poor, the plant was a failure and for a year he went as superintendent of the Federal Coke Co.'s plant, at Grant Town. While there the properties which he approved for purchase many years before were repurchased by the Wisconsin Steel Co., a subsidiary of the International Harvester Co. They had decided to build a coking plant and offered him the superintendence.

This plant, which embodies all the ideas acquired in long years of thought, is now nearly complete, and is Mr. Tucker's "labor of love."

EDITORIALS

The Mine Pump

The danger of our careful distribution of charges as indorsements on the payroll is that we overlook their inevitable inaccuracy as guides to the true expenses of operation.

Thus what we head as "Drainage" covers only a few of the costs to which we are subjected by the presence of excessive water in the mine. The cost of inadequate pumping facilities crops up in nearly every item in the column of distributed charges.

For instance it appears under "Haulage" because cars dragged through water lose the oil in their bearings and are hard to haul, because the mules and motors are unable to do their best if the road is wet and because when many working places are filled with water, the work is scattered and the territory to be served by one unit is too widespread.

Water losses are hidden under "Headings and Dead Work," because additional yardage prices have to be paid to men who have to work in wet places. If the foreman holds down the price, he either loses his men or has to credit the heading men with more yardage than they have driven. Often concessions for water result in increased yardage prices in wet and dry places alike.

Inefficient drainage at the face necessitates the construction of frequent crosscuts from heading to heading and of driving of the airway backward up the rise, which, where sights are not used, often greatly increases the yardage driven without increasing the territory developed.

If sights are used, the engineer's work is increased and in any event the trackmen's time is wasted laying additional partings and in moving track. As for the surveyor he finds his work less accurate and made far slower by the presence of water and parts of the mine remain unsurveyed because inaccessible.

The health of the live stock is undesirably affected and the charge, "Mule Barn," remains excessively high in a wet mine. The item, "Supplies," is increased because rails, pipe and cars left in water impregnated with sulphuric acid are often only fit for the scrap heap when the water is removed.

And, furthermore, all the other items are affected though not in equal measure or in the same direct manner. For example, fixed charges are distributed over a smaller tonnage, when water disorganizes the mine.

In many cases mine development is so delayed by lack of pumping facilities that the operation fails to produce at any time over 50 per cent. of its rated capacity. The headings are delayed or closed down and even the opened portions of the mine stand idle for lack of adequate means to keep them dry.

Most operators buy pumps only when they feel they *must* have them. They do not keep a sufficient reserve supply on hand though any day a flood breaking through the caved areas may fill the workings with water. An operator may always feel sure that, as his worked-out areas increase, the water to be handled will continuously augment and a pump in excess of present requirements will find plenty of work to do.

Too many are looking for some great scheme to lift their mines from profitless to successful operation. Yet in nine cases out of ten, the need is not for a reconstruction but merely for the following up of the simplest principles of foresight.

The Widespread Flood

We can all see now the folly of it, of those light frame houses on the riverside destined some day to be engulfed in the river flood and some to be burned while crowded with the very people who lived in and erected them.

Clearly now we view the thoughtlessness which made them raise feeble levees against ever-rising rivers instead of straightening them and giving them greater cleansing qualities than provided by nature. They built their firetrap shells in the floodbed of the waterways and the rivers rose in their might and claimed their own. We all, as a people, have been unwise in granting unrestricted rights up to the river bank without discrimination, to all those claiming the ground bordering on water courses. In many cases, even further encroachments have been permitted.

No coroner's jury will be called, nothing but sympathy will be extended to those unfortunates who are yet living to see the consequences of their mistakes. We hope the disaster, however, will convince them that all distress above the ground and below it, does not argue a real perversion of human nature.

Mine misfortunes, floods, fires, explosions and the like, are the outcome often of a desire for profit and of a hope born of lack of personal experience that some threatened event will never happen.

And this disaster, was it not caused by a desire to save money in buildings that it might be spent on personal adornment and what is known as the American style of living? A little money would have replaced temporary and combustible dwellings and stores with reasonably floodproof, fireproof structures. A few hundreds of dollars would have made each smaller dwelling as resistant as were the French in a recent flood. A reasonable addition to the costs of living would have strengthened dams, dikes and levees and widened streams to meet all requirements.

But the hope existed here also, as in the mines, that the delayed disaster would never come or if it came, that it could be mitigated by energy and decision. It is now we know no time to condemn. It is our duty to see that profit, comfort, ease, luxury and avarice, do not stand between us and the duty of preventing loss of life.

It is true the flood has been unprecedented in severity. Similarly in the mines, not only do problems of unequaled intensity often occur but new phenomena frequently appear which the imagination of the human mind has been totally unable to foresee.

The Individual Operator

How the individual anthracite operator will fare under the changed conditions in the hard-coal trade is a subject of much speculation among the trade. Some are of the opinion that it means a reversal, in part at least, to the conditions in effect previous to 1900, when the coal was sold in the open market in about the same way that bituminous is handled today. Again, there are others who feel that a way will be found to discourage the individual operator from flooding the market with low-priced coal. In any event, a broad change in the basic principles upon which a large industry of this character is built up, offers grave possibilities.

The outlook in the anthracite trade is dull enough at the moment, without being further aggravated by having the independents flood the market with a low-priced product. To those familiar with the conditions of marketing anthracite coal, it is generally conceded that the present method has proved advantageous to both the consumer and the operator. It has induced the buying of coal during the slack season, thus assuring the mines continuous work the year round, and at the same time offering the consumer the opportunity for storing his winter's supply of coal at the lowest quotations in effect at any time during the year.

In addition, it is a well-known fact that the maximum economy of operation cannot be effected by intermittent work at the mines, and the railroad man is free to confess that the transportation facilities of the country are not adequate to meeting the excessive demands which develop at times during the winter. Nor can the railroads afford to provide sufficient equipment for handling this abnormal tonnage, since it would be idle during much of the year.

A plan that has been evolved from years of experience, such as the one referred to, is not to be lightly cast aside without mature consideration. Last fall the individual operators gave ample evidence of their disregard for the companies' circular when they withdrew from selling arrangements of long standing in order to obtain the extra profit that was being freely offered for premium coal. Now that conditions are reversed, these independents are finding it necessary to sell at less than the companies' circular in order to place their product. And even at discounts ranging from 15 to 40c. per ton under the circular, the consumers are not inclined to give them business.

The country will be fairly well stocked by July and August, and it is interesting to consider what steps the independents will take to place their product. It is doubtful if they will, as a rule, put any curtailment policy into effect, and it seems more probable that this period will find them offering large discounts in order to move their long sizes.

It is to be hoped, however, that such will not be the case, as it is obviously as much to the advantage of the independent operator not to force his coal on an unresponsive market, as it is to the larger companies.

He should also recognize that his corporation neighbors have facilities for fulfilling their agreements and a prestige among the consumers that the individual operator can scarcely ever expect to obtain. It is to be hoped that the current year will see the trade moving along in the same channels of other years, and that the individual operator will support to the best of his ability the orderly method of distribution which has meant prosperity to the anthracite industry for the past decade.

❖

A Mix-Up at St. Louis

The coal industry in and around St. Louis seems to be on the verge of a complete demoralization, with the producers fairly fighting for an existence. The cause is, primarily, a condition of ruinous competition, prices being cut down to, and even below the cost of production, by operators who are determined to keep their mines working at any cost. While instances of overproduction in the bituminous industry, are all too common throughout the country, in this case it has attained most exaggerated proportions.

The trust-busting enthusiast, who has so aggressively demanded the dissolution of the big anthracite combine in the East, would do well to study conditions in the St. Louis market and observe the results where there is a lack of cohesion in the industry. If economic conditions of the country demand that competition be so severe, that company after company is becoming defunct, then the dream of the trust-smasher has been realized in the southern Illinois field.

When overproduction is accompanied by an aggressive campaign among the individual operators to force their competitors into bankruptcy, we must confess that the situation appeals to us as unusual, to say the least.

Everyone knows that it is an expensive proposition to close down a coal mine, and in the case of many of the older operations it is sometimes fatal. Maintenance expenses such as drainage and timbering, continue, regardless of whether the mine be working or idle and, in some operations having a large territory developed, these charges are invariably heavy. And, again, there are other conditions. For example, a mine having a capacity of say, 1600 tons per day, has a contract at $1.02½ to $1.05 per ton for 1000 tons of its production, the cost of producing which is $1 per ton. The best price obtainable in the spot market is 85c. per ton, so that on the face, it appears that the production must be curtailed down to the contract requirements. As a matter of fact, however, operators find that this last 600 tons, which is produced without any additional day men or increase in fixed and running charges, is obtained at a figure which makes it entirely feasible to market it at 85c. per ton in spite of the fact that the average cost of production is 15c. higher. Thus, it is easy to see why odd tonnages of a low-priced coal may occasionally find their way into the market.

This latter condition applies more particularly to the Williamson and Franklin County field. Operators in the Standard field, which comprises the fifth and ninth districts, freely admit that they are losing money and it is difficult to understand why they should persist in the face of such discouraging conditions. The cost of production in this district varies from 85 to 90c. per ton, with a few who can possibly produce at a trifle under this minimum, while the average selling price is only about 75c. a ton.

To further aggravate conditions, the St. Louis Coal Traffic Bureau, made up of all the local coal-carrying roads, has announced a general advance of 5c. a ton into St. Louis. This arbitrary action of the transportation companies is, however, meeting with bitter opposition.

SOCIOLOGICAL DEPARTMENT

The Leisure and Pastimes of the Frick Employee

By Thomas W. Dawson*

SYNOPSIS—The Frick company endeavors to promote healthful sports, providing and maintaining baseball diamonds and making donations for suits and equipment. A swimming pool is provided at Leisenring No. 1. Forty-five playgrounds were constructed in 1912.

The H. C. Frick Coke Co. has built churches of all denominations and encourages the establishing of schools. It coöperates with the school authorities in every possible way, many of its superintendents being members of local school boards.

Sports and recreation of an elevating character are furnished for the young and old, and athletics are encouraged among the young men.

The Frick Baseball League

At every plant there is a baseball team, and all these are in a league with regularly scheduled games. They use the official playing rules of organized baseball, and the winning team at the end of each season receives the Thomas Lynch loving cup as a trophy. Keen rivalry exists among the teams, and public interest in the outcome is well sustained. In the larger towns you will find crowds of people scrutinizing the board which records the scores of the games played by the Frick teams.

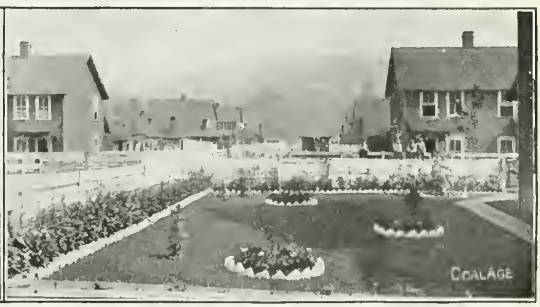
It is doubtful whether any amateur league in the country sustains as many good ball players. All of them are required to work in or about the mines, and only employees who have been in service 30 days immediately before playing are permitted to take part in the league games; furthermore they must be employed at the plant or plants which the club represents.

In 1911, the Leisenring No. 1 ball team won the cup, and in 1912 Edenborn was the victor. The company provides the ball diamond, keeps it in condition, and makes donations for suits and equipment. However, many of the teams are self-supporting, raising money by festivals, picnics and other means. The baseball diamonds are so well constructed and kept that they would do justice to independent municipalities.

The Swimming Pools

The Leisenring No. 1 plant is the first to have a swimming pool, which the company has constructed. It is a rectangular concrete tank, 80 ft. long and 40 ft. wide, and its depth ranges from 30 in. at one end to 7 ft. at the other. Each person using the pool is required to take a shower bath for cleansing purposes; he then dons a bathing suit, before entering the pool. The water is frequently changed so that it is always pure. On certain afternoons the pool is reserved for the exclusive use of women. A competent guard or instructor is in charge of the pool at all times to lend assistance to the bather and see that all rules are complied with.

Park and Playground Provided for the Trotter Youngsters



Lawn and Flowers Which Drew First Prize at Baggaley, Penn.

The Village Greens

In addition to this, tennis courts, croquet greens, parks and playgrounds are provided for all forms of outdoor sport and amusement. They are conducted by organizations overseen by a competent party. Forty-five large and well equipped playgrounds were laid out in 1912. They are equipped with seesaws, flying rings, horizontal bars, roly-polys, dancing pavilions, and the like. In some of the towns, bands made up of employees of the company furnish concert music during the summer evenings. The amusement hall for basket ball, dancing, entertainments, etc., provides exercise and equipment during the winter months.

An employees' bath house has been built at the Collier

*Assistant chief engineer, H. C. Frick Coke Co., Scottdale, Penn.

Note—Abstract from paper entitled "Welfare, H. C. Frick Coke Co.," read before the winter meeting of the Coal Mining Institute of America.

mine as an experiment to see if such an innovation will be appreciated and to educate employees along lines of cleanliness. Workmen leave their clean clothes here during the day, and when they return from the mines at night, they take the shower or bath, as the case may be, leaving the clothes they wore during the day, don clean garments, and are ready for supper as soon as they reach home.

Every Lot Is a Garden or a Lawn

During the summer season, remarkable vegetable and flower gardens and lawns are seen in all the towns owned by the company. The superintendent of each plant is authorized to do the necessary grading, to soil the gardens where good soil does not exist, to fertilize and plow them, and do all he can to assist the employee and teach him how to sow and tend his garden and make a lawn. He is told that every part of his town must be green at the summer season of the year.

It is really remarkable the manner in which the people have interested themselves in the care of their little gardens and lawns, and now little or no persuasion on the part of the superintendent is needed to secure rows of well-kept lots. Cash prizes are offered for the best vegetable and flower gardens and lawns. Committees composed of disinterested parties, doctors, business men, farmers or the civic committees of the nearby towns are called in to award the prizes.

It frequently happens that this committee finds as many as a half dozen gardens, any of which would be entitled to the first prize. In a case of this kind, cash equal to first-prize money is awarded to each. Neatly framed certificates, printed from steel dies, are presented to the owners of the prize vegetable and flower gardens and lawns. These certificates are signed by the various members of the committee awarding the prizes. They bear the name of the owner, the house number, and the name of the mine. Should a prize winner move away from the colliery before these certificates are filled, they are forwarded to him as his property.

In 1912, there were 5150 gardens occupying 72 per cent. of the total area covered by the company-house lots. In 1913, we look for 100 per cent. of them to be cultivated. If we estimate the value of the average garden at $50 (and many of them are worth $75 and $80), we find that last year the employees of the H. C. Frick Coke Co. enriched themselves $257,500 through their gardens alone. Fresh vegetables are usually a scarce commodity, but all the Frick employee has to do is to go out into his little garden and find wholesome food. Should a certain employee be able to cultivate more than the plot of ground allotted to him around his dwelling, the corporation will provide him with land adjacent for cultivation if owned by the company.

The Early Use of Coal

Probably the earliest mention of the use of coal in the United States is contained in the journal of Father Hennepin, a French missionary who, as early as 1679, reported a "cole" mine on the Illinois River, above Fort Crèvecoeur, near the site of the present city of Ottawa. Coal was not mined in the state of Illinois, however, until 1810, when it was produced in Jackson County, at a point on the Big Muddy River.

Later, coal was found at Fort Duquesne, now Pittsburgh, in 1758, when that frontier post fell into the hands of the English under General Forbes. On Oct. 4, 1770, General Washington, while in Fayette County, Penn., made the following entry in his journal:

> At Capt. Crawford's all day. We went to see a coal mine not far from the house, on the banks of the river. The coal seemed to be of the best kind and burned freely.

The coal mine here referred to was at the site of the present town of New Haven, opposite Connellsville, then known as Stuart's Crossing.

Coal was known to be present in Virginia as early as 1700, though mining did not begin until the latter part of that century. In 1789, shipments were made to some of the Northern states.

It is not known when the anthracite deposits were discovered in Pennsylvania, but in 1776 coal was shipped down the Susquehanna River, from the Wyoming Valley to Harrisburg, and hauled in wagons to Carlisle for use in making firearms.

Leisenring No. 1 Team, Which Won the Thomas Lynch Cup in 1911

Wyoming Mining Examinations—Notice has been received from George Blacker, state coal mine inspector, District No. 1, Cumberland, Wyo., stating that the Board of Examiners will meet in Kemmerer, Wyo., Apr. 24, 25 and 26, 1913, to examine those who may desire to take the examintaion for mine foreman and fireboss certificates.

DISCUSSION BY READERS

Post Timbering at the Working Face

Letter No. 11—In my opinion, a miner is the proper person to timber his working face. As all practical miners must admit, a great many difficulties arise in a working place, in a very short time; and as the miner is employed in the same place every day, he is in a better position to know when and where posts are most needed.

I do not think that any systematic method of timbering should be introduced in mines, unless the company is prepared to give their men a particular size and grade of timber that would be suitable in every way for the purpose intended. We can hardly say timbering is being done systematically where we are using timber of various sizes and grades. Say, for ordinary work, the miner is supplied with a number of black-spruce posts, eight inches in diameter, and a number of fir posts of smaller dimension. After a short time the fir posts will be badly broken, while the spruce posts will show scarcely any signs of strain. Under these conditions suppose the posts are to be set six feet apart in every direction, in an endeavor to equalize the weight on every post. If they are not of the same size and grade of timber, it is evident there would soon result a very bad looking place, particularly if the roof was "weighting." The smaller-sized timber of inferior wood would be broken, while the better grades and larger sizes would stand firm.

I claim that every miner should be held reasonably responsible for the proper timbering of his place, and when the foreman is making his usual visits, if the place is not properly timbered he should promptly send the miner out for neglecting a very serious duty.

JOHN A. MCDONALD.

Reserve Mines, Cape Breton, N. S., Canada.

Letter No. 12—In considering the question of timbering at the working face, the safety of life and limb should be of more importance than the cost of the timber. The post plan of timbering, in seams of coal 6 ft. thick or less, is generally found to be efficient; but where the seam is from 8 to 12 ft. thick, with a drawslate over the coal, this plan may have to be modified. It may be, and often is, necessary to modify the general plan of extracting the coal to suit the conditions and to insure safety.

The Miners' Circular, No. 9, published by the Bureau of Mines, pp. 6 and 7, gives four principal causes of accidents from falls, and a table showing the percentage of fatalities at the working face, as compared with those on entries and in pillar workings.

This table suggests to me that the entries of a mine are often more closely inspected and are timbered by more experienced men than the working places, particularly in the anthracite mines, where the number killed at the working face is from six to seven times the number killed on the entries and in pillar workings, although the latter is the most dangerous work. The fact is that miners are too often left to do their own timbering in such manner as they see fit. The posts are set haphazard, according to no particular system. It is true that the percentage of men killed at the working face would naturally be larger on account of more men being employed there, representing a larger number of working hours than is true for the entries or gangways in the mine.

In this connection, I want to state that the second largest producing mine in the state of Montana has adopted a systematic division of the entire work. Machine operators are employed to undercut the coal, by contract; drillers are employed to drill the holes, by contract, power drills being used; the coal is loaded by loaders working on contract. The company employs shotfirers to tap and fire all holes; trackmen are employed to lay all tracks and switches, and timbermen are employed to set all timbers. The seam of coal is from 6 to 10 ft. thick, there being from 1 to 3 ft. of drawslate between the coal and solid roof.

As a result of such a systematic division of the work, this company reports a less number of accidents per thousand men employed, and a greater tonnage or output per fatal accident and, I believe, a larger percentage of coal won, than in most mines in this state. If the plan works well in this mine, why not adopt a similar six-department plan in all mines? The work is better done, track is better laid, which makes hauling easier; timbers are better set, which reduces the number of accidents; and the machinemen, drillers and shotfirers all perform their work with less trouble and better results.

In such a system, if there is any fault to be found, the coal broken too fine, timbers not set right, or cars frequently derailed, a word from the foreman to the man in charge of that work is sufficient to remedy the trouble. Furthermore, machinemen, drillers, shotfirers, trackmen and timbermen all get more experience in their particular line of work and better results are obtained.

Answering, briefly, some of the questions asked in the outline, Feb. 22, p. 286, I would say: The province of a mine post is to indicate the condition of the roof and uphold the roof slate; rather than to sustain any great amount of weight due to the overburden, which must rest on the pillars. Posts should be set as quickly as the working face is advanced 4 or 5 ft., not more; a less distance would be better under many conditions. The posts should be set perpendicular in a flat seam; but when the seam is inclined, they should lean a little up hill from the normal position in the seam. The advantage to be derived from a systematic system of timbering is that the roof has less chance to move or draw and there is greater protection against a chance slip or fault line in the roof.

I believe, however, special timbermen should be employed for the work, as they become more experienced and better results are obtained. An experienced forester, in this locality, when asked in regard to the cutting, storing and preserving of mine timber, notwithstanding his knowledge of the present practice in mines, advised that mine timber should be cut when the sap is up, say from June to September, claiming that the bark is more easily removed, which should be done, and that the timber sea-

sons better, and the wood is stronger than when the timber is cut in midwinter, when the sap is down. The wood then, he states, is harder to work, drier and more brittle.

He also advises storing mine timber in horizontal layers rather than standing the same on end. Strips or slats should be laid between each layer to allow the air to circulate. He advises treating mine timber with creosote or a zinc preparation to preserve it and prevent fungus growth.

J. B. McDERMOTT,
Chief Mine Inspector.

Helena, Mont.

Utilization of Abandoned Mines

I have seen references, from time to time, in COAL AGE, to the question of developing power directly from the coal, in mines, according to the suggestion of Sir William Ramsay. It seems to me that practical use will be made of this suggestion some time, and why not now? It has occurred to me, in this connection, that the large abandoned coal areas that have been worked out could be utilized for the purpose of testing this method for the development of power.

There are right here in western Pennsylvania, large areas, containing several thousand acres of coal land, the coal of which has been worked out and the mines abandoned. These coal fields originally belonged to Jones & Laughlin and the H. C. Frick Coke Co. and were long ago entirely exhausted. The field forms a triangle extending from Broad Ford to Dawson; and, bounded on the north by Jacobs Creek, reaches almost to Scottdale. There are similar abandoned fields near here, Smithdale.

It seems to me that these abandoned fields would form an excellent opportunity for making the proposed experiment. The Jacobs Creek field is on fire, already, in two places. As I understand the suggestion, all that would be required to try out the method would be to close the mine openings and sink drill holes at suitable points for the introduction of air sufficient for the partial combustion of the coal remaining in the mine. Other holes would then have to be drilled and cased and connected with pipe lines that would carry the gas from the mine in which it is generated, to the several points where it is to be used, say Connellsville, Scottdale and other places. I believe this question should be brought to the attention of men who have the capital necessary to carry forward the project.

E. KRAUSE, Mine Foreman,
Forest Hill Mine, Pittsburgh Coal Co.

Smithdale, Penn.

[While the suggestion of Sir William Ramsay, regarding the development of power directly from coal in place, has a practical bearing and appeals to men in the sense that it would eliminate the dangers incident to the mining of the coal, the proposition has not as yet been reduced to a practical basis. The suggestion of piping sufficient air into old abandoned workings to insure the partial combustion of the coal and the generation thereby of combustible gas that could be piped to the surface and distributed to the points where it is to be used, presents a danger that might eclipse the present dangers of coal mining.

Briefly, the probable dangers are: (1) The generation of large quantities of poisonous gases from underground fires, which, under the conditions that would naturally exist, could not be retained in the mine and in the pipe system, owing to the rupture and crevicing of the overlying strata and frequent breaking of the pipeline. (2) The surface damage that would result both from the subsidence of the strata as the coal is burned out, and from the heat of the underground fire, which in some cases would destroy vegetation. These dangers are of such a nature as to hold the proposition in abeyance until some method of converting the energy of the coal into available power is devised that would not entail risks greater than what now invest the industry.—ED.].

An Echo of the Discussion—Reducing Ventilation When Firing

With the consent of the director of the Bureau of Mines, we publish the following excerpt from the report of the chief engineer of the bureau, to whom the matter of conducting a series of experimental tests in the Bruceton mine belonging to and operated by the federal government for the sole purpose of experiment and investigation, was referred.

Several of the contributors who took part in the February discussion, in COAL AGE—Reducing Ventilation When Firing in Mines—made the suggestion that the federal government should be asked to conduct such experiments, at their testing station, as would throw some light on the question discussed. In response to these requests, the director of the Bureau of Mines referred the matter to his chief engineer who reported in part as follows:

> The problem of the effect of the movement of air in a mine at the time of shotfiring has been one of the features of investigation at the experimental mine. Owing to the lack of sufficient funds these tests have been suspended, and, therefore, the bureau is not in position to make any authoritative statements, and will not be until the tests have been resumed this coming fiscal year.
>
> It may be pointed out, however, that in the few tests that have been made in which there has been a variation in the air current, that this variation appears to have no effect on the initiation of a dust explosion; a number of tests were made with the air intaking toward the initiating shot, and in several other tests the air was returning from the point of the initiating shot; there was no appreciable difference in the results of the initiating shots. Explosions of dust resulted under both conditions, although other variations prevented drawing conclusions as to whether the explosion was more violent in the one case than in the other. In the last explosion test, which was a very violent one, the maximum pressures being 115 lb. per square inch, the initiating shots were fired in a perfectly quiet atmosphere; all the crosscuts being closed by stoppings.
>
> From these tests the chief mining engineer gives his personal opinion that the movement or nonmovement of the air is of relatively small importance in the initiation of a dust explosion; although it is quite plausible that in the propagation of a dust explosion, where the dust has been thrown up into suspension by previous shots, that the chances of a continued explosion are greatly increased by a strong air current.
>
> The influence of the composition of the atmosphere in a mine prior to an explosion is another matter, and no large-scale tests have yet been made at the experimental mine, or so far as known in the foreign experimental galleries. From the laboratory tests it does not appear that the presence of small quantities of carbon dioxide have any appreciable effect on either a gas or dust explosion, but the amount of oxygen present is all important. This, however, is yet to be demonstrated on a large scale.

While there was much diversity of opinion manifest in the discussion of this important subject, the point was brought out and the fact quite definitely established that there are conditions existing in some coal mines that

make it safer to fire shots in still air, in the mine, than when the air is sweeping the face with more or less velocity.

Just how far, if at all, the suggestion of reducing the ventilation when firing, or closing the upcast shaft can be applied with safety or advantage, under the varied conditions of coal mining, is yet to be determined.

We note with pleasure the willingness of the Bureau of Mines to look further into the matter and ascertain if possible, the true bearing of the facts brought out in the discussion of the question in COAL AGE. We desire to draw the attention of the bureau to the offer of Mr. Waterman, Genl. Supt. of the Fleming Coal Co., Pittsburg, Kan. (COAL AGE, Feb. 22, p. 311), to assist representatives of the Bureau of Mines "to obtain samples of the air in mines where the fan is entirely stopped for from 30 min. to 1 hr. before firing shots."—Ed.

Textbooks in Mining Examinations

I would like to say a word in reference to your editorial, A Good Suggestion, Mar. 22, p. 456, urging the free use of textbooks, by candidates, in mining examinations. I think every man who takes the examination should possess the ability to answer the questions asked by the examining board, independently. I am in favor, however, of the board giving the proper formula with each question. There is no reason why any man who has the ambition to learn and will take the time to study cannot equip himself properly. The reason why so many applicants fail to pass the examination is because they do not get down to study until the time comes to take the examination.

Many mine foremen who have passed a successful examination set their books aside as soon as the examination is over, and, as a result, they are as far behind today as ever. I would not say that all men who pass do this, but I think it would be safe to say that 60 per cent. of the successful candidates in mine foremen examinations never look at their books after the examination is over.

Study is important in order to keep up with progress, and every mine foreman must continue to study new systems of mining if he would be successful. To give up study is to go back; therefore, I believe in hard study, and I believe the present system of examining applicants for mine foremen should be continued. Also, I think that every mine foreman should be examined again, once in four years. If this plan was followed out, and men would study, I do not think there would be any need for using textbooks in the examination.

WM. K. RAY, Mine Foreman,
Quemahoning Coal Co.

Ralphton, Penn.

Study Course in Coal Mining

BY J. T. BEARD

The Coal Age Pocket Book

FLOW OF WATER

Water, like all fluids, assumes a level surface when at rest; and, conversely, a difference of level causes water to flow from a higher toward a lower point, in obedience to the law of gravity. The theoretical velocity of the flow is the same as that of a body falling through the same vertical height, as determined by the formula,

$$v = \sqrt{2gh}$$

in which v = velocity (ft. per sec.); h = height of fall (ft.); and g = force of gravity (32.16 ft. per sec.).

FLOW OF WATER IN DITCHES

The flow of water in a ditch or pipe, like the flow of air in an airway, is impeded by the friction of the sides or the rubbing surface of the conduit. The formulas for calculating the velocity and quantity of water flowing in a ditch are identical with the same formulas, in mine ventilation, for finding the velocity and quantity of air flowing in an airway, except that the flow of air is expressed in terms of the pressure p, while the flow of water is expressed in terms of the "head" or vertical height h through which the water falls.

Mean Velocity of Stream—Let v = mean velocity of water flowing in a ditch; h = head or vertical fall (ft.) in a distance l (ft.); o = wet perimeter of ditch, in feet; a = area of cross-section of the water; and c is a coefficient expressing the resistance offered by a unit of rubbing surface (1 sq.ft.) to a current having a unit velocity (1 ft. per sec.). Then

$$v = \sqrt{\frac{h}{cl}\frac{a}{o}}$$

In calculating the flow of streams and water in flumes and ditches; $s = \frac{h}{l}$ = slope or grade of ditch, and $r = \frac{a}{o}$ is called the hydraulic radius; and the formula for the mean velocity may then be written

$$v = c_1\sqrt{sr}$$

Following are values of c, for different kinds of material lining the channel and different values of the hydraulic radius:

	Value of c_1 for Different Values of the Hydraulic Radius, $r = \frac{a}{o}$								
Kind of Channel Bed	0.25	0.50	1	2	3	5	10	25	50
Smooth cement lined	125	135	141	144	145	146	147	148	148
Smooth brick lined	95	110	119	124	126	128	130	131	131
Rough rubble masonry	57	72	87	98	104	108	112	115	116
Rough earth bed	26	36	48	62	70	80	91	100	104
Very rough rocky bed	18	25	35	46	53	62	72	81	86

The Coal Age Pocket Book

Example—Find the mean velocity of the water flowing in a ditch that measures 10 ft. wide on the surface, 6.4 ft. on the bottom, the water being 3 ft. deep. The ditch is fairly smooth, brick lined, and has a fall of 4 in. per 100 lb.

Solution—The area of cross-section of water is $a = 3\ (10 + 6.4) \div 2 = 24.6$ sq.ft. The length of each sloping side is $\sqrt{3^2 + \left(\frac{10 - 6.4}{2}\right)^2} = 3.5$ ft. The wet perimeter is then $2 \times 3.5 + 6.4 = 13.4$ ft. The hydraulic radius is therefore, $r = \frac{a}{o} = \frac{24.6}{13.4} = 1.8$. The slope is $\frac{4}{100 \times 12} = \frac{1}{300}$. The value of the constant taken from the table above, for a brick-lined channel, having a hydraulic radius $r = 1.8$, is $c_1 = 123$. Then the mean velocity is

$$v = c_1\sqrt{sr} = 123\sqrt{\frac{1}{300} \times 1.8} = 9.6\ ft.\ per\ sec.$$

FLOW OF WATER IN PIPES

Gravity Or Pressure Head—The flow of water in a pipe line is caused by a certain "head," which is the vertical distance of the point of discharge below the surface of the water in the supply basin or reservoir. This head causing the flow is called the "gravity head" or the "pressure head."

Friction Head and Velocity Head—The gravity head is wholly absorbed or taken up in overcoming the friction of the water in the pipe and in producing the velocity. That portion absorbed by the friction is called the "friction head," and that producing the velocity, the "velocity head." If h of these heads depends on the quantity of water discharged per minute and the diameter of the pipe and the friction head, further, depends on the length of the pipe line. The formulas follow:

Friction head, $h_f = \frac{lG^2}{800\,d^5}$

Velocity head, $h_v = 0.0026\frac{G^2}{d^4}$

In which, h_f = friction head (ft.); h_v = velocity head (ft.); l = length of pipe line (ft.); d = diameter of pipe (in.); and G = quantity of water discharged (gal. per min.).

Example—Find the friction head and the velocity head in a 6-in. pipe line 5000 ft. long, discharging 700 gal. per min.

Solution—Substituting values in the formulas above:

Friction head, $h_f = \frac{5000 \times 700^2}{800 \times 6^5} = 304\ ft$

Velocity head, $h_v = 0.0026\frac{700^2}{6^4} = 0.93,\ say\ 1\ ft$

INQUIRIES OF GENERAL INTEREST

Calculating the Flow of Water in a Siphon

I have taken the following formula from a textbook of W. Wardle and have been told that it is approximately correct as expressing the flow of water through a siphon, in cubic feet per min. As the formula is a simple one, I would like to ask if it is correct. The formula is as follows:

$$Q = \sqrt{\frac{d^5 h}{l}} \times 4.71 \ (cu.ft.\ per\ min.)$$

A. L.

Gastonville, Penn.

The above formula, in many cases, is only approximately correct. It errs, first, in giving too high a value for the constant, 4.71, which is only adapted to pipes of a comparatively smoth bore. Under ordinary mining conditions, the pipes become more or less obstructed by corrosion due to the acid nature of the mine water. On this account, the constant 4.71 should be 3.78, in order to adapt the formula to mining conditions.

Again, the formula is deficient, for general application, because it takes no account of the velocity head, which is the head absorbed in creating the velocity of the water in the pipe. For a low velocity, the pressure or head absorbed in producing the velocity is small and may be disregarded. At other times, however, for higher velocities or when greater accuracy is desired, it is important to allow for the velocity head, in addition to the friction head. Making this allowance for the velocity head, the formula becomes, expressing the flow in cubic feet per minute, or in gallons per minute, as desired,

$$Q = 3.78 \sqrt{\frac{d^5 h}{l}} = 3.78\, d^2 \sqrt{\frac{dh}{l}} \ (cu.ft.\ per\ min.)$$

or

$$G = \sqrt{\frac{800\, d^5 h}{l}} = 28.28\, d^2 \sqrt{\frac{dh}{l}} \ (gal.\ per\ min.)$$

These formulas express correctly the flow of water in a siphon, under mining conditions, taking the coefficient of friction for the flow of water in the pipe as 0.01, which conforms closely to mining practice. If the siphon has a rise h_1 and a fall h_2, the effective head producing the flow is $h = h_2 - h_1$.

The formula given by our correspondent, even correcting the constant and using 3.78 instead of 4.71, will still give too high results, in many cases where the velocity in the pipes is great. The percentage of error, in the use of that formula, will vary with the ratio of the diameter of the pipe, in inches, to the entire length of the pipe, in feet. The percentage of error is practically equal to the ratio of the diameter of the pipe, in inches, to the length of the pipe, expressed in hundreds of feet. Thus, for a 1-in. pipe 200 ft. long, or a 4-in. pipe 800 ft. long, or a 6-in. pipe 1200 ft. long, this ratio is $\frac{1}{2}$, and the percentage of error, in the use of the first formula, is one-half of one per cent. Again, for a 1-in. pipe 100 ft. long, a 2-in. pipe 200 ft. long, or a 6-in. pipe 600 ft. long, etc., the ratio is 1 and the percentage of error, in this case, is 1 per cent.

Suppose, for example, it is desired to ascertain the flow of water in a 4-in. siphon, having a rise of 12 ft. in 60 ft., followed by a fall of 24 ft. in 900 ft. The entire length of the pipe is 960 ft. The effective head, in this case, is $24 - 12 = 12$ ft. This question was submitted by G. H., Johnstown, Penn. In this case, the ratio of the diameter of the pipe, in inches, to the length of pipe expressed in hundreds of feet, is $\frac{4}{9.6} = 0.416$; and therefore, in this case, there is less than one-half of 1 per cent. of error in disregarding the velocity head and using the first formula with the corrected constant. Making the calculation by this formula the quantity of water this siphon will deliver, since $h_2 - h_1 = 24 - 12 = 12$ ft., disregarding the velocity head, which in this case is only 2.58 ft. per sec., is

$$Q = 3.78 \times 4^2 \sqrt{\frac{4 \times 12}{960}} = 13.5\ cu.ft.\ per\ min.$$

Or,

$$G = 28.28 \times 4^2 \sqrt{\frac{4 \times 12}{960}} = 101.2\ gal.\ per\ min.$$

In this case, using the second formula, allowing for velocity head, the flow of water in the siphon is 100.7 gal. per min., instead of 101.2 gal. per min., which is a reduction of $101.2 - 100.7 = 0.5$ gal., or less than one-half of 1 per cent.

We will now take a case in which the loss, by using the first formula and disregarding the velocity head, will equal at least 2.5 per cent. For example, find the discharge of a 4-in. siphon, which has a rise of 12 ft. in 60 and a fall of 20 ft. in 100. This siphon will work properly, because

$$\frac{34 - 12}{2.08 \times 4 + 60} \ is\ greater\ than \ \frac{20 - 12}{2.08 \times 4 + 100}$$

(Coal Age, Vol. 1, p. 386).

The discharge of this siphon, in gallons per minute, calculated by the approximate formula, first, and then by the corrected formula, is as follows:

$$G = 28.28\, d^2 \sqrt{\frac{d\,(h_2 - h_1)}{l}}$$

$$= 28.28 \times 4^2 \sqrt{\frac{4\,(20 - 12)}{160}} = 202.3$$

Again,

$$G = 28.28\, d^2 \sqrt{\frac{d\,(h_2 - h_1)}{2.08\, d + l}}$$

$$= 28.28 \times 4^2 \sqrt{\frac{4\,(20 - 12)}{2.08 \times 4 + 160}} = 197.3$$

The difference in the results obtained in the use of these two formulas amounts to 5 gal. per min., showing an error of 2.5 per cent. in the use of the first formula.

EXAMINATION QUESTIONS

Drainage and Pumping

Ques.—Knowing the head of water, in any case, how is the pressure, in pounds per square foot and pounds per square inch, calculated?

Ans.—Since the weight of 1 cu.ft. of water is 62.5 lb., the pressure, in pounds per square foot, is found by multiplying the head in feet, by this weight. Thus, the pressure due to a head of 100 ft. of water is $100 \times 62.5 = 6250$ lb. per sq.ft.

The weight of a prism of water having a base of 1 sq.in. and a height of 1 ft. is 0.434 lb. Therefore, the pressure due to a head of 100 ft. of water is $100 \times 0.434 = 43.4$ lb. per sq.in. The pressure must always be expressed in the same units of measurement as the head.

Ques.—What is meant by "friction head," in the flow of a fluid in a conduit?

Ans.—The friction caused by the flow of water through a pipe or of air in an airway must be overcome by pressure, in order to allow the water to flow. This pressure expressed in water column, in pumping, is called the friction head.

Ques.—What is the "velocity head" in pumping?

Ans.—The velocity head is that portion of the actual head that is absorbed in producing the velocity of the flow. Except in small pipes and high velocities, the velocity head may be disregarded. When, however, a large quantity of water is discharged through a small pipe, a high velocity is produced, which represents a considerable portion of the head or pressure producing the flow. In such case, it is necessary to consider the velocity head.

Ques.—In pumping, in a shaft 500 ft. deep, what is the pressure on the piston of the pump, due to the depth of the shaft?

Ans.—The pressure due to the depth of the shaft, in this case, is $500 \times 0.434 = 217$ lb. per sq.in.

Ques.—If it is required to discharge 250 gal. per min. through a 4-in. column pipe, in this shaft, what will be the total pressure against which the pump must operate, disregarding the friction of the valves, and, likewise, disregarding the velocity head, which, in this case, is small.

Ans.—Before calculating the pressure due to pumping in a shaft, it is necessary to calculate the friction head, or the additional head due to the friction of the water in the column pipe; and this must be added to the depth of the shaft, in order to obtain the actual head against which the pump is operating. When 250 gal. of water are discharged through a pipe 4 in. in diameter and 500 ft. long, under usual mining conditions, the friction head due to the flow of water through the pipe is

$$hf = \frac{lG^2}{800\,d^5} = \frac{500 \times 250^2}{800 \times 4^5} = 38 + ft.$$

Then adding this friction head to the depth of the shaft the actual head against which the pump is operating is $500 + 38 = 538$ ft.; and the pressure on the piston of the pump is then $538 \times 0.434 = 233.5$ lb. per sq.in.

Ques.—Find the size of pump that will be required to discharge 300 gal. per min., from a shaft 200 ft. deep. Give the size of suction and column pipes. Assume a steam pressure of 80 lb. per sq.in. at the throttle of the pump and a piston speed $S = 100$ ft. per min.

Ans.—The diameters of the suction and discharge pipes, respectively, are as follows:

Suction, $d = 0.35\sqrt{G} = 0.35\sqrt{300} = 6.06$, *say 6 in.*

Discharge, $d = 0.25\sqrt{G} = 0.25\sqrt{300} = 4.33$, *say 5 in.*

Calling the entire depth of the shaft, including suction and discharge, 225 ft., it is first necessary to find the additional friction head due to the flow of water through the suction and discharge pipes, calling each of these 5 in., for the purpose of calculation. For a flow of 300 gal. per min., through a 5-in. pipe 225 ft. long, the friction head is

$$hf = \frac{lG^2}{800\,d^5} = \frac{225 \times 300^2}{800 \times 5^5} = 8 + ft.$$

The total head against which this pump operates is therefore $225 + 8 = 233$ ft. The diameter d of the water end of the pump is calculated thus:

$$d = 5.37\sqrt[4]{\frac{G}{S}} = 5.37\sqrt[4]{\frac{300}{100}} = 9.3, \textit{ say } 10\textit{ in.}$$

Having found the diameter of the water end, $d = 10$ in., the diameter D of the steam end, for a head of 233 ft. and an available steam pressure of 80 lb. per sq.in., is calculated thus:

$$D = 0.7\,d\sqrt{\frac{h}{p}} = 0.7 \times 10\sqrt{\frac{233}{80}} = 11.9, \textit{ say } 12\textit{ in.}$$

In this formula, we have assumed an efficiency of 85 per cent. in the water end and 75 per cent. in the steam end, which is usual pumping practice. Taking the length of the stroke as 16 in., for a piston speed of 100 ft. per min., the pump is running at a speed of $100 \times 12 \div 16 = 75$ strokes per min. The pump required, in this case, is, therefore, a duplex, direct-acting pump 12x10x16 in., the steam cylinder being 12x16 in. and the pump cylinder 10x16 in.

Ques.—At what speed should a pump be driven to insure safety, continuous service, and economy of operation?

Ans.—The safe piston speed of a pump will depend on the style of pump and the service for which it is designed; namely, the quantity of water required to be discharged and the vertical lift of the pump. Under ordinary mining conditions, pumps are designed to make from 50 to 150 strokes per min., according to the style and size of the pump. A pump having a 6- or 8-in. stroke may make 150 or 160 strokes per min., while a pump having a longer stroke, say 2 or 3 ft. or more, is commonly designed for 30, 40 or 50 strokes per min. In usual mining practice, the piston speed varies from 75 to 100 ft. per minute.

COAL AND COKE NEWS

Washington, D. C.

The Interstate Commerce Commission has handed down an important decision regarding the rates on coal from Western Kentucky and Alabama mines to Memphis, Tenn., and points taking Memphis rates. This is the case of the Memphis freight bureau versus the Louisville & Nashville R.R. Co. In substance the Commission holds that a rate of $1.10 from the Kentucky and Alabama mines to Memphis is not unreasonable and it therefore dismisses the complaint. In summarizing the Southern coal situation as exhibited by this case, the Commision says:

Many comparisons were made by defendants with rates from Western Kentucky and Alabama mines to stations intermediate to Memphis, in all of which instances the intermediate rates were higher. On the Louisville & Nashville the maximum is $1.50; on the Frisco, $1.25. As the Frisco is the short line and as water competition cannot be held responsible for the Memphis rate, there is little probative force in the Frisco comparison and but little more in the $1.50 rate on the Louisville & Nashville, which, with 67.3 per cent. of the total rail coal tonnage to Memphis for the year 1910-11, experiences little discomfiture by reason of the 4.85 per cent. handled by the Frisco, and is not seriously disturbed on account of the 24.93 per cent. transported by the Illinois Central. However, compared with other coal rates in the Southeast, the $1.10 rate does not appear to be too high. For example, the rate from Alabama mines to Atlanta, Ga., 168 miles, is $1.20; to Meridian, Miss., 177 miles, $1.10; to Chattanooga, Tenn., 167 miles, $1.10; from Illinois Central mines in Kentucky to Jackson, Tenn., 207 miles, $1.20.

Coke Rates Are Upheld

In another coal decision—that of the St. Louis Blast Furnace Co. versus the Louisville & Nashville, the C. & O. Ry. Co., etc.—and in sundry allied cases, the Commission has ruled that the charges imposed upon shipments of coke from the Virginia, West Virginia and Pennsylvania fields to Missouri are not unduly high and should be sustained in consequence.

In reaching the conclusion thus indicated, the Commission notes that the essential claim is that the rate of $2.80 per ton is unjust and that it discriminates against the city of St. Louis. As to this the point is made that very little testimony was presented in behalf of the complainant in support of the contention that the rate of $2.80 per net ton charged for the transportation of the coke from the various ovens to the furnace was unreasonable, discriminatory, and prejudicial.

The existence of dual rates on coke, whereby blast furnaces at other points, particularly Chicago and other lake ports, enjoyed lower rates on coke intended for their use was alleged in the complaints and admitted by some of the defendants as relating to the time covered by the shipments in question, though it appears that following the condemnation of such rates in the Anaconda case, 19 I. C. C., 592, they were canceled, at least so far as concerns the defendants in the present cases.

Further Anthracite Regulation Anticipated

It is understood that in view of the facts regarding the cost of production of anthracite coal that have been brought to the attention of Congress in the report on the production and prices of anthracite coal lately issued by the Department of Commerce & Labor it is probable that an attempt will be made at the forthcoming session to secure further regulation of the rates charged for the transportation of coal from the mines to points of sale. This may be done through further legislation designed to improve the commodities clause of the Interstate Commerce law. The attention of legislators is being directed to that portion of the coal report in which this subject is discussed and which says in part:

Where there is a common control of the coal mines and railroads (as in all the companies included in this report), the capital invested derives its income from both the mining and transportation of the coal, and the failure to realize profits in mining may be, and often is, compensated by the profits in the operation of the railroad on account of the coal tonnage. In such a case it is not a matter of importance to the controlling financial interests whether the profits are derived from the mining or from the transportation. The purpose is simply to operate the coal mines and the railroad so as to produce the maximum profit from both together and not simply to secure profitable results from each source of income separately.

Under these conditions the motives to increase the efficiency and decrease the cost of mining coal are much weaker than in the case of a corporation dependent for its profits entirely on the results of its mining.

Furthermore, where there is a joint control of the mines and the railroad, and where the failure to realize profits on mining can be compensated by the profit in the transportation of coal over the railroad it might well be advantageous in order to secure all the coal that could be profitably hauled to market to operate at a loss certain collieries that could not be worked independently of the railroad support.

PENNSYLVANIA

Anthracite

Scranton—More than 1200 employees at No. 1 and No. 2 collieries of Jermyn & Co. at Old Forge have gone on strike because of the refusal of about 20 of their number to join the miners' organization. The plants are completely tied up. The strike of the employees at No. 14 colliery of the Pennsylvania Coal Co. at Hilldale has been settled and the men have returned to work.

Wilkes-Barre—Officials of the Lehigh & Wilkes-Barre Coal Co. at Wanamie have not come to any agreement with their employees and the result is that over 900 men and boys are still on strike.

Pottsville—The six miners who were entombed at Buck Run Colliery at Mt. Pleasant, worked their way to the surface through a forgotten airway, greatly surprising the rescuing party, two members of which had been killed while at work. Every man was not only active, but well.

The flooded condition of the Susquehanna and Lackawanna Rivers has caused the closing down of several mines in the valleys of those two streams. All collieries in Plymouth were closed, with the exception of those belonging to the D. & H. Co., and the washeries of the Gaylord and Dodson collieries. Of the collieries operated by the Susquehanna Coal Co., the Glen Dyon, Richards and William Penn collieries were obliged to suspend operations, the latter two owing to the fact that the surface water was entering the workings. The water from the Susquehanna entered the old workings of the Enterprise colliery of the Lehigh Valley Coal Co., and operations were suspended in the Henry Colliery, adjoining the Enterprise.

Bituminous

Stoneboro—The engine and boiler house of mine No. 7 of the Mercer Iron & Coal Co. has recently burned to the ground and the tipple badly damaged. Two hundred men are idle as a result of the fire, but a large force is at work making the necessary repairs. Mine No. 7 is one of the largest in the county and has a daily output of 1600 tons. The origin of the fire is not known.

Punxsutawney—Trouble still exists between the miners and operators at the Eriton shaft at Du Bois. The men quit work Feb. 10 because the company refused to repair the tipple and make the pan self cleaning. For the past three weeks the company has been repairing the workings, especially at the bottom of the mine. Last week a crew started work on the tipple.

Du Bois—The miners of the Buffalo & Susquehanna Coal Co. Shaft No. 2 struck Mar. 25 because J. E. Brown was discharged. This man had been a regular employee for some time. He obtained permission to lay off for a period, desiring to go to Harrisburg to argue in favor of certain labor bills. On his return he did not immediately return to work and when he did attempt to resume work he was not permitted to do so. The strike has been declared off and the men returned to work Mar. 29 pending a settlement by agreement or arbitration.

WEST VIRGINIA

Fairmount Lake coal shipments from Fairmont regions have been stopped and the local mines cut out of much work by an embargo placed by the Baltimore & Ohio R.R. The destruction of the track and of railroad equipment by the flood were the reasons for the order which will cause the local regions to go on about half time for a week or more.

Charleston—John P. White, president of the United Mine Workers of America, held a lengthy conference with H. G. Hatfield, governor of West Virginia, recently during which he handed the governor a letter containing various demands

of the mine workers. The changes demanded in this letter were as follows: That no discrimination should be made against mine workers for joining an organization, and that all employees should return to work. The establishment of a nine-hour day applying to all classes of labor. A semi-monthly pay-day should be established. The miners at any one mine shall be accorded the right to select a check weighman, and the ton shall consist of 2000 lb. That a joint commission shall be established, and also a board of arbitration.

The fan house of the Paint Creek Collieries Co.'s Scranton mine near Mucklow was destroyed by fire recently. The fan was put out of commission and the coal took fire and burned to a distance of 300 ft. back from the fan mouth. Forty men were at work in the mine at the time, but all escaped without serious injury. The mine has been operated by nonunion labor since the middle of last April. The loss is approximately $2000.

Bluefield—As a result of the conference held by the mine owners and their superintendents in the New River and Virginia district, a nine-hour day will be inaugurated Apr. 1. About half of the mines will also adopt a two-weeks' pay-day. Many of the miners do not approve of the two-weeks' pay-day as they claim they can save more money if paid only once a month.

ALABAMA

Indio—One miner is dead and three seriously burned as a result of a gas explosion in the Indio mines. The mine was closed down following the accident. The explosion is said to have occurred when a naked light ignited the gas. The mine is operated by the De Soto Mining Co.

TENNESSEE

Chattanooga—According to a statement issued by C. E. Buck, the merger which has been pending for several months relative to the amalgamation of the City Gas Co., the Durham Coal & Iron Co., and other mineral and coal interests in this immediate section has completely failed and all negotiations are now broken off.

OHIO

St. Clairsville—Six hundred miners in the Provident mine of the Provident Coal Co. have struck, claiming that the scales used by the company are not correct, and that they are being cheated out of many tons of coal every day. The miners have asked the state authorities to examine the scales.

Massillon—Workmen are making great efforts to recover the bodies which are believed to have been buried under the wreckage of the Malcom Mining Co.'s main building when it was destroyed by a fire and gas explosion. Five bodies have been recovered and many more are believed to be under the ruins. The property loss is $100,000.

Columbus—The Thomas resolution providing for the naming of a commission by Governor Cox to investigate conditions surrounding the mining business in Ohio with especial reference to the scale of wages paid was passed by the house by a vote of 61 to 49. The resolution seeks to delay action on the Green anti-screen bill which was passed by the Ohio senate and which is now pending in the House of Representatives. The commision will be named at once and is to report at the extraordinary session of the General Assembly called to meet during the fall or early winter.

Stillwater—Fire recently destroyed the engine house at the new shaft of the Stillwater Coal Mining Co. The origin of the blaze is unknown and the loss has not been estimated. As a result of the fire, which damaged the hoisting engine, the mine has been closed down until repairs can be made.

INDIANA

Bicknell—The Indian Creek Coal Mining Co. hoisted from their shaft mine on Mar. 10, 3103 tons. This mine is gradually increasing its output.

ILLINOIS

Herrin—The Southern Illinois Coal & Coke Co. has brought suit in the United States Court for $500,000 damages against the Illinois Central R.R. on account of failure of the railroad to provide cars to ship coal, between August 1909 and the present date. It is alleged that the railroad favored certain mining companies in the distribution of cars, and damages are claimed under an Illinois statute, requiring the railroads to furnish cars to persons demanding them for the transportation of coal.

De Soto—The State Mine Inspector has closed down the mine of the J. B. Kreikemeier Coal Co., on account of the failure of the mining company to provide its miners with a sufficient amount of air. It is probable that the mine will be closed down for several months.

IOWA

Eldon—A bad fire is raging in the mine belonging to the Anchor Coal Co. at Laddsdale. All operations are suspended. The mine has been in operation for 45 years. It is likely that the 50 men who are thrown out of employment will have to move to other places. The loss to the men is placed at $500, while the company's loss is hard to estimate.

Knoxville—A bed of coal 5 ft. 7 in. thick, has been found within less than 14 blocks of the court house. This is the result of the extensive prospecting work which is being done by Geo. H. Ramsey.

SOUTH DAKOTA

The Interstate Commerce Commission has ordered an inquiry into carload coal rates from producing fields in Wyoming and Montana to South Dakota points. These rates have been the subject of much complaint to the commission, and it has begun an investigation on its own motion. All leading roads in the three states are defendants.

NEVADA

Goldfield—H. A. Darm, who has been developing coal near Coaldale, in this county, has received notice from Washington that the coal land that he has sought to secure by location and purchase has been re-opened to entry. This land was withdrawn sometime ago by presidential order.

ARKANSAS

Russellville—The Russellville anthracite coal mines are in operation after having been idle for more than two years This property is one of the largest in this section, and is owned by Detroit capitalists.

OKLAHOMA

McCurtain—Three hundred and twenty-six miners were thrown out of work when mines Nos. 1 and 3 of the Sans-Bois Coal Co. were shut down. The mines have been thoroughly cleaned and all tools removed, indicating that the shutdown will be for a considerable period.

McAllister—It is rumored that because the Oklahoma legislature repealed the mine-run law, the headquarters of district No. 21, United Mine Workers of America, composed of Texas, Oklahoma, Arkansas, Kansas and Missouri, are to be removed from McAllister, Oklahoma, to Fort Smith, Arkansas

FOREIGN NEWS

Odessa, Russia—The coal famine at present existing in Russia has had the effect of arousing the attention of the state administration to the possibility of vastly increasing the present insufficient output of Russian coal. To this end an expert commission of mining engineers and specialists has been appointed to study and report upon the whole question. It is believed that the Dombrovo coal field can increase its output 25% through improved systems of mining. It is thought that the Donetz basin collieries are also capable of a like improvement.

PERSONALS

James V. Coryell, a lawyer and coal expert, has been appointed receiver for J. K. Dimmick & Co., which firm failed recently in Philadelphia.

William Andrews, of Lansford, chief coal inspector for the Lehigh Coal and Navigation Co., has been appointed foreman of the company's yards, succeeding B. H. Stockett.

It is rumored that United States Senator Clarence W. Watson may be elected president of the Elkhorn Fuel Corporation, which was recently organized with a capitalization of $30,000,000.

Alexander Bennett, former division mine superintendent for the Delaware & Hudson Co., has been appointed to succeed John G. Hayes, as general superintendent of the People's Coal Co. He has assumed the duties of his new position.

John Hines was recently appointed superintendent of the Nay Aug Colliery at Dunmore and of the Mohawk Colliery at Carbondale. Mr. Hines has for several months past acted as foreman at the Nay Aug mine.

A. F. Wolf, of Wilkes-Barre, has bought out the interests of the Central Coal Co., of Scranton in a property of ninety-seven acres of coal land in Plains township, near Hudson

His intention is to erect a modern breaker and to start operations as soon as possible, probably within six months. Mr. Wolf is the head of the Wolf Coal Co., with offices at Freeland, and extensive operations at Lattimer.

Max G. Voelker, northern sales manager of the Skeele Coal Co. at Buffalo, has been appointed northern sales agent of the Youghiogheny & Ohio Coal Co. at the same place, to fill the vacancy caused by the promotion of H. L. Findlay to the position of general sales manager of the Y. & O., with headquarters at Cleveland. Mr. Voelker will be succeeded by Frank J. Honan, from the New York office of the Skeele Company.

TRADE CATALOGS

Sullivan Machinery Co., Chicago, Ill. Bulletin No. 58-O. Portable drilling rigs. Illustrated, 16 pages, 6x9 in.

Ingersoll-Rand Co., 11 Broadway, New York. Form 4017. "Butterfly" hand hammer drills. Illustrated, 8 pages, 6x9 in.

Electric Service Supplies Co., 17th and Cambria Sts., Philadelphia, Penn. Booklet. Garton-Daniels lightning arresters. Illustrated.

The Baldwin Locomotive Works, Philadelphia, Penn. Record No. 72. Mallett articulated locomotives. Illustrated, 44 pages, 6x9 in.

The Sullivan Machinery Co., Bulletin No. 66-G on hammer drills for various classes of mining construction work and 65-A on diamond prospecting core drills.

Wm. Johnson & Sons (Leeds), Ltd., Armley, Leeds, England. U. S. Enginering Co., 80 Wall St., New York, representatives. Catalog. Briquetting machinery. Illustrated, 16 pages, 7½x10 in.

The Link Belt Co. have recently issued a new 48-page book illustrating and listing their line of steel chains. This book should be of interest to the trade and will be mailed free upon request.

The Economical Burning of Coal—The Valley Iron Works, Williamsport, Penn. 32 pp., 8½x11 in. Describes the construction and possibilities of Ajax grates, with notes on the economical burning of coal, the treatment required to efficiently burn various kinds of coal, the air supply, firing methods, etc.

The National Tube Co.—Bulletin No. 12. Under the headings of uniformity, chemical composition, physical properties, bursting strength, threading, improvements, full weight pipes, and spellarizing, this bulletin contains a vast amount of concise information about pipes which the average consumer wants to know.

The Ingersoll-Rand Co., 11 Broadway, New York City, has just issued a 40-page, 6x9-in. catalog, form 3008, covering their class "PE" duplex direct-connected electrically driven compressors. Among the principal features of design and construction are: The clearance controller, the hurrican inlet valve, auxiliary water separator, inclosed flood lubrication for main bearings, crank pins and cross heads, liberal wearing surfaces, maximum valve and port ares. The catalog is illustrated and shows a table of sizes and capacities.

RECENT COAL AND COKE PATENTS

Miners Drill—W. Channon, Des Moines, Iowa. 1,055,608, March 11, 1913. Filed Sept. 13, 1911. Serial No. 649,189.

Mining Transit—W. A. Berger, Boston, Mass. 1,055,309, March 11, 1913. Filed April 30, 1908. Serial No. 430,054.

Cupola Furnace—P. Anderson, Arvika, Sweden. 1,054,381, Feb. 25, 1913. Filed August 11, 1911. Serial No. 644,338.

Mining Apparatus—I. N. Henness, Moclips, Wash. 1,054,410, Feb. 25, 1913. Filed July 18, 1910. Serial No. 572,542.

Rotary Steam Engine—J. Prosseda, Fredonia, N. Y. 1,054,612, Feb. 25, 1913. Filed Sept. 13, 1912. Serial No. 720,246.

Train Coaling Station—C. C. Brackett, Chicago, Ill. 1,054,272, Feb. 25, 1913. Filed Sept. 13, 1911. Serial No. 649,035.

Coal Screening Tower—G. E. Titcomb, Philadelphia, Penn. 1,056,472, March 18, 1913. Filed May 29, 1911. Serial No. 630,107

Blast Furnace Charging Apparatus—J. W. Shook, Holt, Ala. 1,055,671, March 11, 1913. Filed May 14, 1912. Serial No. 697,196.

Check Holder for Mine Cars—O. E. Dickinson, Herminie, Penn. 1,054,513, Feb. 25, 1913. Filed July 23, 1912. Serial No. 711,122.

Conveyor—G. H. Mueller assignor to Jeffrey Mfg. Co., Columbus, O. 1,054,305, Feb. 25, 1913. Filed April 8, 1903. Serial No. 425,903.

Turbine—J. L. Moore assignor to Kerr Turbine Co. Wellsville, N. Y. 1,054,134, Feb. 25, 1913. Filed Dec. 17, 1912. Serial No. 737,292.

Safety Device for Cable Railways—R. H. Williams, Shamokin, Penn. 1,055,249, March 4, 1913. Filed Dec. 26, 1911. Serial No. 667,789.

Preparing Coke for Charging Blast Furnaces—M. C. Steese, Youngstown, O. 1,054,051, Feb. 25, 1913. Filed Feb. 24, 1911. Serial No. 610,653.

Apparatus for Drying Washed Coal and Other Material—C. Catlett, Staunton, Va. and D. Hancock, Birmingham, Ala. 1,056,738, March 18, 1913. Filed June 1, 1912. Serial No. 701,102.

Manual Coal and Rock Drilling Machine—Theo. Lippiett, D. Lippiett, T. Lippiett, S. Lippiett, B. Lippiett and W. Lippiett. Tredegar, Eng. 1,054,925, March 4, 1913. Filed Nov. 4, 1911. Serial No. 658,574.

CONSTRUCTION NEWS

Meyersdale, Penn.—The Boynton Coal Co. is sinking an air shaft in their mines just out of Meyersdale.

Shenandoah, Penn.—The contract for building the new Mammoth breaker of the Locust Mountain Coal Co. has been awarded.

Hauto, Penn.—Contractor Lewis Riebe, of Summit Hill, is erecting a new washery for the Lehigh Coal & Navigation Co., at Hauto.

Moundsville, W. Va.—Riggs Brothers have been awarded the contract for erecting a new tipple at the Hitchman Mine at Glendale.

William, W. Va.—The Roberts & Schaeffer Co., of Chicago, have closed a contract with the Western Maryland Ry. for a large Holmen coaling station for installation at William.

Mt. Pleasant, Penn.—The W. Harry Brown Coke Co. is arranging to erect several hundred coke ovens on the Weltner farm in Green County. The contract will be let and work started at once.

Gary, W. Va.—It is reported that the U. S. Coal & Coke Co. is making preparations for the erection of 200 houses around its various operations. It is said that the work will be begun at an early date.

Charlestown, W. Va.—It is reported that Barboursville is to be the terminal of the Guyan Valley branch of the Chesapeake & Ohio R.R. Work will soon be started on the construction of more than two miles of trackage. It is expected that the improvements will cost over $150,000.

Centralia, Ill.—The Roberts & Schaeffer Co., of Chicago, have just closed a contract with the Marion County Coal Co. for a new Marcus conveyor installation at Centralia. This new Marcus equipment, which this company has brought out during the past year, has met with much success.

Terre Haute, Ind.—The Clovelly Coal Co., H. B. Talley, President, is building a large modern shaft mine northwest of Terre Haute. The plant will have large capacity and will be entirely modern. An order has been placed with Crawford & McCrimmon Co., Brazil, Ind., for a large hoisting engine.

Youngstown, Ohio—Thos. MacDonald, district superintendent of the Carnegie Steel Mill, has returned from New York, where he attended a meeting of the U. S. Steel Corporation coke committee. It is the intention of the Carnegie company to commence next fall, the construction of coke ovens at MacDonald.

Pottsville, Penn.—The Philadelphia & Reading Coal & Iron Co. has awarded a contract for the sinking of a 700-ft. shaft to the Seven Foot Vein in the vicinity of Beechwood drift at Mt. Laffee. The contract calls for a three-compartment shaft, 7x12 ft. 8 in. These dimensions will be continued to a depth of 600 ft. It is possible that a new breaker will also be built at Mt. Laffee.

Scranton, Penn.—The Delaware & Hudson Co. will soon place a new breaker in operation in the southeastern part of Archbald. The breaker has been in the course of con-

struction for eight months and is now practically completed. All the adjoining buildings, such as fan houses, pumping houses, engine and boiler rooms, have been finished. The new slope which was driven about a year ago has been in operation some time. The new structure was built at a cost of about $300,000. The old White Oak breaker will not be abandoned, but the machinery will be removed and it will be used as a culm washery.

NEW INCORPORATIONS

Wytheville, Va.—The Wythe Mining Corporation; capital stock, $50,000.

Cleveland, Ohio—The Provident Coal Co. has increased its capital stock from $300,000 to $600,000.

Louisville, Ky.—The Tennessee Jellico Coal Co. is increasing its capital from $300,000 to $400,000.

Bristol, Va.—An amendment has been issued to the Mount Morgan Coal Co., decreasing the capital stock to $25,000.

Belleville, Ill.—The Southern Coal, Coke & Mining Co. Incorporators: W. K. Kavenaugh, J. Y. Lockwood and J. B. Kennard.

Pittsburgh, Penn.—The American Fuel Co.; capital stock, $10,000. Incorporators: E. F. McMillan, E. R. McMillan and T. R. Roberts, Jr.

Osceola Mills, Penn.—The Grace Coal Mining Co.; capital stock, $5000. Incorporators: S. B. Isenberg, G. W. Minns, E. C. Trees, Robert Wyatt and L. R. Somerville.

Punxsutawney, Penn.—The Brush Creek Coal Mining Co.; capital stock, $750,000. Incorporators: L. W. Robinson, B. M Clark, F. H. Beck, J. W. Brown and Lewis Iselin.

Harlan, Ky.—The Martins Fork Coal Mining Co. has been organized with a capital of $20,000. The incorporators are W. F. A. Gregory, W. A. Brock, Geo. W. Creech, and H. M. Brock.

Frankfort, Ky.—The Butler County Coal Co., of Aberdeen, has been organized with a capital of $2000. The incorporators are J. A. Watkins, C. E. Sullivan, J. C. Haney and C. L. Drury.

Columbus, Ohio—The Maple-Gallia Coal Co. has been organized with a capital of $100,000. The incorporators are F. A. McManigal, W. J. Hamilton, A. Morse, M. L. Phelps, L. E. Ridgway.

Frankfort, Ky.—The Hobson Coal Co. has been incorporated with a capital of $30,000. The incorporators are A. Maben Hobson, S. Delaney, and W. R. Carter. The incurrence of debt is to be limited to $100,000.

Phoenix, Ariz.—A charter has been granted to the Tanaha Goldfield Mines Co.; capital, $10,000,000. Incorporators, M. O. Bicknell, Harry E. Jarman and Edgar McLaren, all of San Francisco, Calif., to mine gold, coal, etc.

Boston, Mass.—The Wakefield Coal Supply Co. has been organized with a capital of $35,000. The incorporators are Edward P. White, E. Horace Perley, Herbert M. Whitten, Albert R. Perkins, Daniel D. Peabody and Geo. H. Smith.

INDUSTRIAL NEWS

Pottsville, Penn.—It is reported that the Reading company is preparing to develop abandoned mines in the anthracite region.

Indiana, Penn.—R. W. Webrle, of Indiana, is the sole owner of about 1200 acres of coal land in Blacklick Township, and is making openings to mine the same.

Coal Creek, Tenn.—A 30-ft. coal seam is said to have been discovered on the property which lies between the Louisville & Nashville and the Southern railroads.

Birmingham, Ala.—The Tennessee Coal, Iron & R.R. Co. has made an appropriation of $100,000 with which to open a new coal mine near Blocton, in Bibb County.

Morgantown, W. Va.—Pittsburgh coal operators, who recently purchased large tracts of coal along Cheat River, are preparing to develop the same and openings are being made.

Lansford, Penn.—All the collieries in the Panther Creek Valley are closed on account of an oversupply of coal. The collieries have been working only a few days during the latter part of March.

Connellsville, Penn.—The Penn-Westmoreland Coal Co. has recently purchased 100 acres of 4-ft. coal near West Norton and will develop it at once. A. R. Byers, of New Stanton, is at the head of the company.

Cleveland, Ohio—Bankruptcy schedules filed in Federal Court by the Buckeye Clay & Coal Co., operating in Jefferson and Columbia Counties, show liabilities of $75,417, and assets of $83,395. I. E. Mathers is treasurer.

Morgantown, W. Va.—Holdings of the Kingwood Coal & Coke Co., situated on the West Virginia Northern and the Morgantown & Kingwood R.R., in the vicinity of Kingwood, have been sold to Cleveland capitalists, who will develop the same.

New Florence, Penn.—A big coal-land deal has just been closed in which the consideration is said to be over $20,000, and the land purchased lying between New Florence and Seward. It is believed that the Berwind-White Coal Co. is behind this deal.

Charlerol, Penn.—It is understood that negotiations have practically been closed for the purchase of the Pike mine of the People's Coal Co., at Brownsville, by the Vesta Coal Co. This mine, which opens into a tract of coal of between 1000 and 1200 acres, has not been in operation for about three years.

Pittsburgh, Penn.—The Buckeye Engine Co., of Salem, Ohio, have appointed the Federal Engineering Co., of Pittsburgh, Penn., as sales agents for the Pittsburgh district, to handle their full line of steam and gas engines and other products of their manufacture. This appointment takes effect Apr. 1, 1913.

Buffalo, N. Y.—Rumors persist that the Buffalo & Susquehanna railroad and mining interests are soon to be taken over by the Shawmut company, which is expected soon to be out of the hands of the receiver. Still it seems hardly probable that the Shawmut could swing the property without very material help from some source.

Uniontown, Penn.—Floods in the Middle West are responsible for the temporary shutdown in the coking industry. The H. C. Frick Coke Co. has announced that three-fourths of its ovens have been shut down for four days and independent companies have closed down for an indefinite period. Railroad companies are refusing to take shipments.

Birmingham, Ala.—The development work at the mines of the Maryland Coal Co.'s new operation is progressing rapidly, twenty drifts having been already opened. They will begin shipping coal about July 15 and will have the largest output of Black Creek coal of any mine in the State. About six miles of railroad is being constructed and a rich mineral district is opened up by it.

Bayview, Ala.—The opening of mine No. 16 of the Tennessee Coal, Iron & R.R. Co. is progressing rapidly. The company has been working for some time and has struck a fine bed of coal about a month sooner than was expected. Although no preparations had been made for mining the coal the company has started their men to work on a new opening in order that there may be no delay.

Steubenville, Ohio—It is understood that Chicago capitalists are about to purchase several thousand acres of No. 8 coal in the vicinity of Morristown, in Belmont County. If present plans do not miscarry, at least two mines will be opened on the property as soon as the sale is completed. It is believed that a further extension of the Belmont Central R.R. will be made in the direction of Morristown as soon as the sale is completed.

Bluefield, W. Va.—A new branch line of the Norfolk & Western is being constructed from Norwood up Laurel Hollow, a distance of four miles. It is the opinion of residents in that section that it will be but a short time before the road will be extended to Pineville. It is said that this extension will be made eventually with a view to tapping the coal deposits which are found in that section in large quantities.

Birmingham, Ala.—The Standard Steel Co. has recently purchased from the trustee in bankruptcy all the lands, works, merchandise, accounts and business of the Southern Iron & Steel Co., and have taken over the title to and possession of said property and business. The business of the purchased company will be conducted without the slightest interruption, and the various departments will be handled by the same staff of officials as heretofore.

Wheeling, W. Va.—The Richland Coal Co. has purchased the property of the Beech Bottom Coal Co., located south of Warwood. The sale was a conditional one, and the purchase price amounts to approximately $600,000. The property contains about 2500 acres of coal land, a modern mine and machinery, and a number of miners' houses. The new owners expect to increase the working force from 100 to 200 or 300 men. Bids will be received within a short time for the erection of 50 additional houses.

COAL TRADE REVIEWS

TRANSPORTATION CONDITIONS IN THE FLOOD ZONE

The most serious consequences of the recent flood, insofar as the coal industry is concerned, will be in the loss of tonnage due to the restricted transportation facilities and curtailment in demand, because of the general suspension of manufacturing in the affected area. At the moment, the transportation problem in the flooded zone is the controlling feature in the situation. While the trouble is being cleared up rapidly, there is still a considerable territory along the Ohio Valley, upon which reliable reports are wanting. In general, however, the situation is now fairly well in hand, and the conditions are about as follows:

New York Central & Hudson River R.R. and Subsidiary Lines—The New York Central reports all main lines open and conditions normal. On the branches, however, particularly down through the Miami Valley, in which are located Dayton and Piqua, there is still considerable uncertainty as to when traffic will be restored. Aside from a number of small landslides and washouts, which delayed traffic for not to exceed a few hours, the situation in Pennsylvania, except immediately in the Pittsburgh district, was at no time serious. Conditions at the latter point are normal and the main line open and working to Ashtabula on Lake Erie, so that consignments to the Lakes will not be interfered with. They report no congestion of any kind and, owing to the light traffic recently, expect to be able to handle everything offered without any trouble.

Pennsylvania Railroad—This company reports conditions as normal on their lines East of Pittsburgh. They concede trouble to the west in Ohio, but are not prepared at the moment to make any estimate of the extent. Western shipments were embargoed, most of last week, and production fell off to less than half capacity, but these embargoes were raised the first of the current week, and the shipments are now about 60 per cent. capacity. The first movement is, of course, being confined to flood sufferers, then to perishable freight, after which the coal consumers will be considered, and finally the Lake shipments. Fortunately, the traffic has been light over the past few weeks, and the roads generally are in an excellent position to recover rapidly from the high waters. One large coal company on the Pennsylvania lines reports no trouble of any kind at their operations, and this in spite of the fact that they are ordinarily subject to minor floods of all descriptions.

Norfolk & Western Railroad—This road reports the Eastern movement as normal in every respect, but with embargoes against everything North and West of the Ohio River. Their service across the river seems to be very seriously crippled, and indications are that Lake consignments will not be accepted for between one and two weeks.

Baltimore & Ohio Railroad—As in the case of the other roads, the Baltimore & Ohio reports the movement East as steady and normal in every respect. This road has declared no embargoes, and are accepting freight of all kinds, but with the understanding that it is subject to delay. It expects to have western connections completed at the end of the current week.

Chesapeake & Ohio Railroad—At noon on Tuesday of this week, the Chesapeake & Ohio succeeded in restoring its tidewater service, which had been out for several days. Their Western end is still under water, and the movement beyond Ashland, Ky., is restricted. Indications are that connections will be restored between Cincinnati and Chicago by the last of the current week. The Chesapeake & Ohio connections into Ohio over the Kanawha & Michigan Ry. at Point Pleasant, are all intact, and service would be normal except for trouble on the latter line, the extent, of which it is impossible to estimate at the moment.

GENERAL REVIEW

With the spring discount of 50c. per ton on all the domestic grades now in effect, the winter season on hard coal is technically closed. The summer trade opens with an unusual lack of activity. Ordinarily, there is a strong demand for April tonnages, since these are the lowest official prices of the year. Offerings at the spring circular have been freely made for some time, while many dealers still have some of their winter supplies, and the combination of these two conditions has resulted in rumors that the companies' circular will be liberally cut throughout the summer. Naturally, in the face of such conditions, buyers are hesitating to enter the market.

Many of the Eastern bituminous consumers are still holding off on contracts and do not appear to be uneasy over the outlook; shipments on the old agreements continue heavy, prices are not changed, and little interest is shown over the future. The Middle Western floods have not affected the Eastern situation in any way, as all the lines shipping those markets have experienced little or no trouble, and it is doubtful if anything short of a protracted and general suspension would be felt at the present time. As a matter of fact, the closing of shipments to the Northern and Western markets has resulted in these extra tonnages being thrown into the Eastern trade, creating a large surplus at several points.

Contracting has naturally increased, most of the old ones having expired on Tuesday of the current week. Some offerings off of the regular circular are still being reported, but the trade as a whole is holding remarkably firm for advances all along the line, and it is evident that they will not in any event recede to the low level of last year. In the Pittsburgh district, on the outskirts of the flooded area, the market is rather unsettled, and rests entirely on transportation conditions.

There is practically no market in Ohio, and the trade is at a standstill, with the exception of a few odd tonnages of domestic coal for flood refugees. The coal movement in the state was probably never more completely paralyzed. The mines proper appear to have suffered comparatively little, from what information is available at the moment, and the greatest loss will be sustained by the falling off in tonnage. Many manufacturing concerns have been indefinitely crippled, and with the train service practically at a standstill, the consumption has dropped to little or nothing. Some of the Southern roads have issued embargoes on all shipments to the Lakes through Ohio, but it is expected that these will be raised before very long.

The railroad companies in the Middle West are in such poor condition that there is liable to be a serious shortage of steam coal. Contracting is not being very actively carried on, as buyers evidently prefer to pick up what they require in the spot market. There have been some heavy storms and snow, but these have not helped the situation much. There are rumors of an important coal consolidation among certain Illinois operators, which, if consummated, may establish a new condition in the Middle Western trade.

BOSTON, MASS.

Bituminous—The shippers argue variously on the outcome of the strike talk in the New River field. The general opinion is that the recognition granted in Kanawha County means that the New River operators must either concede this point now or face a strike that may be more or less serious. The prospect is rather in doubt. Meanwhile, the receipts at tide are ample and the agencies are still trying hard to place spot coal. Buyers decline to be scared into long purchases and shipments on old contracts continue to arrive in liberal amounts. Prices are unchanged and there is little interest shown in any of the Southern coals for future shipment.

It is understood that the largest producers of Georges Creek have marked prices up to a new high level; $2.95 is being talked now for a contract figure f.o.b. Baltimore. The impression seems to be that with the volume of business offshore and coastwise trade already in hand, the Georges Creek district is reasonably well supplied with orders.

The Clearfields show no change from a week ago. The heavy rains are being heard from and some of the operations are temporarily out of commission, but the market is dull and anything short of a general cessation will have little effect. Prices are weak and consumers are slow placing orders. In Somerset and Cambria counties there is a disposition to hold for prices at least 5c. higher than last year, and to curtail if the program is not realized.

Anthracite—April is is bound to be a disappointment to the producing companies. Spring prices have announced 50c discount from the March circular on all sizes, but they had been so generally anticipated that little interest was shown.

The least quibble on the part of a transportation company as to towing or docking is enough to divert the order elsewhere. The outlook is that May will be a dull month, for New England will be fairly well stocked by the end of April.

Current wholesale quotations are about as follows:

Clearfields, f.o.b. mine	$1 00@ 1 35
Clearfields, f.o.b. Philadelphia	2 25@ 2 60
Clearfields, f.o.b. New York	2 55@ 2 90
Cambrias, Somersets, f.o.b. mines	1 25@ 1 50
Pocahontas, New River, f.o.b. Hampton Roads	2 60@ 2 80
Pocahontas, New River, on cars Boston	3 55@ 3 80
Pocahontas, New River, on cars Providence	3 35@ 3 65

NEW YORK

Bituminous—With many of the old contracts having expired and the new ones not renewed as yet, production for the current week will probably experience some falling off. However, consumers are showing a more active interest in contracts, and there has been considerable done in this line during the week. Furthermore, the operators generally are obtaining the substantial advances over last year's quotations, for which they have been so firmly holding out. Conditions during the week appear to have taken a turn for the better, and there is a good healthy demand which has placed the sellers in a strong position. As compared with last year at this time, the price level is about $1 lower at the moment, but such comparison is hardly fair because of the unsettled labor conditions prevailing at this time in April, 1912.

The movement into New York is fairly strong, and the spot market comparatively good. Because of the number of contracts which have not been renewed, there will probably be an increase in this business for the time being. Prices continue at the low point for the year so far, as follows: West Virginia steam, $2.55@2.60; fair grades, Pennsylvanias, $2.65@2.70; good grades of Pennsylvanias, $2.75@2.80; best Miller, Pennsylvania, $3.05@3.15; Georges Creek, $3.25@3.30.

Anthracite—The hard-coal mines were, in a great many instances, closed down between one and two days as a result of the flood. As all the companies were, however, working under a curtailed production, the matter was of no consequence. The anthracite movement, as a whole, has not been seriously interfered with by the high waters except for the comparatively small shipments to the West, where the flood conditions are more severe. Car supply has been in excess of requirements for several weeks, and as freight traffic has been generally light, there is little cause for the roads to become congested because of the recent trouble.

April business did not open up as strong as in previous years, and the consumers are apparently undecided about entering the market at the present time. A number have carried fairly large stocks over from the past winter, and there are rumors to the effect that April prices are liable to continue well into mid-summer, so there is not much inducement to stock heavily this early in the season. The larger companies are again working full time, and apparently expect to continue so indefinitely. Both steam and domestic grades are moving rather slowly, the only active demand being for pea.

No important change is noticeable in the New York market, with the exception of the automatic decrease of 50c per ton on the prepared sizes, the market now being quotable as follows:

	Individual			
	Circular	L. Ligh	Scranton	
Broken	$4 50		4 75	4 50
Egg	4 75	$4 50@	4 70 $4 50@	4 75
Stove	4 75		4 70	4 75
Chestnut	5 00	4 70@	4 95 4 75@	4 90
Pea	3 50	3 25@	3 45 3 25@	3 50
Buckwheat	2 75	2 10@	2 45 2 10@	2 25
Rice	2 25	1 90@	1 95	2 75
Barley	1 75	1 20@	1 50 1 55@	1 75

PHILADELPHIA, PENN.

To all intents and purposes the winter season in the coal trade is over, and the past week marks the first of the new coal year. Mining has again been resumed on an all week basis, and the tonnage is moving off well, but there seems to be a marked apathetic attitude by the trade. Reports from all sides indicate an unusual indifference at the inception of the coal year. Perhaps this may be due to the fact that many dealers carried over considerable coal, owing to the unseasonable weather that has prevailed, another factor which is determining the policy of many dealers, and causing them to lay in supplies as economically as possible, is that prices in the summer will probably be even less than they are at present because of price cutting by the individual operators. It is current gossip in the trade that even April prices are shaded, and offers have been made of a straight price all through the summer up to Sept. 1, which would net even less than the company's prices in this vicinity. It is these rumors that are keeping the dealers from tieing up money in coal now, when they possibly may be able to secure all the tonnage they want in midsummer at even less than they are paying now. This is the proposition that is keeping many of them wondering what is best to do.

The individual operators are not having an easy time in disposing of their product, and it is only by making concessions such that consumers cannot well turn down, that they are doing any business at all. Everything being equal, the dealer who was not held up for heavy premiums, is going to place his business where he was fairly treated during the past winter, but a saving of $10 to $15 a car is likely to cause many of the trade to swallow their resentment. At any rate, the month of April is likely to show good business, both from a wholesale as well as retail standpoint, but as has been indicated, it is the result of the number of units, rather than the volume of tonnage requirements.

In the bituminous trade, they are still playing a waiting game. An increased price on contracts is being asked but consumers feel that they will not be justified in paying the advance. It is understood that some contracts are being signed up, but many orders are still being held, with the hope that lower prices will prevail.

PITTSBURGH, PENN.

Bituminous—The Pittsburgh coal district was affected by last week's floods only in the matter of transportation, although some Pittsburgh interests have mines in Ohio which were closed by the high water. Tuesday and Wednesday of last week coal shipments from Pittsburgh to the West were entirely suspended, railroads embargoing all coal and coke. On Saturday night the Pittsburgh & Lake Erie began accepting shipments again for all points on its lines, including Connellsville coke for Chicago. Sunday the Pennsylvania had everything open to Lake Erie points, also the Fort Wayne line as far as Orrville and the Pan Handle as far as Dennison, with prospects that it would be nearly the close of the week before transportation could be resumed to points farther west.

The Pittsburgh district fell to operating less than half capacity toward the close of last week, but is opening the new week with operations at nearly half capacity, and the week will probably close with above 50 per cent., and perhaps above 60 per cent. Full shipments are not possible, even where lines are opened up, as there is a marked shortage of empties. As a rule the railroads are refusing to accept coal destined for the Lake trade, holding that supplies for flood sufferers should be cleared up first, then perishable freight, and then coal for consumers, before lake coal is moved. However, there is reason to believe that a little lake coal is being moved.

Many consumers west of Pittsburgh are suffering badly from lack of coal, but there is not much demand marketwise since it is simply transportation that is involved. Coal operators are not undertaking to arrange for delivery, in offering coal, and purchases of prompt coal being made are simply f.o.b. mine, and at regular prices, the buyer looking after the movement. We note one sale of this sort, where the buyer (in the west) took 25 cars and hoped to have a train made up which could be moved expeditiously.

Apr 1 marks the beginning of a new year, on many coal contracts. Not all expiring contracts have been renewed, the slowness of buyers being attributed to the higher prices this season, but the leading operators have been adhering to these prices quite well and report that they have lost little business on account of cut prices by small operators. We continue to quote: Slack, 90c.; nut and slack, $1.05; nut, $1.25; mine-run, $1.30; ⅜-in., $1.40; 1¼-in., $1.55, per ton at mine, Pittsburgh district.

Connellsville Coke—The floods last week stopped practically all coke shipments to the West, or about one-half the total normal movement out of the region. As already noted, railroad movement is being resumed. A large tonnage of coke has accumulated in the region, little effort being made to curtail production, by the merchant operators. The H. C. Frick Coke Co. banked many ovens, practically in proportion to the steel corporation furnaces which had to be banked. There is little wire communication with Western points affected, and the condition of blast furnaces is not fully known, but reports gathered by one of the railroads are to the effect that eight furnaces have chilled, and will therefore have to be shoveled out, requiring two to three weeks, and perhaps relined, involving more than double the time. Other furnaces affected are resuming as the water goes down.

The coke market has been entirely upset, and fresh prices will have to be developed as demand appears. At the moment there is no demand at all, while some operators are offering prompt coke and would naturally take low prices. It is out

of the question to mention prices at this time which would be at all informative, and even a week hence a market may not be clearly established.

BALTIMORE, MD.

Interest here, at the moment, is centered in the floods in Ohio and adjoining states during the past week, which practically brought Lake shipments to a standstill on the Baltimore & Ohio and other roads. Large tonnages had started to move to Loraine and Cleveland on Mar. 20, and other operators were preparing to forward cargoes, when the roads notified shippers that they would be unable to handle fuel traffic to the West and Northwest. During the latter part of the week the Baltimore & Ohio was closed, West of Parkersburg and Wheeling, and its Cleveland, Loraine & Wheeling line, over which most of the Lake coal traffic is carried, was also put out of commission. Such shipments accumulated rapidly during the week.

BUFFALO, N. Y.

It is claimed by bituminous jobbers that prices are firmer than they were a week ago, as the leading operators, especially in the Pittsburgh district, are holding firm on their season's quotations. While it is conceded that there is more or less coal offered at reduced prices, the trade as a whole is refusing to consider such business and is determined not to recede to the low level of last summer.

The beginning of shipments to the Lakes always disturbs the bituminous market, especially as it develops a surplus of slack. In addition to this the floods have practically shut down the mines and absolutely held up the movement in many cases.

Bituminous quotations remain at $2.80 for Pittsburgh lump; $2.65 for three-quarter, $2.55 for mine-run and $2.15 for slack, with Allegheny Valley 25 to 30c. lower. Coke is steady on the basis of $5 for best Connellsville foundry. There is next to no demand for anthracite, though the April price will revive it.

The drop in prices has been more pronounced in the East than it has here; all quotations appear firmer towards the West. The great scarcity of anthracite Westward no doubt has something to do with that. Flood conditions will tend to make that still scarcer in the West and as it now appears there will not be much relief possible till the lakes are open. There is a large amount of both sorts of coal going afloat and it may begin to move very soon. Buffalo ships only anthracite by lake, having about 125,000 tons afloat now, with all shipping docks active; tonnage is plentiful.

CHICAGO

It is estimated that half of the domestic supply and 25% of the steam production has been shut out of the Chicago market because of the floods in Ohio and Indiana. As a result, prices here are increasing. Cold weather has also stimulated the demand. Almost half the mines which supply domestic coal to this market are now unable to ship. Chicago is dependent, at present, upon the mines of the northern central part of Indiana and the more northerly operations in Illinois. There are but a few of the Indiana producers able to get their coal into this market. Companies in a position to make shipments here are able to get fancy prices, about on a level with those obtained for the better grades of Illinois coal. The coke market remains steady as a result of a curtailment in supply. New circular prices on byproduct coke place the price of that commodity at $4.45 for April delivery.

Prevailing prices in Chicago are:

	Sullivan Co.	Springfield	Clinton	W Va.
Domestic lump	$2.47	$2.07	$2 27	.....
Egg	2.47	.....	.....	$3.95
Steam lump	$2.12 @ 2.37	1.92 @ 1.97	2.17	.....
Mine-run	.....	1.87 @ 1 92	1.97	3.30
Screenings	1.67 @ 1.72	1.57 @ 1 62	1.67	.....

Prevailing prices for coke are: Connellsville and Wise County, $6@6.25; byproduct, egg, stove and nut, $4.45; gas house, $4.75@4.85.

COLUMBUS, OHIO

The heavy floods of last week completely demoralized the coal trade in this state. Railroads are paralyzed, and in fact work of all kinds was suspended after Tuesday, when the worst of the flood occurred. As a result of the high waters communication with almost every section of the state was cut off and it has been impossible to estimate the damage.

Generally speaking the greatest loss will result from the stoppage of work and the fact that many large consumers were put out of commission, temporarily at least. Only a few of the mines of the state were flooded and the damage from that source will not be large. Some of the tipples at the mines of the Sunday Creek, New York Coal Co. and the New Pittsburgh Coal Co. were badly damaged, entailing some loss.

There was a rush of small domestic orders during the latter part of the week because of the flood necessities, the colder weather after the waters subsided making is uncomfortable for the refugees. This demand is only temporary and will fall off just as soon as the homeless people have been housed.

Steam tonnage is not so much in demand because many of the factories were put out of commission. Some of the electric light plants bought more heavily but this does not counteract the falling off in tonnage from other sources. There was not quite so good a demand for railroad fuel, due to the small train movement. Thousands of bridges in Ohio are out and it will be some time before repairs are made and the movement again normal.

Preparations had been made for an active Lake trade but the high waters have made shipments impossible for the time being. Considerable coal has been loaded on boats, however, and this will be moved as soon as navigation opens.

In eastern Ohio a number of the mines were flooded and some damage is reported although it is a little early to estimate its extent. In the Pomeroy Bend field some of the mines were out of commission but most of them were on higher ground and will be worked just as soon as the railroads are able to move the coal. Prices along the list were held at the same level as the previous week.

Quotations in the Ohio fields are as follows:

	Hocking	Pittsburgh	Pomeroy	Kanawha
Domestic lump	$1.45	.....	$1.50	$1.40
2-inch	1.35	$1 20	1.35	1 30
Nut	1.30	.....	1 30	.....
Mine-run	1.15	1.10	1.15	1.10
Nut, pea and slack	0.80	.....	0 75	0.80
Coarse slack	0.70	0.80	0.65	0.70

BIRMINGHAM, ALA.

The continued cold weather is a relief to many of the dealers who were fearful that they were not going to be able to clean up their yards. Considerable trouble is being experienced by some of the local mines on account of too much water and the production at many is below normal at the present time. The recent storms damaged the surface plants of a few of the mines and production was thus further reduced by this cause.

Smithing coal is very scarce, none of the producers of this grade of coal being able to promise anything like prompt shipment. There has been no material change in the coke market, the demand for high-grade foundry product continuing to be good.

LOUISVILLE, KY.

The railroads have been so hampered by washouts and weakened bridges that the movement of all kinds of traffic has been seriously interfered with. The Louisville & Nashville and the Chesapeake & Ohio, in the eastern field, and the Illinois Central and the Louisville, Henderson & St. Louis, in the western, have all had their troubles in getting out coal, although the latter is in the best condition of any. While the water is still high, and will probably recede slowly, the railroads in Kentucky are rapidly recovering, and conditions will probably be approximately normal by the end of the week.

Prices are from $1.75 to $1.85 on Jellico and Straight Creek, with block and lump selling at $1.60 and $1.75, and round at $1.25 to $1.40. Second-class coals are being offered to the trade at $1.50 to $1.60 for block, $1.35 to $1.50 for block and lump, and $1.10 to $1.15 for round. Straight run-of-mines is available at $1 to $1.10 for the better grade, and 90c. to $1 for No. 2. There is a keen demand for nut and slack as high as $1, with Western Kentucky nearly as high, in some cases, although some straight mine-run has sold at 80 cents.

ST. LOUIS, MO.

The heaviest snow of the winter came the middle of the past week, but it did not help the market. Coal is still dragging and there is nothing out of the ordinary from reports of the past two or three weeks.

There has been some little encouragement to the retail coal man, inasmuch as there was a good demand for very small lots of coal, but on the whole this did not affect the shipping market in the least. As a matter of fact, if anything, it created a disturbance that brought prices lower than they have been thus far this season, and especially was this so on the better grade coals.

Overproduction still continues, but there is hope now that conditions will improve, inasmuch as some of the operators are in a movement to suspend operations for the next three or four months. Washed coals are in fairly good demand.

and from this time on these grades will continue to get better.

The prevailing circular is:

	Carterville and Franklin Co.	Big Muddy	Mt. Olive	Standard
2-in lump				$0.90
3-in. lump			$1 25	
6-in lump	$1 20 @ 1 25		1.35	1.10
Lump and egg	1 25	$2 25		
No. 1 nut	1 10 @ 1 15			
Screenings	0 90 @ 0 95			0 65
Mine-run	1 05 @ 1 15			0 85
No. 1 washed nut	1 40 @ 1 50			
No 2 washed nut	1 35 @ 1 45			
No 3 washed nut	1 25 @ 1 30			
No. 4 washed nut	1 15 @ 1 20			
No 5 washed nut	1 00 @ 1 05			

MINNEAPOLIS—ST. PAUL

Wholesalers representing Illinois coals, report business dull with prices inclined to be rather weak. Carterville district coal is selling for $1.15 to $1.25, and Franklin County lump is quoted from $1.25 to $1.40. Dock circular prices, quoted Apr. 1, are as follows: Youghiogheny, Hocking and Splint lump, $3.55; Hocking screenings, $2.30; Youghiogheny and Splint screenings, $2.25; Splint and Youghiogheny dock run, $3.25; Hocking dock-run, $3.15, Smokeless lump or egg, $4.75; Smokeless lump and egg, $4.50; Smokeless mine-run, $3.50; Smokeless screenings, $2.90. The above prices are 15c. above the opening prices at this time last year.

OGDEN, UTAH

The storms which have visited the inter-mountain territory during the past 10 days have stimulated the demand for coal. This was noticed first about Mar. 24, when urgent demands were made for immediate shipment of both lump and nut. The movement of coal into the Nebraska and Kansas territory picked up slightly and no doubt will continue to do so until it is again normal. Naturally the summer prices, effective Apr. 1, have had a tendency to curtal shipments during the last of March owing to the reduction of 50c. per ton on lump coal, f.o.b. mines.

Quotations on Wyoming coal for shipments to Nebraska and Kansas are: Lump, $2.25, egg, $2; nut, $1.75; mine-run, $1.75; slack, $1. For shipment to the Northwest from Wyoming and Utah: Lump, $2.75; nut, $2.25; mine-run, $1.85; Wyoming slack, $1; with Utah slack, $1.25.

PORTLAND, ORE.

The weather in the Pacific Northwest the past week has been conducive to a good cleanup of coal stocks. Indications and records are to the effect that the cool spell cannot well be expected to continue longer, milder weather having already been noticed in the vicinity of the coast. Prices have shown no fluctuation since last fall when winter quotations were put into effect.

What effect the opening of the Panama Canal is going to have on the fuel situation in the Pacific Northwest, is one on which there is much speculation. That there is ample room for lower prices and that such would tend to increase the consumption is the general belief of the buyers, if not of the dealers.

PRODUCTION AND TRANSPORTATION STATISTICS

VIRGINIAN RAILWAY

Total shipments of coal over this road for February of the current year were 399,267 tons as compared with 294,041 tons for the same month last year. Shipments for the first two months of the year were 853,153 tons for the current period and 611,446 tons in last year

IMPORTS AND EXPORTS

The following is a comparative preliminary statement of imports and exports for February and last 8 months in long tons.

	8 Months		February	
Imports—	1911	1912	1913	1912	1913
Anthracite		2,184	1,645	15	
Bituminous	1,345,447	789,246	1,114,209	118,921	134,269
Coke	122,535	38,663	79,924	5,241	4,084
Exports—					
Anthracite	1,911,812	2,301,177	3,224,604	231,684	361,493
Bituminous	7,714,369	9,664,216	9,923,966	695,655	896,790
Coke	615,230	514,421	566,403	59,536	71,541
Bunker Coal	4,189,020	4,453,131	4,794,912	530,272	564,222

OHIO COAL TRAFFIC STATEMENT

The following is a comparison of the coal shipped over the different Ohio roads during the past three years in short tons:

Railroads	1910	1911	1912
Hocking Valley	4,777,478	3,621,794	4,172,908
Toledo & Ohio Central	2,186,435	1,902,304	1,965,893
Baltimore & Ohio	2,455,473	1,828,320	4,283,998
Cleveland, Lorraine & Wheeling	3,053,998	3,018,267	3,368,863
Zanesville & Western	1,245,103	1,151,434	1,208,628
Toledo Division (Pennsylvanie Co.)	2,331,160	1,942,145	6,603,773
Lake Rrie, Alliance & Weheling	1,328,594	1,256,636	1,103,177
Marietta, Columbus & Cleveland Ry	94,101	30.131	36,707
Wabash, Pittsburgh Terminal Ry	63,291	53,920	183,440
Kanawha & Michigan Ry		121,682	183,440
Detroit, Toledo & Ironton			255,427
Total	21,307,370	18,601,509	25,828,745

THE CAR SITUATION

American Ry. Association reports surpluses and shortages of coal equipment for two weeks ended Mar. 15, as follows:

	Surplus	Shortage	Net*
New England Lines	79	0	**79**
N. Y., New Jersey, Del.; Maryland; Eastern Penn	3,279	1654	**1,625**
Ohio; Indiana; Michigan; Western Pennsylvania	3,434	260	**3,174**
West Virginia, Virginia, North & South Carolina	1,004	462	**542**
Kentucky, Tenn.; Miss.; Alabama, Georgia, Florida	683	835	**152**
Iowa, Illinois, Wis., Minn.; North & South Dakota	2,099	496	**1,603**
Montana, Wyoming, Nebraska	764	40	**724**
Kansas, Colorado, Missouri, Arkansas, Oklahoma	3,026	0	**3,026**
Texas, Louisiana, New Mexico	438	6	**432**
Oregon, Idaho, California, Arizona	3,061	23	**3,038**
Totals	17,867	3776	**14,091**
Greatest surplus in 1912 (Apr. 25)	94,692	2,144	**92,548**
Greatest shortage in 1912 (Oct. 10)	6,491	14,897	**8,406**

*Bold face type indicate a surplus.

BALTIMORE & OHIO R.R.

The following is a comparative statement of the coal and coke movement over this road for February and the first two months of this year and last year:

	February		2 Months	
	1913	1912	1913	1912
Coal	2,550,417	2,695,874	5,553,821	5,139,402
Coke	371,355	366,777	810,531	696,333
Total	2,921,772	3,062,651	6,364,352	5,835,735

FOREIGN MARKETS

GREAT BRITAIN

Mar. 19—With the near approach of the holidays, business is of a quiet character. Sellers are firm in their ideas of prices for April loading.

Quotations are approximately as follow:

Best Welsh steam	$4 62@4.74	Best Monmouthshires	$4.20@4 26
Best seconds	4.50@4.62	Seconds	4 08@4 14
Seconds	4.38@4.44	Best Cardiff smalls	3.78@3.84
Best dry coals	4.44@4.50	Seconds	3.54@3.60

The prices for Cardiff coals are f.o.b. Cardiff, Penarth or Barry, while those for Monmouthshire descriptions are f.o.b. Newport; both exclusive of wharfage, and for cash in 30 days—less 2½%.

British Exports—The following is a comparative statement of British exports for February, and the first two months of the last three years in long tons:

	February			2 Months	
	1911	1913	1911	1912	1913
Anthracite	205,275	187,057	430,564	447,199	485,365
Steam	3,996,361	4,046,314	7,126,219	7,941,579	8,46,307
Gas	903,273	875,335	1,548,601	1,730,474	1,776,699
Household	125,224	147,861	247,708	264,903	293,587
Other sorts	284,911	313,350	489,552	552,007	620,277
Total	5,514,984	5,569,917	9,812,644	10,936,159	11,640,235
Coke	108,160	98,755	169,873	222,010	205,850
Manufactured fuel	161,251	154,253	284,884	310,183	350,992
Grand total	5,784,404	5,822,925	10,297,401	11,468,382	12,197,077
Bunker coal	1,550,319	1,539,410		3,066,978	3,297,089

GERMAN EMPIRE

The following are the German imports and exports for the years 1911 and 1912:

	Imports		Exports	
	1911	1912	1911	1912
Coal	10,913,948	10,380,482	27,046,193	31,143,115
Lignite	7,069,061	7,266,116	58,071	56,965
Coke	598,958	589,713	4,559,975	5,849,020
Coal Briquettes	94,822	52,562	1,958,826	2,119,541
Lignite Briquettes	116,111	135,714	518,666	726,995

FINANCIAL DEPARTMENT

Lehigh Coal & Navigation Co.

The following is summary of President Warriner's report for the year ended Dec. 31, 1912:

The decrease in commercial production during the year is accounted for mainly by the suspension of mining during the month of April and part of May, pending the conclusion of negotiations between the operators and the United Mine Workers of America. Production was further curtailed by interruptions at several collieries which occurred in the month of September and lasted for a period of nineteen days, due to trouble among the men over the question of union membership. The decrease in production was general throughout the anthracite trade in 1912, as the official statistics show that the total shipments of anthracite during the year amounted to 63,610,578 tons, a decrease of 6,343,721 tons as compared with 1911. The cost of mining increased on account of increased maintenance charges during the suspensions of work above referred to, as well as on account of increased wages and cost of supplies.

Market conditions were satisfactory during the year, excepting for the company's inability at times to supply the demand for its coal, a condition resulting from the suspension above referred to. This inability to meet the demand is now almost overcome, and it is expected that within a short period the production will be able to fill every demand. The company sold its entire production during the year as well as its supply of stock coal. The tonnage sold was 3,646,431 gross tons, an increase of 467 tons compared with the previous year.

During the past year the company expended for additions and betterments the sum of $649,743, and charged off for depreciation, and abandonment on account of obsolescence, $522,667.

During the year an exhaustive investigation was made into the operating and accounting methods of the company and in accordance with the advice of certified accountants, your board are agreed on the wisdom of a policy of accounting under which there shall be established proper reserves for coal lands depletion, depreciation of improvements, insurance, mining hazards and similar items entering into mining costs; and have, beginning with the current year, in accordance with this plan, transferred the securities and cash in the coal lands sinking fund and the insurance fund into the general funds of the company, under appropriate accounts establishing the proper reserves, which will appear in the balance sheet for the year 1913.

The gross revenue from all sources for the year amounted to $13,862,437, an increase of $128,659. Expenses increased $453,572.

The tonnage of commercial coal mined by the Lehigh Coal & Navigation Co. and by the Alliance Coal Mining Co., and the tonnage of these companies, during the past four years (in gross tons) compares as follows:

Mined by:	1912	1911	1910	1909
Company	3,275,585	3,615,141	3,375,541	2,828,788
Lessees	181,505	215,887	285,822	224,927
Alliance	88,067	39,645		
Lessee of Alliance	71,776	130,334	188,492	134,264
Total	3,616,933	4,001,007	3,849,855	3,187,979

*

Northern Securities Co.

President Jas. J. Hill, of this company, states under date, Jan. 10, 1913:

Checks are herewith transmitted for a dividend of 2% on the stock declared payable on this date.

For the year ending Dec. 31, 1911, the company received one dividend of 1% upon its holding stock in the Crow's Nest Pass Coal Co., but during 1912 no dividend was received from this source. The Coal company resumed operations about Nov. 1, 1911, following a prolonged strike. We are informed that the business of the Coal company has been satisfactory during 1912, but that it has been the policy of its directors to apply the net earnings to the reduction of the floating debt. That the debt at the end of the year 1911, amounted to about $1,374,000 (as against their paid-up capital stock of about $6,213,000), and we are informed that at the end of 1912 it had been reduced to about $900,000.

The by-laws of the Northern Securities Co. have been amended and the number of directors of the company reduced from fifteen to six.

RESULTS FOR CALENDAR YEARS

	1912	1911	1910
Divs. from C. B. & Q. R.R. (reg. (8%))	$119,704	$119,704	$119,704
Divs. Crow's Nest Pass C. Co., Ltd.		(1%) 27,552	(2%) 55,104
Interest	34	40	40
Total receipts	$119,738	$147,296	$174,848
Deduct—Taxes	$3,477	3,679	3,512
Administration expenses	15,521	20,609	20,952
Interest on loans	5,615	5,438	5,427
Dividends	(2%) 79,058	(3%) 118,590	(4%) 158,116
Total deductions	$103,671	$148,316	$188,007
Balance	sur $61,067	def $1,020	def. $13,159

BALANCE SHEET DEC. 31

	1912	1911
Credits—		
Organization exp.	$85,048	$85,048
Investments	*a* 6,599,954	6,600,949
Cash	61,585	99,091
Debits—		
Capital stock	$3,954,000	$3,954,000
Bills payable	160,000	175,000
Surplus	*b* 2,632,587	2,656,088
Total	$6,746,587	$6,785,088

a The item of investments includes in 1912 14,963 shares Chic. Bur. & Quincy R.R. valued at $2,858,688; 26,552 shares Crow's Nest Pass Coal Co., Ltd. $3,741,166.

b Before deducting 2% dividend paid Jan. 10, 1913.

COAL SECURITIES

The following table gives the range of various active coal securities and dividends paid during the week ending March 29:

Stocks	Week's Range—High	Low	Last	Year's Range—High	Low
American Coal Products	90	90	90	87	87
American Coal Products Pref	109¼	109¼	109¼	109¼	109¼
Colorado Fuel & Iron	35½	33½	35½	41½	31
Colorado Fuel & Iron Pref			155	156	150
Consolidation Coal of Maryland	102½	102½	102½	102½	102½
Island Creek Coal Pref	86	85	85		
Lehigh Valley Coal Sales	210	204	204		
Pittsburgh Coal	19¾	19	19½	24¾	19
Pittsburgh Coal Pref	85	82½	85	95	80¾
Pond Creek	23½	22	23½	28¾	22
Reading	161¾	155¾	161¾	168¾	152¾
Reading 1st Pref	91	90½	91	91½	89¾
Reading 2nd Pref	90	89½	90	93½	87¾
Virginia Iron, Coal & Coke	50	50	50	54	44¼

Bonds	Closing Bid	Asked	Week's Range or Last Sale		Year's Range	
Colo. F. & I. gen. s.f.g. 5s	97½	99	98	98	98	99¼
Colo. F. & I. gen. 6s			107½	June '12		
Col. Ind. 1st & coll. 5s, gu	78½	Sale	78	79	78½	85
Cons. Ind. Coal Mc. 1st 5s			85	June '11		
Cons. Coal 1st and ref. 5s		94	93	Oct '12		
Gr. Riv. Coal & C. 1st g 6s	96	102½	102½	Apr 06		
K. & H. C. & C. 1st s f g 5s			98	Jan 13	98	98
Pocah. Con. Coll. 1st s f 5s	85	87	87½	Mar 13	87½	87¼
St. L. Rky. Mt. & Pac. 1st 5s	77	78	76	Mar. 13	76	80
Tenn. Coal gen. 5s	100	102½	100¼	Mar 13	100¼	103
Birm. Div. 1st consol. 6s		103½	101¼	101¼	101¼	104
Tenn. Div. 1st g 6s		103¾	102	Feb. '13	102	102
Cah. C. M. Co. 1st g 6s			110	Jan 09		
Utah Fuel 1st g 5s						
Victor Fuel 1st s f 5s	80	81	79½	Feb '13	79½	79½
Va. I. Coal & Coke 1st g 5s	94	97½	94½	Mar. 13	94½	98

Burns Brothers—Regular quarterly of 1¾% payable Apr. 1, to holders of record Mar. 20.

Lehigh Valley Coal Sales Co.—Regular quarterly of $1.25 payable Apr. 21, to holders of record Apr. 10.

Delaware, Lackawanna & Western Coal Co.—Regular quarterly 2½% and an extra of 20% payable Apr. 15, to holders of record Apr. 1.

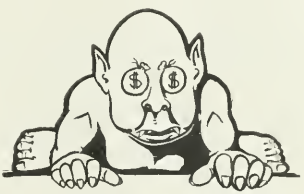
Pocahontas Consolidated Collieries—Regular dividend of 2% and an extra of 1% payable Mar. 31, to holders of record Mar. 25.

COAL AGE

Vol. 3 NEW YORK, APRIL 12, 1913 No. 15

"A Carpenter is known by his Chips;" likewise the butcher, the baker, the candlestick maker. If you can't find yourself in any of the above classes, just add: "So are we all."

Now for the chips. Well; did you ever know trackmen who always had useless pieces of rail to hide in the gob at the completion of each switch; and of brattice-men who supplied the camps with kindling because of mis-fits and mis-measurements; and of blacksmiths who swelled scrap accumulations with short ends and burnt pieces, etc., etc?



We are acquainted with a man who has worked his way from trapper boy to managing director of a large mining corporation. Step by step, unaided except by sheer personality, he has overcome every obstacle, every difficulty, until now his very word is all but law to a vast army of toiling, struggling mining folks. Viewed from most any angle his career is both romantic and inspiring.

But just now we are thinking of neither inspiration nor romance.

We are trying to apply a world-old proverb as a measure of a man; to do this we must eliminate the man and examine the chips he scattered while he builded.

We must forget that he completed for himself a fortune and a name, and think only of the material that he used; the hands, the feet, the brains of his workingmen.

Were their lives abused and wasted that he might accomplish his ends? How were they housed and fed; were they furnished with schools and churches and what about their recreations?

Go into their towns, the towns that he planned and must leave behind for future generations, and search out the women folk in their homes, the children at their play, the men as they come from work; look for their minister, their doctor, their school teacher.

Do you find here any evidence of want or waste or criminal negligence? Perhaps you are startled to find that the welfare of thousands of toiling human beings had been entirely overlooked simply because the man who was the moving spirit in the establishment of this vast enterprise was neither moralist nor philanthropist.

This brings us back face to face with the proverb.

We are reminded that time was when a man might sacrifice an entire forest in order to obtain enough choice timber to build one mansion, if such were his whim; the conservationist would plaster that mansion with ridicule today.

Wait until our humorists are able to compare men with trees; the fellow who has played fast and lost, may decide that the laugh is on him.

The Buttonwood Washery in Pennsylvania

By Frank B. Davenport*

SYNOPSIS—Description and detailed drawings of an efficient and modern anthracite washing plant in Pennsylvania. The portion here described acted as an auxiliary to the main washer and was equipped for handling the steam grades only. Concrete hoppers are used and the structure is quite stable.

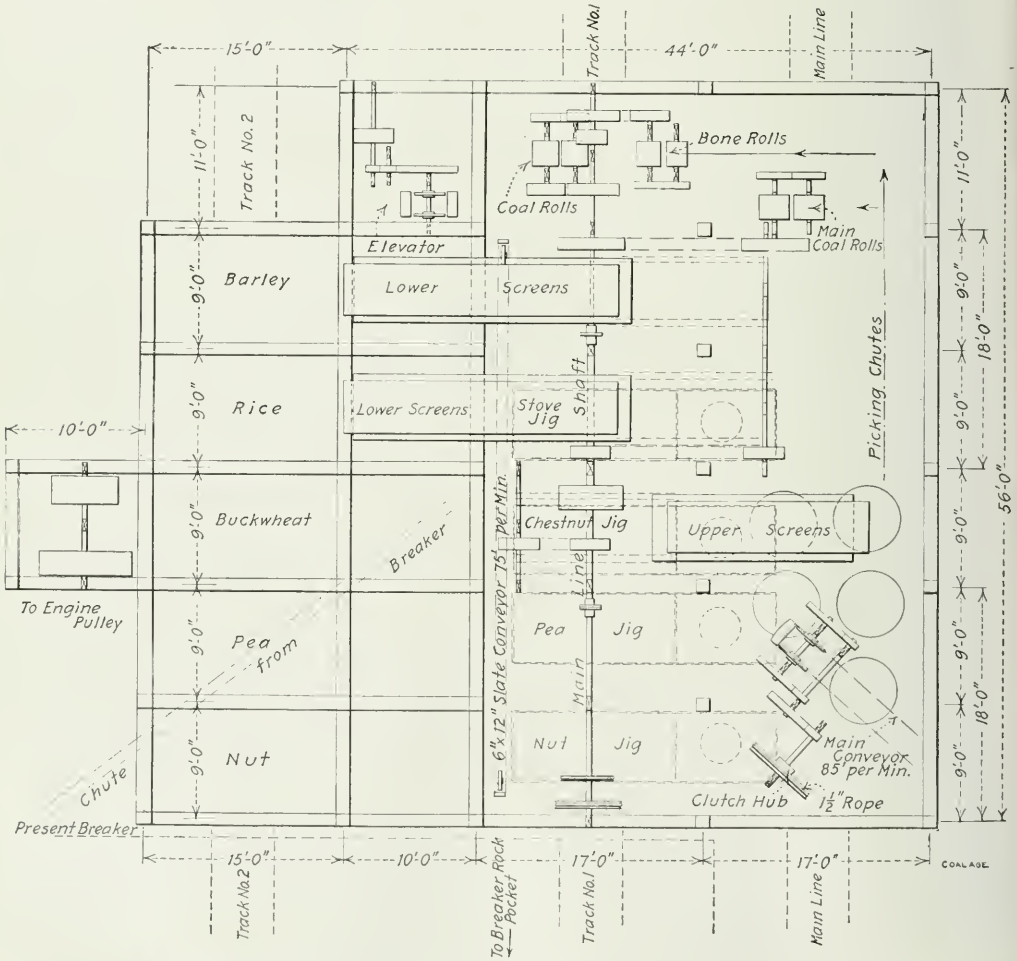
The washery at the Buttonwood colliery of the Parrish Coal Co. at Buttonwood, Penn., is one of the largest of its kind in this region. It cleans and prepares about 800 to 1000 tons of bank coal daily and was designed and built during the summer of 1911, by the Parrish Coal Co. On Feb. 1, 1913, the property and holdings of the Parish Coal Co. were taken over by the Lehigh & Wilkes-Barre Coal Co. and it is now worked under the supervision of that company.

*Engineer, Room 35, Welles Building, Wilkes-Barre, Penn.

Some Features of the Modern Washers

This washery was designed by the writer to relieve and better prepare the fine or small-size coal from the large breaker and at the same time handle the bank coal. It was, therefore, built adjoining the south side of the present breaker and takes most of the pea, buck, rice and barley coal, where the facilities are better for a cleaner preparation.

While washeries have been built for a considerable time back, their use was confined primarily to the preparation of steam size from the waste or refuse of the older collieries, dumped there when there was no demand for such grades. The banks often contain large per-



General Plan of the Buttonwood Breaker, Showing Scheme for Sizing the Coal

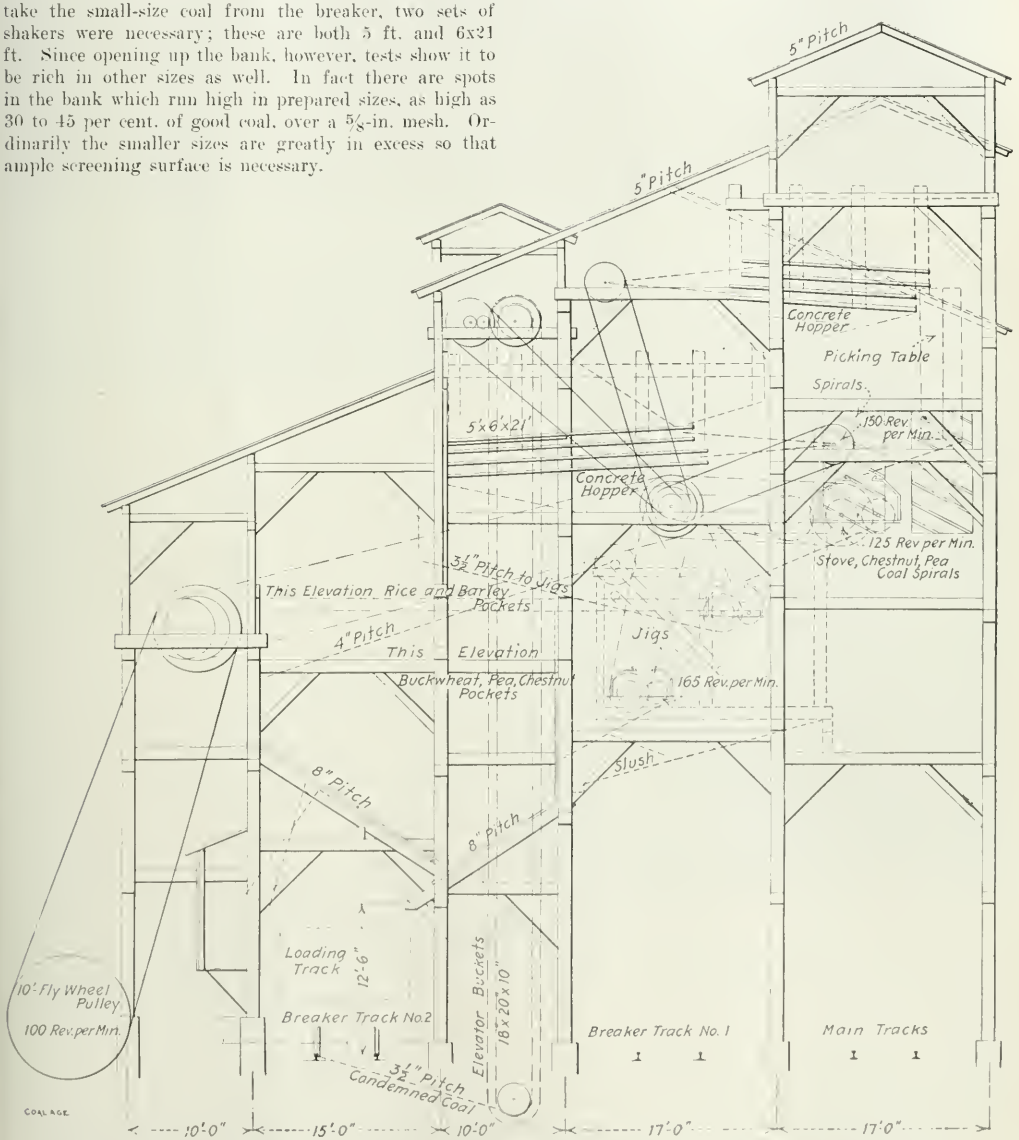
centages of domestic sizes condemned years ago, probably because it was easier to put it on the bank than to re-prepare it. Up to a few years ago this coal was ground down to pea and the smaller sizes. With the improvements in mechanical pickers, this bank material is now reclaimed, and today domestic sizes are as important in this plan of operation as the smaller or steam sizes.

Conditions Found in the Bank

Tests of the banks show a large percentage of the smaller sizes. To meet this condition and at the same time take the small-size coal from the breaker, two sets of shakers were necessary; these are both 5 ft. and 6x21 ft. Since opening up the bank, however, tests show it to be rich in other sizes as well. In fact there are spots in the bank which run high in prepared sizes, as high as 30 to 45 per cent. of good coal, over a 5/8-in. mesh. Ordinarily the smaller sizes are greatly in excess so that ample screening surface is necessary.

The building itself covers an area of 50x59 ft. and contains almost 400,000 ft. of lumber. A wet preparation is used so that a substantial plant was desired. All the machinery was built by the Vulcan Iron Works, which includes the conveyor lines, shakers, jigs, rolls, line shafting, etc.

All the bank material is brought into the washery by a 12x24-in. double-strand Keystone Straight Line Riveteless Conveyor, built on a 27 deg. pitch. The drive was compounded and every means taken to make it as substantial as possible so as to eliminate breakdowns and at



End Elevation of the Buttonwood Colliery, Showing Method of Sizing the Coal, and the Location of the Concrete Hoppers

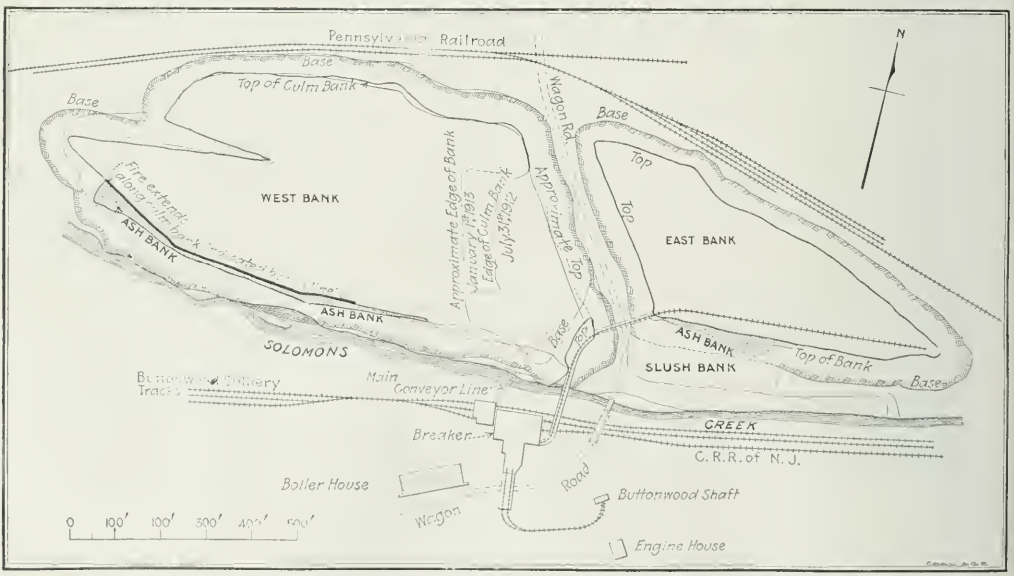
General View of the Buttonwood Steam Plant, Washery and Breaker, Looking North. The Culm Banks Are on the Opposite Side of the Breaker

the same time yield a large capacity. From this main conveyor the coal goes onto the upper screens, 5 ft. and 6x15 ft. These make egg size and larger, the finer grades going to one or both of the lower or fine-coal screens. The material from the upper deck, egg coal and above, is hand picked and the coal sent to the large rolls, where it is ground down to chestnut.

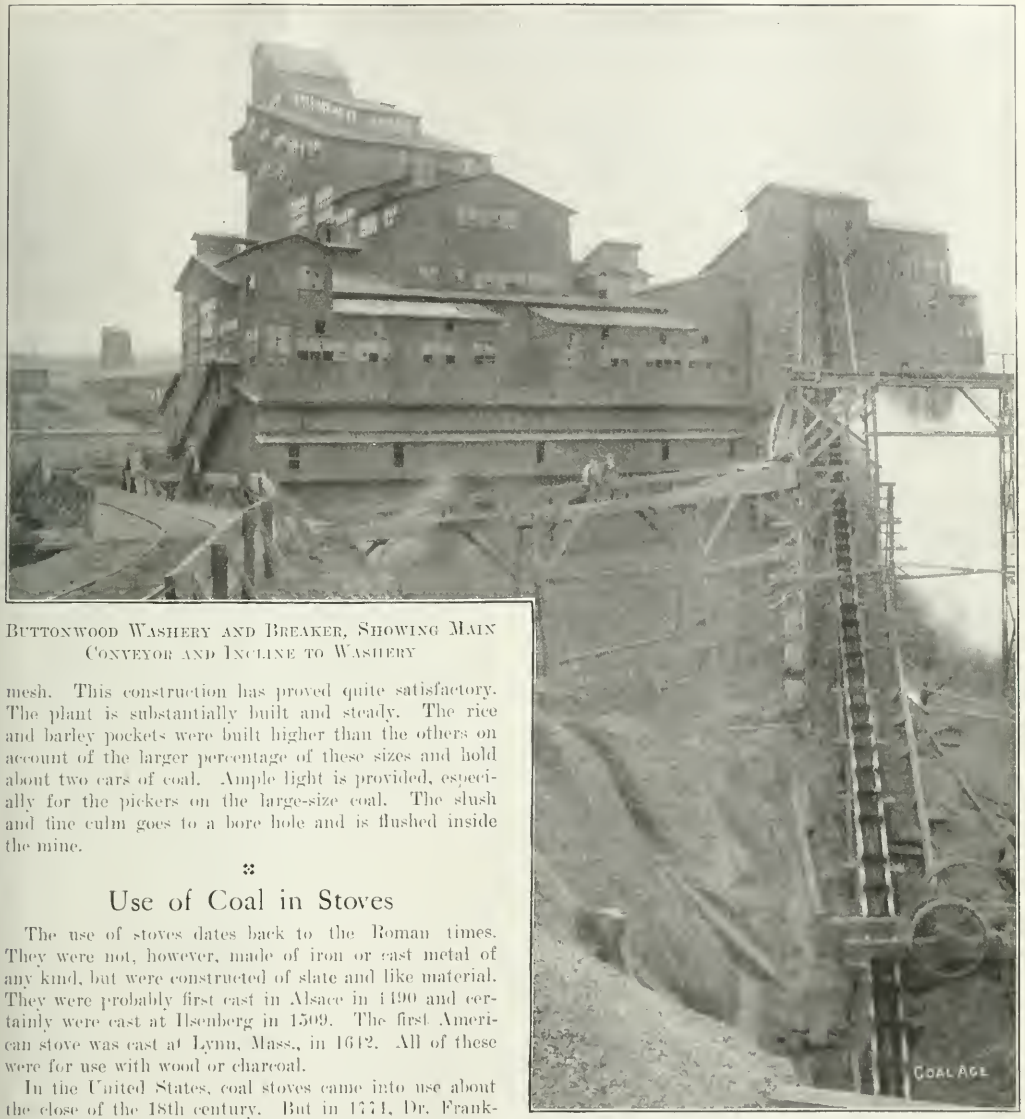
The Prepared Sizes

The prepared sizes are sent to the spirals direct from the upper screen. An arrangement was made to jig the tailings from these spirals if necessary. Four Lehigh Valley Jigs were installed and five Anthracite Spirals. No stove coal was to be prepared for shipment; however, this size is prepared, being sent to the middle set of rollers and ground down to chestnut. The other set of rolls grind any bone coal from the hand pickers to pea size; this also goes to the elevators. All the elevator material goes to the fine-coal screens, which have a special deck hung underneath the top deck. The chestnut, pea and buck sizes can be returned to the jigs if necessary.

The hoppers underneath the shakers are of special note in that they are of concrete, reinforced by stout wire



General Plan of the Buttonwood Culm Bank, Showing Relative Location of Breaker and Plan for Attacking the Banks



Buttonwood Washery and Breaker, Showing Main Conveyor and Incline to Washery

mesh. This construction has proved quite satisfactory. The plant is substantially built and steady. The rice and barley pockets were built higher than the others on account of the larger percentage of these sizes and hold about two cars of coal. Ample light is provided, especially for the pickers on the large-size coal. The slush and fine culm goes to a bore hole and is flushed inside the mine.

Use of Coal in Stoves

The use of stoves dates back to the Roman times. They were not, however, made of iron or cast metal of any kind, but were constructed of slate and like material. They were probably first cast in Alsace in 1490 and certainly were cast at Ilsenberg in 1509. The first American stove was cast at Lynn, Mass., in 1642. All of these were for use with wood or charcoal.

In the United States, coal stoves came into use about the close of the 18th century. But in 1774, Dr. Franklin, who was then in England as a representative of the American colonies, constructed a stove for burning bituminous coal, which consumed its own smoke.

The introduction of anthracite made it necessary to adopt some type of stove that would burn such a coal. Dr. Eliphalit Nott, president of Union College, constructed a stove for that purpose which, however, had the unpleasant property of blowing up when it was opened. Jordan L. Mott and James Wilson, both of New York, made self-feeding stoves, sometime between 1827 and 1831, which would burn English or Welsh coal. In 1833, the former constructed a self-feeding base burner, which would burn anthracite coal of chestnut size, fed in thin layers from a magazine.

Doubtless, in England, coal has been burned for several centuries in open grates. The first reference to coal, in England, is found in the records of the Bishop of Peterborough, in 850 A.D. Chimneys were introduced about the 15th century, and the open grate is probably at least as old.

In Great Britain, open fires consuming barely half the coal fed to them are still preferred to the economical and freely burning coal stove. The desire to see the fire burning is the reason for this practice, but it has many disadvantages. A stove acts as a regenerator storing up caloric energy and the heat which it emits serves to ignite new fuel and to keep the room at a uniform heat.

The Illinois Coal Fields

By A. Bement*

SYNOPSIS—A general and valuable review of mining conditions throughout the state. The seams lie level and are comparatively thick as a rule, so that conditions are favorable for economy in production. The room-and-pillar system is most commonly used, although longwall is found quite frequently. The state is estimated to have a productive capacity of from two to three times its requirements.

Knowledge concerning Illinois coal fields has been derived, not so much from geological investigation, as from engineering experience. Notwithstanding this fact, more is known regarding the fields than would usually be expected under such circumstances. This is due very largely to the fact that the seams as a rule are quite uniform in thickness and persistent throughout their known areas.

Coal Resources and Geology

The territory covered by the principal seams is shown in Fig. 1, which also outlines the area of the coal formation covering about three-fourths of the state, or a little over 37,000 square miles. My estimate of the original coal is 201 billion tons, which conclusion is illustrated somewhat in detail by Table No. 1, giving the known thickness of beds; it assumes that such beds are underlain by certain others of less thickness, and that a little over 10,000 square miles in the center of the basin contains coal averaging 18 in. in thickness. F. W. DeWolf, Illinois state geologist, places the original coal at 136 billion 960 million tons, and M. R. Campbell, of the United States Geological Survey, estimates 240 billion. It is difficult to form an estimate of this kind, because while the upper and more important seams have been extensively operated and are well understood, those in the lower measures have not been exploited to any great extent. Total production of coal up to the present time is approximately 811 million tons, which on a basis of a 57 per cent. recovery, represents an exhaustion of 1159 million tons, which is about 3 per cent. of the known thick coal.

TABLE NO. 1. ORIGINAL COAL RESOURCES

Area in Square Miles	Known Thickness, Ft.	Estimated Thickness, Ft	Tons
674	9	6	10,352,640,000
3,883	7	4	43,738,112,000
12,546	4	3	89,929,728,000
10,184	3	1	41,713,664,000
10,199		1 5	15,665,664,000
37,486	Total.		201,399,808,000

Briefly, the coal formations of the state may be divided into the upper and lower measures, the most important seams being in the lower. These are sometimes referred to as the lower productive and the upper barren measures. Illinois is a low-lying state, being usually only 500 to 700 ft. above sea level. For this reason the coal measures have not been much eroded by water courses, now existing.

An early geological survey described 16 coal seams in the state, but the number is greater. That survey gave a numerical designation to the seams reading upward, No. 1 being the lowest. Under this classification the known seams operated are Nos. 1 to 7 inclusive, but Nos. 3 and 4. are only mined in a small way.

Production of Different Fields

Illinois may be designated as a thick-coal state. The thickness of the beds have largely dominated the commercial aspect of production. The commercially workable coal seams in the northern part of the state are thin,

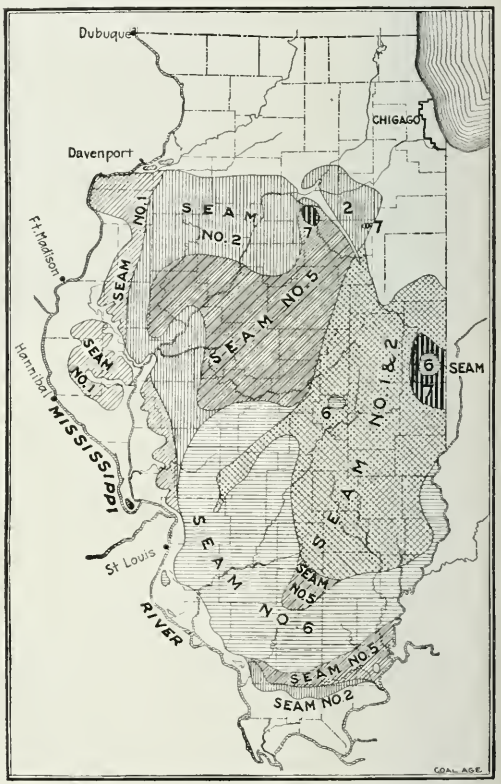


Fig. 1. Map Showing Areas of Different Seams

but they become thicker advancing southward. As the markets are largely to the northward, someone has said that from the coal standpoint, "Illinois was made wrong end to." Others have taken an opposite view, feeling that the distance from the markets is compensated by the advantage due to the thick coal. At all events, if the larger seams were in the north instead of the south, the bulk of production would have always been there. Although markets are principally north and northwest, the center of production has migrated from north to south, until now the southern end of the state leads in commercial importance.

The first mining of any importance was in Jackson County, and immediately following in St. Clair County;

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both of these localities are in the southwest portion of the state where Illinois was first settled by the French. Later, however, the northern part became settled and the population rapidly extended southward, the reverse of its initial trend, and when coal production first assumed important proportions it was in the northern part of the state instead of the southern. When the thick seams were discovered and their advantage realized, the center of production began its southern migration, which is illustrated by Table No. 2. From 1906 to 1910, the southernmost county has been the leading one in production. St. Clair County led in 1911, and Franklin will probably lead in 1912.

TABLE NO. 2. SHOWING GRADUAL SHIFTING OF CENTER OF PRODUCTION

County Leading in Production	Year	County Leading in Production	Year
La Salle	1882		1883
	1887		1884
Vermillion	1897		1886
	1899	Macoupin	1889
	1898		1890
	1900		1892
	1901		1895
Sangamon	1902		1896
	1903		1885
	1904		1888
	1905	St. Clair	1891
			1893
			1894
			1906
			1907
		Williamson	1908
			1909
			1910
		St. Clair	1911

TABLE NO. 3. PERCENTAGE OF PRODUCTION FROM DIFFERENT THICKNESSES OF SEAM

Seam Thickness	Percentage of Total Production
Thin coal under three feet	10
Medium coal between four and six feet	11
Thick coal between six and eight feet	65
Very thick coal over eight feet	14
Total	100

TABLE NO. 4 PRODUCTION FROM THE DIFFERENT SEAMS

Seam No.	Field Where Operated	Per cent of Total Output
1	1	1
2	2	11
	3	
	13	
5	4	21
	6	
	14	
	5	
	7	
6	8	66
	9	
	10	
	11	
	12	
7		1

Referring to Fig. 1, a thick coal area is shown in LaSalle County. This was a small bed of seam No. 7, which had a considerable thickness and was a most active producer for many years, although at the present time it is exhausted. It was this bed, in fact, which gave LaSalle County its lead in 1882 and 1887. As illustrating the influence of thick coal on output, Table No. 3 shows the percentage of production from different thicknesses of seam, from which it appears that about 79 per cent. is from the thick seams. Table No. 4 shows the percentage of output of the different beds, in the fields, as illustrated by the circles in Fig. 2, the production being proportionate to the size of the circle.

Roof Conditions and Faults

Table No. 5 presents such data referring to each of the fields as conveniently lends itself to a classification of this character. It will be observed that no ash values are given for mine-run coal for the Northern and Wilmington fields as these produce no mine-run. The designations under the column headed "Mining" show where the longwall or pillar-and-room methods are in use.

Roof conditions are generally good, although it is often necessary to have some of the top coal as a roof. The stratum above the No. 6 seam is shale or slate. Where slate, it is timbered and the full height of the coal mined. As a general rule, however, shale immediately overlays the coal, and it is necessary to leave up some top coal, which forms a satisfactory roof and requires only a minimum amount of timber.

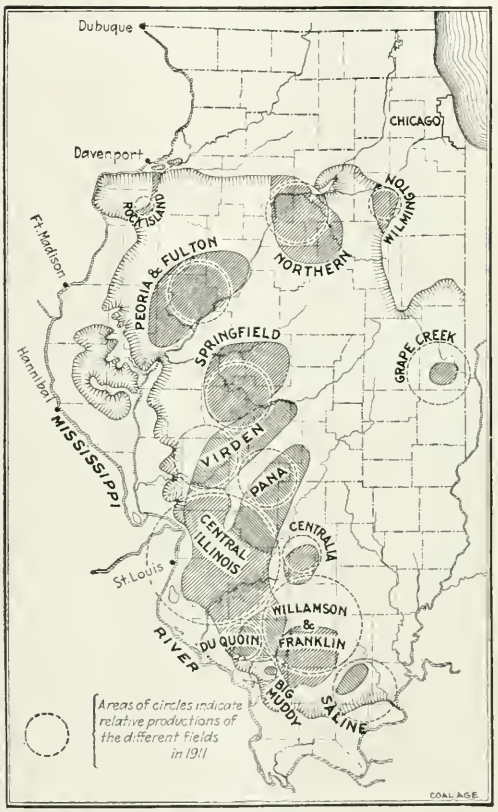


FIG. 2. COAL FIELDS AND RELATIVE PRODUCTION OF EACH

The No. 5 seam has various kinds of roof in the three districts where it is worked, all of which readily allow mining the full height. This seam varies to such an extent as to justify the belief occasionally that the beds are not identical. But the conclusion of both the first and second Geological Survey is that the three beds are one and the same seam. The No. 2 seam, in the north, has a shale roof especially suited to the longwall method of mining. The strata underlying all seams are generally a fairly soft fire clay, although the floor of No. 5 seam in the Saline field is quite hard.

There are comparatively few faults and disturbances in the coal measures, the most important being the LaSalle anticline, which separates the Wilmington from the Northern field, and which extends the greater part of the

length of the state on its eastern edge. The DuQuoin is another anticline of importance, passing through the city of DuQuoin in Perry County in a north and south direction.

There are a number of minor faults, more particularly in the southern part of the state, which, however, are not serious, except in a few instances. The No. 5 seam in the Springfield district contains what are known as horse-backs, an intrusion of the roof material through the seam until it meets with the floor. It has been estimated that these horse-backs will add about 1 per cent. to the ash content of the seam; they are removed separately, and not mined with the coal. The No. 5 seam in the Peoria and Fulton field has been somewhat disturbed and eroded, attributable, according to John A. Udden, to glacial action.

The coal seams lie practically horizontal in all parts of the state, the pitch being so slight as to have no effect on mining except in a few instances, the most important of which is on the west limb of the LaSalle anticline, which throws the No. 2 seam abruptly to the surface.

TABLE 5. MISCELLANEOUS DATA, ILLINOIS COAL FIELDS

Coal Field		Seam				Composition of Coal			
						Moisture	Ash in Dry Coal		B.t.u. per lb.
Number	Name	No.	Thickness	Depth in feet	Mining	at Mine	Mine Run	Lump	of Pure Coal
1	Rock Island	1	4 to 6	70 to 125	P & R*	11 57	7 0 to 8 5	6 5 to 7.5	14,375
2	Northern	2	3 5	164 to 565	L W*	14 86		8 0 to 9 0	14,438
3	Wilmington	2	3.0	50 to 195	L W	15 34		5 0 to 6.0	14,662
4	Peoria & Fulton	5	4.0	12 to 185	P & R	14 67	13 0 to 14.0	11 0 to 11.5	14,330
5	Grape Creek	6	7.0	12 to 200	P & R	14 38	12 0 to 13.0	10 7 to 11 6	14,140
6	Springfield	5	5.9	70 to 360	P & R	12 66	11.5 to 12.0	11 0 to 11 5	14,350
7	Virden	6	7 to 8	270 to 460	P & R	14 38	10.3 to 10.7	9 8 to 10.5	14,145
8	Pana	6	8.0	380 to 720	P & R	13.54	10 0 to 10.5	9 7 to 10 3	14,225
9	Central Illinois	6	7 to 10	12 to 400	P & R	12 74	10.5 to 11.0	10 0 to 10 5	14,240
10	Ceotralia	6	6.0	550 to 716	P & R	11 00	9 0 to 9.5	8 8 to 9 0	14,390
11	Du Quoin	6	6 0	21 to 320	P & R	10 85	10 0 to 10 7	9 5 to 10 0	14,360
12	Williamson & Franklin	6	7 to 12	15 to 720	P & R	9.56	10 0 to 12 0	9 0 to 11.0	14,575
13	Big Muddy	2	6 0	120 to 165	P & R	7.80	5 0 to 7 0	4 0 to 5 0	15,075
14	Saline	5	4 to 8	20 to 425	P & R	6 75	7 0 to 8 0	5.0 to 6.0	15,048

* P & R indicates pillar-and-room system and L W the longwall method.

TABLE NO. 6. GRADING OF ILLINOIS COALS

Grade	Size	Grade	Size
6-in. lump	6	No. 1 washed coal	1¼x2½
3-in. lump	3	No. 2 washed coal	1¼x1¼
2½-in. lump	2½	No. 3 washed coal	¾x1¼
1¼-in. lump	1¼	No. 4 washed coal	⅜x¾
¾-in. lump	¾	No. 5 washed coal	⅛x¼
Mine-run			Through
Egg	3 x6	Washed screenings	1¼
Egg	2½x6	Washed screenings	¾
Nut	1¼x3	Raw screenings (6-in. mine-run)	6
Nut	1¼x2½	Raw screenings ("steam nut")	3
		Raw screenings	1¼
		Raw screenings	¾

Mining Methods

The coal as hoisted from the mine, in practically all of the pillar-and-room operations, is delivered by self-dumping cages to a weigh hopper, from which it is discharged, onto shaker screens and separated into various sizes, and dumped directly into railway cars, or the fine coal may be diverted to a separate screening or washing plant; there are often as many as five parallel railway tracks. Much of the fine coal is washed, other cleaning, except in a few instances, being confined entirely to selection in the mines and hand picking of the larger coal on the railway cars. In 1911 the output of 50,165,099 tons of coal produced was divided into the following percentages: Mine-run, 26; lump, 38.5; egg, 7; raw screenings, 8.5; washed screenings, 10. The coal was marketed principally as shown in Table No. 6, which gives the leading grades produced, some twenty-one, although there are actually about forty.

Forty per cent. of the coal is undercut by machines, and 50 per cent. is shot from the solid. The other 10 per cent. is worked on the longwall system, where the coal is supposed to be undercut in the fireclay by hand, and broken out by roof pressure.

During 1911 the average days worked by Illinois mines was 169. The total capacity of the mines of the state is at least from 100 million to 150 million tons per annum.

Table No. 7 shows the relative standing of the coal carriers. Many of the mines are counted more than once, as some are served by more than one railway.

There were 845 mines in the state in 1911, of which 458 were local country openings, producing but a few tons. The total output for these local openings, which are mostly drifts in the outcrop, amounts to only 2 or 3 per cent. of the state's production. The remaining 387 mines, shipping their coal by railway, are those with which this paper deals.

TABLE NO. 7. COAL RAILROADS OF THE STATE AND PERCENTAGES HANDLED

Relation of Coal Transportation Lines

Railway	Percentage of Total Production	Number of of Mines Accessible to Railway
Illinois Central	18 00	111
Chicago, Burlington & Quincy	12 13	48
Cleveland, Cincinnati, Chicago & St. Louis	9 8	38
Chicago & Eastern Illinois	8.6	31
Wabash	6 6	27
Chicago & Northwestern	6 0	8
Chicago & Alton	4 8	38
St. Louis, Iron Mountain & Southern	4 0	27
Baltimore & Ohio Southwestern	3 0	22
Vandalia Line	2 8	7
Chicago, Milwaukee & St. Paul	2 2	6
Elgin, Joliet & Eastern	2 0	8
Litchfield & Madison	2 0	5
St. Louis, Troy & Eastern	1 9	3
St. Louis & O'Fallon	1 8	2
Southern	1 5	10
Mobile & Ohio	1.5	7
Chicago, Peoria & St. Louis	1 5	10
Louisville & Nashville	1 2	19
Chicago, Rock Island & Pacific	1.2	10
Iowa Central	1.1	8
Toledo, St. Louis & Western	0 97	4
East St. Louis & Suburban, Electric	0 88	3
Atchison, Topeka & Santa Fe	0 82	10
Chicago & Illinois Midland	0 77	1
St. Louis & Belleville Electric	0 50	2
Illinois Southern	0 45	3
Cincinnati, Hamilton & Dayton	0.45	5
Peoria & Pekin Union	0 45	5
Toledo, Peoria Western	0 45	5
Chicago, Indiana & Southern	0 36	3
Illinois Traction System, Electric	0 31	9
Wabash, Chester & Western	0 13	3
Lake Erie & Western	0 06	2
Illinois Terminal	0 02	1
By boat—Illinois river and Hennepin Canal	0 05	

The openings of the shipping mines in Illinois are almost exclusively shafts, ranging in depth from 12 to 1000 ft. At the present time I recall no drift of importance, and only one hoisting slope, which is in the No. 2 seam on the west limb of the LaSalle anticline, although in earlier days a few slopes and drifts were operated.

The hoisting record for Illinois is held by Mine No. 3 of the Superior Coal Co., located in the southern part of Macupin County. This mine produced over 790,000

tons of coal in 1911, and has hoisted over 4500 tons in one day with two single-deck cages, from a depth of 350 ft. Other shafts in the state have equipment justifying larger capacities than this, but as the Superior Coal Co.'s mines deliver their coal to the Chicago & Northwestern Ry., for railroad use, the car supply is practically continuous, and no time is lost. The Assumption Coal & Mining Co., in Christian County, has a shaft, 1004 ft. deep, and mines what are considered to be seams Nos. 1 and 2, ranging from four to six feet thick, and operated by the longwall method. The Lovington Coal Mining Co., in Moultrie County, has a shaft 920 ft. deep, and is working what is considered to be seam No. 6, which is eight feet thick.

Hoisting shafts are all double-compartment. The standard hoisting equipment, for the pillar-and-room mines, is a self-dumping cage, holding one car, but some of the longwall operations hoist two cars tandem on a cage, and others have double-deck cages. With the longwall mines, however, about one car in five hoisted contains dirt; for this reason self-dumping cages have not been used, as it is customary to make a separation between the coal and dirt cars before they are unloaded.

A Review of the Fields

This subject would not be complete without some individual treatment of the various coal fields, which is presented as follows:

No. 1—The Rock Island Field, in the early history of mining in Illinois, was a most important one in supplying the northern markets. At present, however, there are only two companies shipping coal, the principal railway is the Chicago, Rock Island & Pacific and the main towns are Sherrard and Cable.

No. 2—The Northern Field, like the others in the northern part of the state, formerly occupied a leading position; in fact, until within recent years the output has steadily increased, although not at the same ratio as for the state as a whole. The Chicago & Northwestern Ry. was formerly a heavy producer in this field, largely for use on its own lines. A few years ago, however, they purchased a large field in the southern part of Macoupin County and extended their line to the City of Peoria in Peoria County, and by a trackage agreement with the Chicago & Alton Ry., now haul coal from Macoupin County, through the Northern Field. The diversion of this large tonnage has had a marked effect on the production in the latter district.

The principal operators in this field are the Spring Valley Coal Co., which formerly supplied the Chicago & Northwestern Ry.; the St. Paul Coal Co., which is controlled by the Chicago, Milwaukee & St. Paul Ry., the LaSalle County Carbon Coal Co., and the Oglesby Coal Co. A thick area of the No. 7 Seam at the City of Streator was an important factor in the production of this territory some years ago but the coal has been exhausted. The principal railroads are the Chicago & Northwestern; Chicago, Milwaukee & St. Paul; Chicago, Rock Island & Pacific and the Chicago, Burlington & Quincy. Principal towns are LaSalle, Spring Valley, Streator and Oglesby.

No. 3—The Wilmington Field was an important producer in the early history of Illinois, at one time furnishing 17 per cent. of the production of the state. The Elgin, Joliet & Eastern Ry., formerly hauled a considerable tonnage from this district, but they are now taking coal from the Grape Creek Field, and the loss of this business has had a marked effect on the production. In addition to this, the increasing popularity of the Franklin County coal has also contributed to the reduction of output.

Thus, coal from the Wilmington Field is being supplanted by that which has to stand a 300-mile greater transportation cost. The principal railways are the Chicago & Alton, Atchison, Topeka & Santa Fe and the Elgin, Joliet & Eastern and the main towns are Coal City, South Wilmington, Braidwood and Braceville.

No. 4—The Peoria and Fulton Field is not an important one, as far as local consumption is concerned, the product being largely shipped away from the state. The principal railways are the Chicago, Burlington & Quincy, Iowa Central and the Toledo, Peoria & Western, the principal towns being Peoria, Farmington, Canton and Cuba.

No. 5—Grape Creek is a field quite remarkable in some respects, the area being small and the output large. The reason for this latter is that the field lies close to Chicago, and the transportation facilities are favorable for the movement of the large output; the Illinois Steel Co. has taken its supply from here for many years.

The largest operator in the field is the Bunsen Coal Co., which is a subsidiary of the United States Steel Corporation. The principal railways are the Chicago & Eastern Illinois and Cleveland, Cincinnati & St. Louis, the main towns being Westville and Steeltown.

Mining conditions here are the least favorable of any in the No. 6 Seam, due especially to the roof. The great activity and large output, however, neutralizes this disadvantage so that the field enjoys considerable prosperity.

No. 6—The Springfield Field is made up of a large number of mines which center about the City of Springfield. They are an average size group which have maintained a fair production for a good many years, and the field is as active today as any time in its history. The principal railways are the Chicago & Alton; Illinois Central; Chicago, Peoria & St. Louis; Cincinnati, Hamilton & Dayton, and the Illinois Traction System (electric). The main towns are Springfield, Greenview, Lincoln and Athens.

No. 7—The Virden Field was at one time quite an active one, but its output has declined in the last few years, as scarcely any new mines are being opened. The principal operator is the Illinois Midland Coal Co., with a territory of some sixty thousand acres. This property is operated by the Peabody Coal Co. The Chicago, Burlington & Quincy Ry. is the next largest property holder. The principal railways are the Chicago & Alton; Illinois Central; Wabash; Baltimore & Ohio Southwestern and the Chicago, Burlington & Quincy. The main towns are Virden, Thayer, Diverman, Pawnee, Taylorville, and Girard.

No. 8—The Pana Field is essentially a new one. Mining has been conducted at the City of Pana for a good many years, but the remainder of the field was not opened until quite recently. The Chicago & Eastern Illinois Ry. is the largest property holder and its lands are operated by the Peabody Coal Co. The principal railroads are the Chicago & Eastern Illinois; Illinois Central and the Cleveland, Cincinnati, Chicago & St. Louis, the main towns being Pana, Hillsborough, Nokomis and Witt.

No. 9—The Central Illinois Field is much larger in area than any other in the state. This is due to the fact that there is practically no difference in the condition or the quality of coal over this area and hence it cannot be subdivided. This is a district of small mines, although at the same time it has some of the largest. The seam is only a few feet below the surface in St. Clair County and having a good roof, the opening of a mine is quite a simple proposition.

The largest operator is the Superior Coal Co., a subsidiary of the Chicago & Northwestern Ry.; it owns fifty thousand acres of coal, and operates three mines, which are the largest producers in the state. The Consolidated Coal Co. and the Western Coal & Mining Co., subsidiaries of the Wabash Ry., are also large operators. The principal railways are the Illinois Central; Louisville & Nashville; Southern; Baltimore & Ohio; Southwestern; Terre Haute & Indianapolis; Wabash, and the St. Louis, Troy & Eastern. The main towns in this field are Belleville, Collinsville, Edwardsville, Gillespie, Mt. Olive and Staunton.

No. 10—Centralia is a small, but quite active field. The towns are Centralia, Sandoval, Salem and Oden, the principal railways being the Illinois Central and the Chicago, Burlington & Quincy.

No. 11—The DuQuoin Field is an old one. Mining was begun at an early date, owing to the outcrop of the No. 6 Seam. The field, however, has never been especially active, the distance to the market being considerable, and the quality of coal rather inferior to the Williamson County product. Therefore, when shipments from this locality are to bear a high freight rate, preference is given to the latter county. The principal towns are Pinckneyville, Willisville, Tamaroe and DuQuoin, the main railways being the Illinois Central; Mobile & Ohio; and the Wabash, Chester & Western.

No. 12—The Williamson and Franklin Field is today the best known, the best advertised and the most spectacular field in Illinois, particularly the Franklin County portion of it. The Williamson County coal area of the No. 6 Seam is practically all in the hands of a large number of comparatively small operators, some of the most important of which are Big Muddy Coal & Iron Co., the Taylor Coal Co. and the Peabody Coal Co.

The Franklin County portion is new, mining beginning in 1904, when Mr. Joseph Leiter acquired eight thousand acres and erected an elaborate and expensive mining plant, which he attempted, with only partial success, to operate with nonunion labor. This fact, together with spectacular advertising methods, made Franklin County known in a way that no other coal field has ever been advertised before. This, followed by the intelligent and progressive methods of the United Coal Mining Co., and other operators, has given the Franklin County product a valuable prestige.

The seam was formerly designated as No. 7, an error due to mistaken interpretation of the seams at the City of DuQuoin in Perry County. The anticline there has thrown the seam to the surface and the apex was eroded leaving what appeared to be two outcrops, the eastern one of which was exposed, while the western one was covered. This led to a belief that the exposed outcrop on the east was a seam lying above the one to the west, which latter was known to be the No. 6 and the other was, therefore, called No. 7. The second geological survey, however, has made the matter clear, and the seam is now generally recognized as the No. 6.

The largest property holders in Franklin County are the Bunsen Coal Co., a subsidiary of the United States Steel Corporation, the Chicago, Burlington & Quincy Ry., United Coal Mining Co., D. W. Buchanon, the Chicago, Wilmington & Vermillion Coal Co., Brazil Block Coal Co., Consolidated Indiana Coal Co., and the Ziegler Coal Co., whose property is now operated by the Bell & Zoller Mining Co.

The mines of this county are deep, and for Illinois they are quite gassy, requiring more than usual care in mining. The coal has practically the lowest sulphur content of any in the state, and some experiments toward coke making have been carried out, which appear to indicate the possibility of it being a good mixer with lower volatile fuels for the production of a metallurgical coke. The principal railways are the Chicago, Burlington & Quincy; Chicago & Eastern Illinois, St. Louis, Iron Mountain & Southern and the main towns are Carterville, Herrin, Marion, Christopher, Benton, West Frankfort and Zeigler.

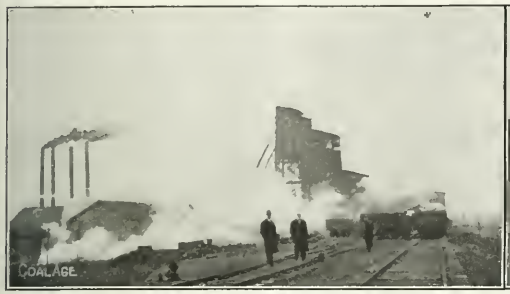
No. 13—The Big Muddy Field, although a small one, is in other respects the most important in Illinois. It is the oldest field, having produced the first coal in the state and having continued with a uniform output up to the present time. The quality of the coal is the best in the state. While it has been known to many by the old name of Big Muddy, for a number of years it has been marketed as New Kentucky coal.

The principal operator is the Big Muddy Coal & Iron Co., whose product is marketed by the New Kentucky Coal Co. Coke from this seam made the first iron produced in Illinois in a coke furnace. When the iron-ore deposits at Pilot Knob and Iron Mountain in Missouri were discovered, furnaces were erected at St. Louis, and in Illinois. Coke made in the Big Muddy Field was used in these furnaces and this was continued until the iron deposits were exhausted. Principal towns are Murphysboro and Carbon and the main railways are the Illinois Central; Mobile & Ohio, and the St. Louis, Iron Mountain & Southern.

No. 14—The Saline Field, next to Franklin County, is the newest in the state. The coal is of a high quality, and the mining conditions are especially favorable although the seam is variable in thickness; in this latter respect it differs from all other fields. It is known to the trade as Harrisburg, after the town of that name, which is the county seat. The O'Gara Coal Co. is the leading operator. The principal towns are Harrisburgh and Eldorado and the railways are the Cleveland, Cincinnati, Chicago & St. Louis; Illinois Central, and Louisville & Nashville.

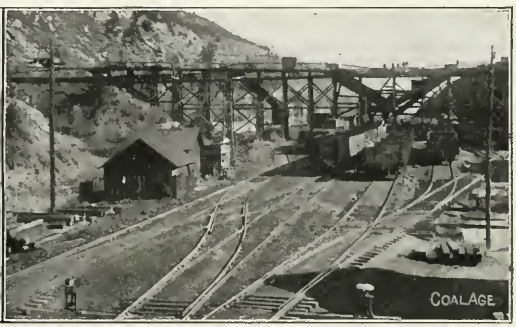
The use of iron and steel in place of mine timbering has increased rapidly during the last few years. Iron and steel give good results as props at the coal face or as girders or bars where the pressure is great or in return airways where timber decays rapidly. Where iron girders are used in a permanent lining, great care should be taken to prevent rupturing the masonry and bending the girders. Lay pine planks 3 in. thick and 12 in. wide along the top of the side walls and place the girders on them. Each girder must be absolutely plumb with webs at right angles to the plane of the roof and with ends clear of the ground or stone on either side. The side walls should be from 2 to 5 ft. thick. It is advisable to use quick-setting mortar, which must be allowed to obtain a perfect set before the girders are put in position, as otherwise it is liable to failure.

SNAP SHOTS IN COAL MINING



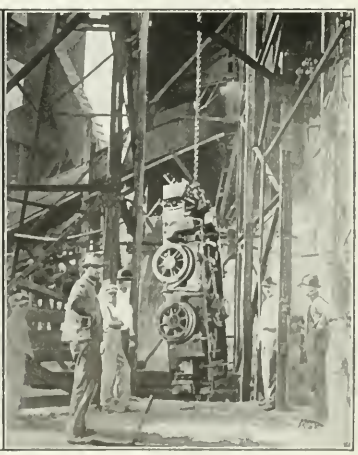
THE CLOVER LEAF MINING CO. AND THE CENTURY COAL CO. IN ILLINOIS

THE VICTOR-AMERICAN CO.'S HEATON MINE IN NEW MEXICO



THE KOEHLER MINE OF THE VICTOR-AMERICAN CO. IN NEW MEXICO

CONCRETE FAN INSTALLATION OF THE ISLAND CREEK COAL CO.



LOWERING MOTOR DOWN AN ILLINOIS SHAFT

Our British Coal-Mining Letter

Special Correspondence

SYNOPSIS—A current of 18 miles an hour will remove loose coal dust from a mine. Equal quantities of pulverized coal and dust form a noncombustible mixture. Bitumen electric cables are preferable for high-tension work below ground. A fireboss who has been trained to judge gas percentages at one air pressure is not capable of estimating them when the pressure is changed. In England, it is still being taught that firedamp is a highly complex mixture containing ethane, propane, butane, hydrogen, carbon monoxide, sulphureted hydrogen, carbon dioxide, oxygen and nitrogen, as well as methane. An interesting attempt is made in England to reduce carpet-bagging.

W. E. Garforth, in a lecture at Nottingham, stated that, according to experiments, an air current at a velocity of 700 ft. per min. is not sufficient to remove coal dust from the rock ledges and the tops of cross-bars on which it has been deposited. At a velocity of 1500 to 1600 ft. per min. coal dust is raised and carried away by the air current, but stone dust is left undisturbed. At 2200 to 2600 ft. per min., stone dust is also carried away, leaving the surface of a roadway entirely free from dust.

The Cost of Effective Stone Dusting

Twelve miles of mechanical haulage roads at the Altofts collieries have now been treated with stone dust. The approximate cost has been $1.80 per thousand tons of coal produced, including the loading of the rock in the mine, the haulage of rock to the mortar mill, the transport of the stone dust to the point of distribution, the work of grinding, the cost of raising steam, the depreciation of the mill and the total cost of application underground.

Stone dust should be sprinkled wherever coal dust is found, and not merely in occasional zones. The proportion between coal and stone dust should be continually maintained. Although coal dust when mixed with an equal quantity of pulverized rock is rendered incombustible no matter how much of the mixture may be present, yet the proportion used at Altofts is about 14 parts of the ground stone dust to 1 of coal dust, on the principle that it is better to be sure than sorry.

Precautions to Reduce the Coal Dust in the Mine

Much can be done to prevent accumulations of coal dust. The dust made on the surface need not be carried down the shafts, the cars can be made dust tight, the bumping of wagons along roadways and at junctions can be reduced and other causes of disintegration of coal and distribution of dust prevented. But as long as coal continues to be mined, so long will dust be made in the process of working, and this will remain in the mine. Its presence is inevitable, but now we know that it is not necessary that this dust be a potential danger.

The underground roadways can be kept free from accumulations of pure coal dust in the same degree that the workings are kept clear of accumulations of firedamp or water. Coal dust should be diluted as faithfully as noxious gases. Its treatment is as much a part of mining as the maintenance of pumps or the use of timbering.

In process of time, precautions against the danger of coal dust will form part of the ordinary routine of the mine. At Altofts, the application of stone dust has not caused the slightest discomfort to the workmen, nor has it interfered with the haulage system, or injured the ropes or other appliances.

Electric Cables in Mines

For installing electric light or carrying power below ground, the cables may be provided with any of four kinds of insulation: (1) Rubber, (2) paper, lead covered, (3) paper, leadless, (4) bitumen. Discussing these in a paper before the Manchester Geological and Mining Society, G. W. T. Anderson says that bitumen cables are by far the most suitable for average colliery work. For use in shafts they are certainly the most serviceable.

Until quite recently great difficulty was experienced in getting the bitumen insulation to such a consistency that in moderately high temperatures the conductors would not decentralize. On the other hand, if the bitumen were made too hard, at low temperatures it would become brittle. It is possible today to avoid these troubles over a range of temperature which covers all ordinary working conditions—say from 28 to 120 deg. Fahrenheit.

Bitumen Cables No Longer Contain Hygroscopic Material

Whereas it was formerly necessary to introduce in the construction of the cable, mechanical reinforcements, such as tapes, braids, etc., the improvements in the physical properties of the bitumen and in the methods of manufacture now available enable cables to be made without these hygroscopic and electrically undesirable components. For instance, the "solid" three-wire bitumen cable which is familiar to most colliery engineers, is so constructed as to contain no hygroscopic material whatever within its sheath, so that in effect the conductors are imbedded in a solid cylinder of vulcanized bitumen.

A recent form of construction called "Cracore," consists in the laying up of the separately insulated cores on a central cradle of vulcanized bitumen shaped to receive them. The whole is then sheathed over all with a tube of vulcanized bitumen, which is cylindrical on the exterior but shaped internally, so as to fit the interstices of the laid-up cores. This construction, by distributing the mechanical pressure between the cores over a large area, enables even twin bitumen cables to be made without the inclusion of hygroscopic substances anywhere within the boundary of the vulcanized bitumen sheath.

The Cables Above Ground

Bitumen cables should not be installed immediately after direct exposure to frost or cold winds. The space between generating station and headgear is perhaps the most prolific field of any for cable breakdown. The best means are either to build a well ventilated surface culvert (open or covered with checker plate) in which the cables can be carried on brackets, or to sling them overhead from a catenary wire. Old haulage rope can

generally, be used for this purpose, made taut with socketed ends and tightening screws.

When shaft and power house are some distance apart, paper lead-covered cable laid solid is worth considering. In such a case, a disconnecting box should be inserted at the top of the shaft. For even greater distances, especially on the "extra-high-pressure" lines where the tension normally exceeds 3000 volts, bare overhead conductors are frequently used. In bitumen cables, the conductivity of the metallic coverings should be equal to 50 per cent. of that of the largest conductor which they inclose.

Atmospheric Pressure and Gas Caps

C. J. Wilson, of Heriot-Watt College, Edinburgh, in an article entitled "An Investigation into the Influence of Variations of Atmospheric Pressure on Gas Caps," read before the Mining Institute of Scotland, showed how a fireboss trained to estimate gas in a mining school might fail to determine the correct proportion of gas in an actual mine owing to the air feed being insufficient in the laboratory or because in the mine a greater pressure of air might be encountered.

He declared that the gas cap in a lamp represents the combustion of the gas in the mixture and not the burning of the oil of the lamp which we can ignore. It must be borne in mind that the size of the cap depends on the proportion of gas present and on the presence of air capable of supporting its combustion. The height of the cap represents the proportion of gas to air or the volume of gas in the mixture.

If we compress the mixture, we compress the gas in the same proportion. The reduced volume of the gas results in a reduced size of the cap but the flame increases in intensity. Dr. Thornton, of Armstrong College, Newcastle, has suggested that the higher the heating value of the gas, the smaller would be the gas cap. In the compressed mixture we get a greater heat for the same volume of gas. As the height of the cap varies inversely as the heat of the combustion of the mixture, the cap decreases in size as the pressure increases.

Height of Flame and Cap, in Inches, for Varying Pressures

Percentage of Coal Gas	Atmospheric Pressure	546 ft. Deep	1092 ft. Deep	1638 ft. Deep
5¼	8.29	6 99	5 69	4.38
5	6 01	4 87	3 75	2 60
4½	4 03	3 25	2 46	1 67
4	2 69	2 22	1 73	1 24
3½	2 17	1 83	1.49	1 16
3	1 97	1 68	1.41	1.13
2½	1 85	1 58	1.34	1 09

Increase of pressure has no effect on the oil flame when no gas is present, but when testing mixtures of air and gas under varying pressure the flame has to be reduced as the pressure increases, if it is to render a proper test flame. As the pressure increases, this flame changes, whether it augments merely in luminosity or whether it also increases in height has, unfortunately, not been observed. There is merely the record of the fact that the wick has to be pulled down as the pressure goes up, and vice versa, if the standard flame is to be maintained.

The Effect of Depth on Caps

The importance of this effect of pressure is that it is hard to estimate the percentage of gas present in a mine when the pressure of the air is higher than it was at the point where we have learned to estimate the amount of gas present from the appearance of the flame in a test chamber. The percentage is bound to be understated if measured only by the standard, which has been acquired in the laboratory, near the sea level. If the atmosphere rarified, the cap will grow longer.

There is a limit to the height of cap due to increased percentage; a point is soon reached at which the tip of the cap becomes indistinct. It begins to feather at certain percentages; at higher proportions, this feathering extends throughout the full length of the space beneath the gauze and the mixture explodes. When the cap feathers strongly, it gathers first with a good, clear tip, and more or less slowly rises to a certain maximum height; from that it suddenly drops, then as suddenly rises and feathers, filling the whole lamp.

Composition of Firedamp

In the course of a paper before the Yorkshire branches of the National Association of Colliery Managers and the Association of Mining Electrical Engineers, David Bowen, the mining lecturer at Leeds University, said, that the term "firedamp" is ordinarily used to describe all explosive mixtures of air and gas met with in mines, but frequently also in reference to the gas itself, as it issues from coal or rock, before it diffuses into the air of the mine to form an explosive mixture.

Investigations have shown that these natural gases are not simple bodies but are mechanical mixtures which vary within wide limits. The most essential constituent of firedamp is the hydrocarbon, methane (CH_4). Many blowers consist entirely of this gas.

Associated therewith, usually in much smaller proportion, are frequently found several of the heavier hydrocarbons. These are, according to more recent investigations chiefly ethane (C_2H_6), but occasionally also propane (C_3H_8) and butane (C_4H_{10}). Hydrogen is also frequently found, but the presence of carbon monoxide and of sulphureted hydrogen in firedamp appears to be exceptional. Carbon dioxide is seldom absent, and in addition, nitrogen and oxygen are frequently met with.

Bonus Scheme for Miners

For some time Lord Hythe has been trying to get the Powell Duffryn directorate to adopt a bonus scheme for the mines. The present annual output of the company exceeds four million tons, and fourteen thousand men are employed. To make his scheme better known, Lord Hythe has described it in the "Western Mail." It is practically the bonus system which he introduced in the mines in Sardinia and the principal provisions of which he thinks applicable to the South Wales coal field.

Every workman is furnished with a booklet, in which is set down every year, the rate and amount of the bonus, the sum standing to his credit and the interest upon it, for the preceding year.

The workman cannot withdraw any part of the sum standing to his credit till after he leaves the company's service.

In the event of a workman's death while still working for the company, the sum standing to his credit is paid to his dependent relatives.

Only men who have been in the service of the company a certain period (Lord Hythe would make the qualifying period three years), are entitled to participate. This clause is proposed to prevent those men who are restless from shifting constantly from mine to mine.

"Horsebacks" in Oliver No. 3 Mine

By E. S. Moore*

SYNOPSIS—Under lateral pressure from earth movements, the bottom clay of the Pittsburgh bed in Oliver No. 3 is lifted in places so that in part it cuts out the coal. The rolls or lifts in the floor are by some termed "horsebacks." They bear no relation to the original deposition of the coal and are not sand or clay bars, such as we find occasionally deposited by a primeval stream. Pyrite is often found to increase at rolls and the writer suggests reasons for this phenomenon.

The word "horseback" is used in different senses in the coal areas of the various states. What in Pennsylvania are termed "clay veins" are named in Kansas "horsebacks." On the other hand, the word "roll" in Kansas is synonymous with "horseback" in Pennsylvania. The words are used in Iowa with almost the same meaning as in the latter state.[1]

Derivation of "Horseback"

The Germans have long used the term "horst" for a geologic structure where a mass of rock has been pushed up into the overlying stratum. Among American metal miners, a portion of the country rock which occurs in an ore deposit is termed a "horse" whether it was forced into that position by the sidewise pressure of the measures or existed before the ore was deposited, and whether it has been partly or wholly surrounded by the ore.

Although the structures are somewhat alike in origin and the words "horst" and "horse" have a similar sound, it is doubtful whether the adoption of the English word was at all influenced by the use of the German. The word "horse" as used by the miner has doubtless been employed because it is used in ordinary parlance to indicate either a truss or something which must be overridden, both meanings being suggested by the fact that the miner must pass around or over these masses, for they are often left and they act as supports when the ore is removed.

The confusion between the terms "horseback" and "clay vein" may have arisen from the fact that in many cases, at least, the metal miner's "horse" and the coal miner's "horseback" are both developed from lateral pressures which cause the floor of the coal seam to buckle in places of weakness. The clay vein marks the pushing of clay into a fissure in the coal while the "horseback" is a mound formed by the clay being squeezed out of place and thus compressing the coal overlying it.

Either of the terms "roll" or "horseback" is quite appropriate for the wave-like structures which appear in the floor of the coal seam just as "hogback" is sometimes used in geological literature to describe a pitching anticline on the earth's surface from which the softer layers have been partially removed by erosion so that the harder beds stand out as a ridge resembling at a distance the back of a thin hog.

Uniformity in Direction

In the mine under discussion the arrangement of the "horsebacks" is remarkably uniform, as will be observed from the accompanying map. (Fig. 1.) They are small, nearly parallel anticlines produced by gentle folding, and, owing to the coal being less resistant than the underlying floor, the folding is almost entirely expressed in anticlines without prominent synclines. (See Fig. 2.) These undulations have somewhat the arrangement of the

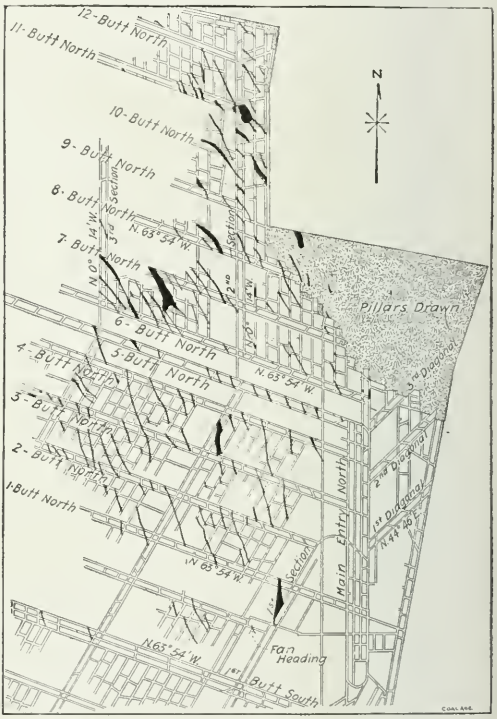


Fig. 1. Map Showing "Horsebacks" in Oliver No. 3 Mine near Connellsville, Penn.

large and small waves on water, when there is a gentle ground swell, and they die out longitudinally like a wave. The largest one traced was about 50 ft. wide and they vary from this to a few feet in length. They rise from 6 in. to 4 ft. above the general level of the floor of the seam and the coal is invariably compressed and thinned above them. (See Fig. 2.) The mine superintendent at Oliver No. 3 stated that only in one case did they find the full thickness of coal in the seam and in that case the draw slate was arched above the "horseback."

In its structure the "horseback" shows the strata which compose it dipping away from its crest and often much fractured and slickensided where slipping has occurred. The laminae in the coal overlying, are bent and fractured and the coal is harder than is natural to the seam. The rock forming the "horseback" may be shaly sand-

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[1]The words "horseback," "roll" and "clay vein" vary in meaning extensively in the state of Pennsylvania. They are popular words without generally accepted interpretation. A mine report in Pennsylvania once declared that a man was "Filled by a fall off horseback." Evidently the word "off" was a typographical error and the word "horseback" referred to a slickensided agglomeration of clayey material in the roof. Such bodies are frequently termed "bells," "camel-backs" and "tortoises"—Editor.

stone, shale or clay. Frequently the upper part of the mound consists of fairly rigid rock while underneath is a jumbled mass of clay which has been squeezed in from beneath.

In the center of the fold bunches of pyrite often occur and it is stated that scarcely any of this sulphide is found elsewhere in the floor of the seam. The reason for this is explained later.

Origin of the "Horsebacks"

The folio of the United States Geological Survey shows that the region in which Oliver is situated is folded so that the axes of Laurel Ridge and the basin lying along its western side run almost N. 25° E. this being approximately parallel to the greater Appalachian folds in this

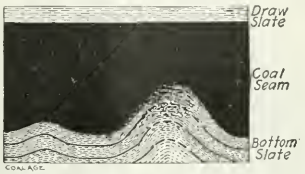

Fig. 2. A Typical "Horseback," Showing Secondary Undulation

region. These small ridges and basins have in turn developed upon them still smaller ridges and basins and the structure of the Appalachian Mountains is seen on a diminutive scale in the "horsebacks" of the coal mines.

Fig. 3, which is a reduced copy of a portion of the geological map of the Masontown-Uniontown quadrangle, shows the contours on the Pittsburgh coal seam and the position of the Oliver No. 3 mine with relation to the large coal-bearing basin. The mine is located along the southwest side of the basin where the contours indicate that the coal bed is less disturbed than farther north, and the folds have been produced by pressure from two directions only, resulting in nearly parallel and narrow "horsebacks" with their long axes nearly parallel to the strike of the rocks at this point.

Farther north, nearer the center of the basin, the contours are more irregular and I am informed that the "horsebacks" tend to run in various directions because cross folding is produced by thrust from all four points of the compass. Under these conditions there would be a tendency to develop, in some cases, dome-shaped structures which would be higher and broader for their length. The Pittsburgh seam averages over 9 ft. in thickness over large areas in this region and the coal is readily compressed sufficiently to allow a buckling of the strata in the floor without materially disturbing the roof. There are often considerable areas even in the same mine where no "horsebacks" occur because the strata are either almost uniformly strong throughout or not rigid enough to fold up and compress the coal. One fold tends to produce another in some cases and where the strata are weak in some locations and strong in others they tend to buckle in the places where the resistance is least.

"Horsebacks" Are Not Depositional

There has been an opinion prevalent among some mining men that the "horsebacks" are sand and clay bars left by streams which flowed into the basin in which the coal now lies. It is to be observed, however, that the present basin was not there, as it now exists, when the coal was laid down and that if a stream of sufficient size to make the bars flowed through the swamp where the coal was deposited, it would be impossible to have such a great mass of vegetation, so free from sediment, laid down in the basin.

Moreover, these structures show the strata dipping away from the crest of the fold as in any ordinary bend in the earth's crust, the coal is shattered and squeezed and in some cases slickensided where compressed by the folding action. The laminae in the coal also conform to the bedding in the "horseback" and the draw slate is uniform. A number of narrow fissures, without displacement were seen in the seam and roof running roughly parallel with the long axes of the "horsebacks" and probably due to tensional stresses which accompanied the bowing upward of the floor.

From the above statements it seems clear that these structures are due to folding and that the folding occurred subsequently to the development of the coal seam and not in the bottom of the swamp previous to the deposition of the vegetation as has been supposed to have happened in rare cases.

A preliminary study of the structure of an area where "horsebacks" occur may in some cases aid the miner greatly by establishing the general trend of these structures so that if they be regular he may drive the main headings parallel or normal to them when desired.

The Development of Pyrite in a "Horseback"

The more frequent occurrence of pyrite in the "horsebacks" than in the other portion of the floor of the coal seam is apparently due to two conditions; in the first

Fig. 3. Contours of Pittsburgh Bed at Oliver, Penn.

place there is more pyrite in the strata a little below the coal than in the floor of the seam as the latter often contains little or no iron, and secondly where the strata are bowed up and fractured in the folding there will be greater freedom of movement of water tending to carry iron sulphate and deposit it where the sulphate is reduced by oxidation of carbon, as the water will come more readily in contact with the metamorphosing coal in these fractured folds than where the fuel is protected by an impervious floor of clay.

I am indebted to F. C. Keighley, general superintendent for the mine map illustrating the "horsebacks" at Oliver No. 3, and for some of the information in this article.

The maintenance of a constant humidity rate throughout the year is said to be of material benefit to mine roofs as the yearly expansion and contraction, due to moistening and drying is thus avoided.

Folding Troubles in the Bering Field

By W. R. Crane*

SYNOPSIS—The coal beds being weaker and less resistant than the rock masses with which they are interstratified have suffered considerable distortion, in some places being pushed together in a mass toward the tops and bottoms of the folds. In others the broken rock has been pushed into the coal mass. But some beds are free from all irregularities other than bad roof, broken coal or complex cleavage. The fourth of a special series of articles by W. R. Crane.

The irregularities in coal beds caused by folding are of a large variety of forms, among the most common and consequently important being the thickening and thinning of the stressed beds. An excellent illustration of the squeezing out of a thin bed of coal on the sides of a fold and its massing at the crest in the form of a saddle is shown in Fig. 1.

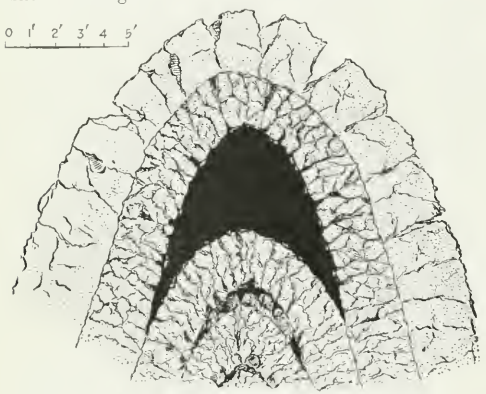

Fig. 1. Massing of Coal at Crest of Fold

Illustrations of the massing of coal beds in both the troughs and crests of folded strata can be found without end in practically every district of the Bering River field. In certain localities masses containing thousands of tons of coal have been forced together by the folding back upon themselves of coal beds ranging from 18 to 40 ft. in thickness. Usually the crowding together or massing of the coal has seriously disturbed or broken up such rock strata as are folded with it as they must of necessity be displaced to make room for the increased volume of coal. Such massing of the fuel is shown to good advantage in Fig. 2.

In fact the thickening of coal beds is of such frequent occurrence that when a large deposit of coal is encountered and there are signs of folding the inference is that an abnormal thickness is shown rather than the normal width of the bed.

Faults

Excessive folding usually results in the rupture of the rock strata inclosing the coal beds and if continued will produce displacements, forming faults. There are many such dislocations in this field displacing the bed from a few inches to probably hundreds of feet. Among the most important of the large faults are those inclosing the Lake Charlotte portion of the Kushtaka and Carbon ridges district, the two on Kushtaka Ridge, one extending southwestward from Lake Tokun, one on Clear Creek, and one cutting across the ridge in a northeast

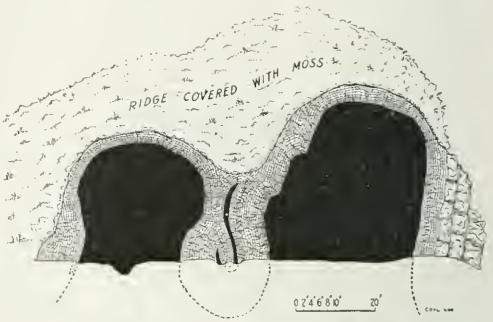

Fig. 2. Outcrop of Coal, Showing Massing of Coal Due to Folding

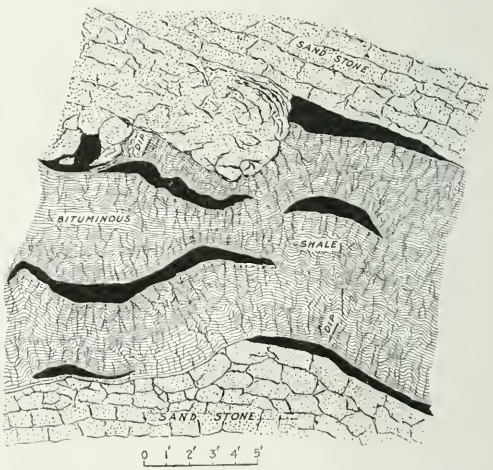

Fig. 3. Shove Fault on Falls Creek, Bering Lake District

and southwest direction just north of the Bering Lake district.

In the first instance an area of coal-bearing rocks has been completely isolated from the rest of the district by two extensive fault planes. The faults on Tokun and Clear Creek have so shattered the rock strata that the fissured zones have presented lines of least resistance to mountain streams which have cut deep gorges for considerable distances along the lines of the faults.

Owing to the much greater frequency of faults of less magnitude they are of more importance economically. The effect of faults upon bedded deposits is so well known

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that such disturbances of the coal beds of this field will not be considered in this connection. When, however, faulting is accompanied by compression of strata, due to folding or otherwise, shove faults may result. Two illustrations of such disturbances occurring in this field are of more than passing interest and will therefore be cited here.

In the Bering Lake district on Falls Creek, a thick bed of shale containing a high percentage of bituminous matter and closely resembling coal, containing, in fact, many stringers of real fuel, has been both faulted and folded. The result of this combined action is that the top rock has been badly broken and a large portion forced forward into the bituminous-shale bed. Detached masses of the top rock are embedded in the coal and shale and the gnarled and twisted mass of the beds shows indisputably the nature of the movement which has taken place. See Fig. 3.

Fig. 1. Shove Fault and Horse on Carbon Mountain

The other illustration of a similar occurrence, although in this case not accompanied by actual displacement of the whole bed, was observed on Carbon Mountain. Here the coal bed was fractured and a lateral movement of the top-rock has forced a mass into the upper portion of the bed actually shaving off, as it were, a mass of the coal. Many nodules of bituminous shale and pyrite as well as fragments of rock occur around this disturbed portion of the coal bed. See Fig. 4.

As was previously pointed out, it is not an easy task to determine in all cases whether the occurrence of an irregularity is wholly normal or whether it is partially due to subsequent action. A case in point is shown in Fig. 5, taken from the face of a tunnel in the Bering Lake district. Were it not for the broken condition of the sandstone inclosing the coal, as shown in this section, it might readily be assumed to be a normal occurrence.

Could a greater extent of the face be examined it is possible that the true condition of affairs might be readily determined. Under the circumstances the most natural conjecture is that the coal bed has been broken up and masses of the top and bottom rock have been forced into it, otherwise the jagged rock masses could not be explained.

Another peculiar occurrence belonging to the same class of irregularities as the last above mentioned is shown in Fig. 6.* There are several explanations of this irregularity worthy of consideration, namely, first, the end of a roll occurring next to the top rock has been forced into it; or second, that a fissure was formed by

Fig. 5. Face of Tunnel, Showing Coal and Broken Sandstone

rock movements and some foreign material has been forced into the coal bed between it and the top-rock. The occurrence of nodules of pyrite would tend to indicate a disturbance of the coal bed, thus permitting the percolation of water, which assumption is also strengthened by the broken condition of the coal itself.

Dikes and Sills

Action subsequent to the formation of the coal beds has been responsible for another interesting class of irregularities occurring in the coals of this field, namely, the occurrence of dikes and sills, produced by igneous

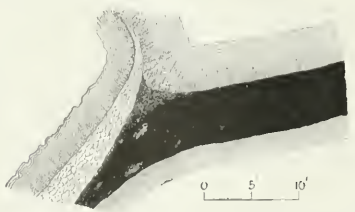


Fig. 6. Either a Contorted Clay Vein or a Filled Fissure from a Fold, Carbon Mountain

intrusions, following the line of fissures and planes of deposition.

Dikes may extend in any direction irrespective of the

*This illustration is taken from the article in this series published Mar. 22, Fig. 1A. All three sections A, B and C, differing widely in appearance as they do, were taken from the same side of the tunnel on Carbon Mountain at distances not exceeding 30 ft. apart along the line of the tunnel. However, this section occurs at right angles to the heading line being on a rib of coal where a room was turned off.

bedding planes, while with sills the rupturing force is not sufficiently intense to form fissures crossing the beds. They are able merely to follow the contact between the coal beds and the top and bottom formations.

Dikes and sills are of fairly frequent occurrence in this field, but the former are usually small. A number of sills of moderate size were observed, attention being given particularly to those associated with the coal beds. Both dikes and sills are composed of basalt and diabase and seldom exceed 3 or 4 ft. in width, although in one place, I observed a 20-ft. dike.

Two particularly interesting occurrences of diabase sills intruded into coal beds are to be found at the south end of Carbon Mountain and on Clear Creek, just below the falls, at an elevation of about 700 ft. In the first mentioned locality the coal has been changed wholly to coke, while in the other there are evidently two sills following the contact of the coal bed with both top and bottom rock. Only a few feet of the coal beds immediately

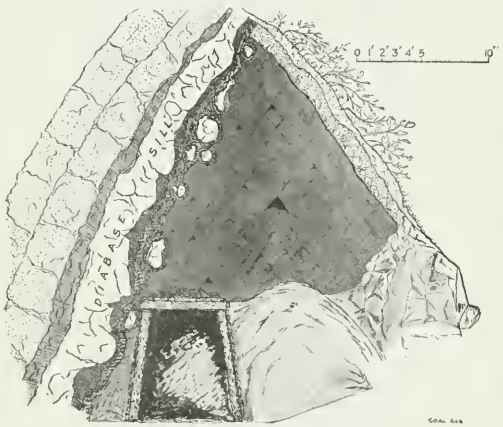


FIG. 7. OUTCROP OF COAL BED, SHOWING TOP ROCK, IGNEOUS SILL, NATURAL COKE, "BOMBS" AND COAL

adjacent to the sills, particularly the top one, have been altered and the transition from columnar coke to coal is clearly shown. A section of the coal bed, sills and associated formations is shown in Figs. 7 and 8.

In this section the massive sandstone strata are shown, immediately beneath which is some 6 in. of shale oxidized to a reddish color by the intense heat and considerably altered by being burned. Directly below the burned shale occurs the diabase sill, which ranges in thickness from 20 to 30 in., and directly below the sill is from 8 to 24 in. of natural coke. The occurrence of the coke is as follows: Columnar coke 4 to 18 in.; dense, hard coke, merging into a flaky form, 4 to 6 in., and at irregular intervals half-coked coal 1 to 6 inches.

Considerable labor was required to uncover the bottom-rock of this coal bed, which accomplished, gave 17 ft. 8 in. of coal and coke. A mass of diabase boulders was also uncovered, indicating that there had been an igneous intrusion along the bottom rock also. No coke was observed next to the lower sill, which is probably due to the extreme weathering action to which the bed had been subjected at this point, the coal even being reduced to a fine powder bordering on muck.

Numerous rounded masses of diabase varying in size from 4 to 18 in. occur along both the top and bottom of the coal bed, some of which are detached and entirely independent of the main body of the sill, while others are connected by stringers of varying size. These isolated masses of rock are in turn inclosed in layers of natural coke, which have approximately the same order as to form as was previously given in connection with the sills proper, but the coking action has extended less far.

SUMMARY OF IRREGULARITIES IN COAL

The detached masses or bombs constitute a great source of danger when considered from the standpoint of mining, having in this respect the nature of nodules of shale and pyrite.

Many minor irregularities occur in the coals of this field but they are insignificant when compared with those mentioned and they differ but little from coal troubles occuring in other fields.

While particular emphasis has been placed on the irregularities occurring in the Bering River field and on those which are peculiar to it in many respects, yet not

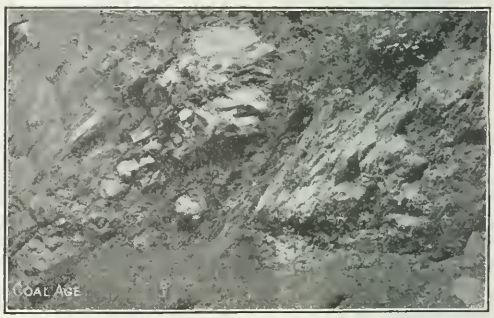


FIG. 8. OCCURRENCE OF DIABASE SILL BETWEEN TOP ROCK AND COAL. COLUMNAR COKE AND DETACHED MASSES OF SILL ARE SHOWN

all of the beds are troubled by every disturbance mentioned and many are apparently free from all irregular occurrences of a serious nature, except possibly shale partings and other impurities common to all coals.

There are, however, two conditions, which are in themselves irregularities strictly speaking, which are particularly troublesome in this field, namely, bad top formations and irregular and extensive fracturing of the coals or complex cleavage. Many of the coal beds have, however, excellent sandstone top-rock which will be a great assistance in mining the coal.

Coal in South Africa

An estimate of the coal resources of the Union of South Africa, based upon geological surveys, yet only approximate, places the aggregate quantity at 55 billion tons. Most of the coal, about 36 billion tons, it would appear, is in the Transvaal, while in Natal the given quantity is 9400 million tons. The remainder, equal to say 9600 million tons, is distributed among the other provinces. The Union produced over 7½ million tons in 1911.

Co-operation in the Coal Industry

By J. F. Callbreath

SYNOPSIS—The present law restricts efficiency as much as monopoly and therefore is being extensively evaded. The public should be protected against monopoly, only when those combining, seek to make an unreasonable profit. While the laws against producing and selling trusts are drastic, there is no law against buyers who conspire to obtain an unreasonable price. Conservation and safety are neglected where a corporation is losing money.

The Sherman anti-trust law was enacted for the purpose of preserving equal opportunities by means of unrestricted competition. Its purpose was laudable and there are many today, who still believe that in the end, it will accomplish the purpose for which it was designed. However, we must admit that since its enactment, the most far-reaching monopolies the world has ever known have been developed, enormous aggregations of capital have been amassed and, to an extent, through disregard of its provisions, the most marvelous industrial prosperity that the world has ever known, has been created.

Why have its provisions been violated? Because the law attempted to prevent efficiency as well as to destroy monopoly. Its prevention of monopoly, all will approve, but no system can be devised, no law can be enacted which can ever force intelligent men to choose cumbersome and unproductive methods.

The Anti-trust Laws Should Be Operative Only When Public Is Injured

It must be apparent that when a man with a small business investment is asked to compete with one having an operation involving an outlay of $1,000,000, he is told to perform a feat which is utterly impossible. Production upon a large scale is necessary if we would attain the highest efficiency. There is a magnitude in operation, however, beyond which the cost of production naturally and necessarily increases.

When this point is reached by a business, it naturally seeks, by control of transportation rates, by manipulation of the market, or some other unfair means, to make up the deficiency brought about by its more cumbersome machinery. At this point, the Sherman Law should begin to become effective. If it fails it creates a condition which absolutely drives out the small operator by competition, who, notwithstanding the efficiency of production, is unable to compete, in the market, because of the increased cost of sale and delivery.

Over-production has made exceedingly burdensome the increased cost of such safety appliances as are necessary for the protection of the miners. It has forced entire disregard for every principle of conservation. The Sherman Law has not prevented the aggregation of buyers, but it has debarred the small operator from joining hands in an effort to even up the advantages necessarily coming to large aggregations of capital.

In almost every other line of business, there are combinations, understandings or general agreements, by which cut-throat competition is avoided. In the bituminous coal-mining industry, the one industry upon which all others depend, the one which cannot close down, except with enormous loss, a most startling and dangerous condition exists.

Depreciation and Interest Charges Are Provided, Other Overhead Cost Is Not

In the latter part of 1911, our office sent out 2300 letters of inquiry to the various coal operators, with blank forms, asking for information, outlining the then condition of the business. A large number of replies were received. The information contained in these answers was tabulated, and upon the basis of information furnished, a paper was prepared by B. F. Bush, of St. Louis, Mo., and presented to the Chicago Convention of the American Mining Congress, by A. J. Moorehead, also of St. Louis, Mo.

This paper shows the average cost of producing bituminous coal at the mines, to be 95c. per ton, and that the average selling price, for a number of years was $1.11, leaving but 16c. per ton, to meet the cost of selling, accounting, insurance and taxes, legal expenses, interest upon investments, depreciation of property and exhaustion of resources, to say nothing of profit.

At the same convention, a paper was presented by James Douglas, of the Phelps-Dodge company, owners of the Copper Queen mine, in Arizona, which operates its own smelters, railroads and coal and coke plants. Doctor Douglas described one of the coal mines of his company, with 10,000 acres of coal land, with an uptodate plant designed for 40-years' operation, with a continuous demand for its product and no selling cost, and demonstrated that a sinking fund of 15.62c. per ton of production is necessary to meet the interest on the investment at 5 per cent., depreciation of plant and exhaustion of coal reserves. The Phelps-Dodge plant probably reaches the maximum of possible efficiency. The charge of 15.62c. must be greatly increased, to meet the cost of the same items for smaller plants with a limited acreage and designed for but a few years' operation.

The Possibility of Nation-wide Insolvency of Coal Interests

How many coal operators are there in the country who, after meeting their payroll, could have put aside a sinking fund of 15c. on each ton of coal produced during the last five years? There may be a few, but the number is small. The fact is, that the bituminous-coal industry is facing a critical situation and its danger menaces all lines of production in which the use of coal is a necessary factor. The bankruptcy of the coal business, with its investment estimated by Mr. Moorehead, at over a half billion dollars, will create a panic, the like of which has not been experienced since the days of '73.

This is the condition. What is the remedy? Co-operation, a joining of hands in a general effort to effect a greater economy in production and to protect the operator against the brutality of big buyers of coal, to the end that coal shall not be sold at a loss; to the end that

*Secretary American Mining Congress, 602 Munsey Building, Washington, D. C.

Note—Address delivered at the fourth annual banquet of the Southern Appalachian Coal Operators' Association, Knoxville, Tenn., Feb. 11, 1913.

coal buyers may, at all times, be able to do business with going concerns and not with referees in bankruptcy, to the end that the small consumer of coal in the future will not be obliged to pay back the losses now being made to enable the big consumer to scalp the small producer.

The Bill for a Regulation of the Coal Industry

To meet this situation, a bill has been prepared, providing for the creation by Congress, of an Interstate Trade Commission, with powers similar to those exercised by the Interstate Commerce Commission, over transportation companies.

By the provisions of this bill, the commission is authorized to consider and pass upon all existing or proposed trade combinations and to issue a permit to all those whose purposes are fair and reasonable and which will not result in monopoly.

The Effectiveness of Restraint

It makes possible the highest and most beneficial cooperation for the betterment of any industry and, at the same time, provides a most wholesome check upon monopoly. Senator Clapp, chairman of the Senate Committee on Interstate Commerce, said to me: "When you will show me how it is possible to open the stable door and still have it closed, or, having it closed, may at the same time have it open, I will understand how what you want can be accomplished."

My reply was this: "Between the stable and the garden is a plot of grass going to waste, and needing to be cropped; in the stable is a horse suffering for want of this grass, I am going to put a halter on that horse, give you the end of the halter strap and allow you to supervise the grazing and whenever the horse attempts to go over into the garden, you can pull him back and, if he persists you can put him back in the stable."

The coal operators should demand:

1st. That the lives of the mine workers shall be given the best possible protection.

2d. That the operators shall have a fair profit.

3d. That the public shall have its coal at the lowest price consistent with economical production expenses and a reasonable profit.

4th. That unnecessary waste of coal resources shall be prevented.

A Storage and Reclaiming Machine

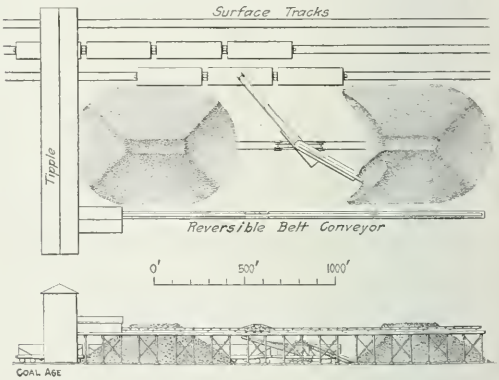
In common practice, coal as soon as mined goes directly to the tipples, over the screens and into railroad cars. If none of the latter are to be had the mine must shut down. It is apparently impossible for the railroads to furnish at all times cars in sufficient numbers to meet the rated capacity of all the mines tributary to them.

Frequently, also, operations are halted because there is no means of disposing of such grades as nut and slack, even though bins or bunkers of a limited capacity have been provided. But from whatever cause the shut-down may arise, it is certain to prove not only expensive in dollars and cents, but highly demoralizing in its effect upon the operating organization.

To overcome these difficulties, to a certain extent at least, the Jeffrey-Hamilton storage and reclaiming machine has been placed on the market by the Jeffrey Manufacturing Co., of Columbus, Ohio. This machine is self-contained, combines the elasticity of the locomotive crane with the reach of a traveling bridge, is without the limitations of either, and with a conveyor, gives a capacity and speed superior to both, dispensing with the crushing clamshell, or grab bucket, and the rough handling of coal incident to their use.

Storage capacity is limited only by the ground space available. The coal yard may be from 50 to 150 ft. in width, and of any length desired. The standard-gage machine takes care of a yard 70 ft. wide, which with coal piled 20 ft. high, contains 30 tons per each foot of its length. The same equipment stores a thousand tons, or a hundred thousand tons, and at a lower cost than any other mechanical method now in use.

If the storage yard can be located with one end near the mine tipple, run-of-mine coal may be conveyed to the machine from a chute beneath the weigh-box. When cars are available, the machine reloads the coal from the stock pile into the same conveyor, which, when reversed,



Storage and Reclaiming Machine in Conjunction with a Belt Conveyor

discharges directly onto the tipple screen. In reclaiming nut coal and other sizes which do not require rescreening, the machine handles coal from the storage pile and delivers it directly into the railroad cars.

As the machine can be operated so that the coal does not roll down from the apex of the pile, does not avalanche or slide in massed quantities, its employment causes less breakage than any other method. The coal is gently handled by the rubber-belt delivery conveyor and placed without fall immediately in its permanent position. It is not disturbed by continued operation of the machine and does not move until reclaimed for shipment.

The demand for coal constantly fluctuates. The mine which has, say, ten thousand tons in stock that can be shipped immediately (being loaded out at the rate of a ton per minute), will frequently be able to secure orders which otherwise would be lost. During the summer season, when trade is dull and prices are low, men are more plentiful and production is easier. By then accumulating a stored surplus at a minimum cost, the operator prepares for the season of rush orders and best prices; since this machine can be equipped with a screen to make one separation, as the coal is loaded directly into the car the reclaimed material will go to market in the best condition.

In addition to the benefits heretofore mentioned, both the operators and the railroad companies will appreciate relief from the constant controversies over the distribution of empties, and better car service may be thus secured.

EDITORIALS

Mining Legislation in British Columbia

Two important mining bills have recently been introduced into the British Columbia legislature, providing, respectively, for the inspection of mines by persons appointed for that purpose by the employees of the mine, and prvoiding for a minimum wage in coal mines.

The bill providing for the inspection of mines by mine workers, Bill No. 47, introduced by Mr. Place, is entitled "An Act to Amend the Coal Mines Regulation Act," and is as follows:

His Majesty, by and with the advice and consent of the legislative assembly of the province of British Columbia, enacts as follows:

1. This act may be cited as the "Coal-Mines Regulation Act Amendment Act, 1913."

2. The "Coal-Mines Regulation Act," being Chapter 160 of the "Revised Statutes of British Columbia, 1911," is hereby amended by striking out Rule 37 of Section 91, and reënacting the following in lieu thereof:

Rule 37. The persons employed in a mine may from time to time appoint two competent persons to inspect the mine at their own cost, and the persons so appointed shall be allowed, once or oftener in every shift, day, week, or month, accompanied, if the owner, agent, or manager of the mine thinks fit, by himself or one or more officials of the mine, to go to every part of the mine, and to inspect the shafts, levels, planes, working places, return airways, ventilating apparatus, old workings, and machinery, and shall be afforded by the owner, agent, and manager, and all persons in the mine, every facility for the purpose of such inspection, and shall make a true report of the result of such inspection; and such report shall be recorded in a book to be kept at the mine for the purpose, and shall be signed by the persons who made the same. And if the report state the existence or apprehended existence of any danger, the person or persons making the inspection shall forthwith cause a true copy of the report to be sent to the inspector of mines for the district: Provided always that where the miners in any mine fail to appoint two competent persons to inspect the mine, the chief inspector of mines shall select from the men, in alphabetical order where possible, two competent miners, who shall comply with the provisions of this section, and the said owner, agent, or manager may withhold from the wages of the underground employees a sufficient sum pro rata to remunerate the persons making such examination.

The Minimum Wage Act, Bill No. 18, introduced by Mr. Williams, is entitled "An Act to Establish a Minimum Wage in Coal Mines," and reads as follows:

His Majesty, by and with the advice and consent of the legislative assembly of the province of British Columbia, enacts as follows:

1. This act may be cited as the "Minimum Wages Act."

2. Every adult person working underground in any coal mine shall be paid a wage of not less than $3 per day.

3. No contract shall be entered into that provides for the payment of a wage less than herein specified. Provided always that contracts entered into previous to the passing of this act shall be of full force and effect.

4. Any employer who employs any person in contravention of this act may be enjoined therefor, and shall also be liable to prosecution under the "Summary Convictions Act" and amending acts before two justices of the peace or a police magistrate; and upon conviction for such offense shall be liable to a penalty or fine not exceeding $100 nor less than $10 in each instance.

5. This act shall come into force upon the first day of May, 1914

These acts now before the Canadian assembly are in strong contrast with the acts presented to legislative bodies in many of the mining states, in our own country. We have in mind, at present, a number of conflicting acts that have been presented to the Pennsylvania legislature and are now awaiting their action. These acts are so numerous and embody such a variety of views and opinions in relation to mining conditions and requirements in the state, that the situation can only be described as wild and chaotic.

The mass of mining bills now before the legislature or in the hands of the committee on Mines and Mining, has been referred to, by one of the oldest and best informed mining men in the state, as a "crazy quilt." It yet remains to be seen which of these bills and how many will ever get beyond the committee, and be presented to the legislature for their action. Little is to be expected that will improve mining conditions in that state, in the present session of the Pennsylvania legislature; unless, by a miracle, the House and Senate approve of the report of the commission charged with the revision of the anthracite code. That commission has presented two reports some time since—one a majority report, File of the Senate, No. 656; and the other a minority report, File of the senate, No. 657. The former of these bills was amended in a few slight particulars by the committee, Apr. 1.

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"Red Tape in the Geological Survey"

In the department "Discussion by Readers" in this issue, appears a reply from Director Smith, of the U. S. Geol. Survey, to a previous editorial on this subject. We publish Mr. Smith's remarks with the belief that some of the information contained therein will be an agreeable surprise to many American engineers. We quite agree with him that doing business under an inflexible appropriation is a serious handicap, although as a matter of fact much of the construction work of the country is done under such restrictions, as most any engineer can testify. But this question has been discussed at such length that further comments along this line would be superfluous. To our mind, it is not so much a question of how the appropriations are made, or of the amount, but of the most effective way of applying them.

No complaint is evident in our editorial, because of the fact that certain sheets are occasionally out of print, as Mr. Smith seems to infer. Furthermore, we wish to congratulate the Director on the fact that, of the 2200 sheets now in existence, only eight of these are, at the moment, out of print. It is incidentally interesting to know the reason thereof.

On the matter of substitution of maps, when the same are out of stock, we grant that the Director has offered some extenuating circumstances in this connection, but we still maintain that our comparison is a fair one. There can be nothing more exasperating to an engineer than to order a map covering a particular district, and receive one which only shows the territory immediately adjoining that in which he is interested. We repeat: "Engineers generally know what they want and resent this apparently indifferent attention to their requests." It would be more satisfactory to them to know when they can get the map they want, than to be surfeited with others in which they probably have no interest whatever.

In reply to the Director's anxiety to see that those ordering maps obtain the advantage of the wholesale rate, we would suggest that this could be accomplished easily by adopting some method of coupon books; the books could be bought at the wholesale rate and the coupons torn out and sent in as the maps were ordered. This would also eliminate the uncertainty of sending cash ("the exact amount") by mail, as is always specified in the instructions for ordering maps.

We do not think Mr. Smith is justified in reminding us of the fact that no "firm" sells maps worth from one to three dollars at ten cents each. When we said: "The high excellence of the government publications, and particularly its maps, is too well known to require comment," we believed we were paying the Survey a high compliment, and if these maps are selling at far below the cost of manufacture, the people of the United States are standing the loss, and it is assuredly no cause for self-complacency on the part of Mr. Smith or the Geological Survey.

That it is possible for engineers to wire the Survey for maps is a revelation to us, and if such is the case, we certainly feel that we owe an apology in this instance. Obviously, however, this was far from being generally known to engineers throughout the country, and we are sure that now it has been brought to light, there will be many who will avail themselves of this new convenience.

Mr. Smith's figures of the number of maps handled per day are most interesting. Furthermore, the extra rush occasioned by the change in the prices of the maps seems a good explanation for the excessive delay of eight days in getting maps from New York. Engineers generally, however, are of the opinion that the Survey has always been rather lax in this respect, and we do not see why even 24 hours, and surely not 48 hours should elapse before an order is filled.

We think the Director has either misunderstood or evaded our point in regard to estimates of the probable time that reports will be issued. We know that the Survey occasionally publishes announcements of the "probable" date of issue for certain reports. However, what we referred to more particularly was a specific personal inquiry regarding a certain report or map. Unless such could be answered on one of the blank forms of the Geological Survey, we still contend that it would be ignored. If a certain report that an engineer has been patiently waiting for, month after month, is hopelessly buried in a mass of other matter and possibly will not appear for a year or two, it would surely be a relief to him to know that such is the case.

The Unearned Increment

The public has seen coal lands rise in price continuously, has watched coal territory advance in value from 66c to over $1000 per acre, and wonders if the people as a nation cannot enjoy the profits which have fallen to some of the people as individuals. The thought is natural, the purpose is patriotic, and if it is practical and fair to the states in which public lands are still found, it is to be commended.

But we must not be blind to the nature of those increments in values or to the examples we see daily where the increase failed to accrue, where large land holders comparable in a degree to the United States Government failed utterly to get profits per acre in any way comparable to those of the small holder.

In a small boom town, a millionaire held his lots at $600 per acre; another land holder charged $100 or $200 for properties of slightly less value. Today the lots which sold for the smaller price are held for far more than those of the millionaire, for a thriving town has been built on the cheaper lots and competition has raised their value immensely. On the other hand, the millionaire's lands still serve merely for the grazing of cattle.

Increment is not always unearned. When a coal company has made a market for its coal, despite opposition, and at great expense, the value of its property rises. The company has demonstrated the ability of the fuel to fill the needs of the market. Having shown the character of the bed and the popularity of its output, all the neighboring lands become of greater value.

Still more important increments arise when new industries are started owing to the availability of fuel, and when railroads are built which provide for its transference to market. Thus the demand constantly grows and the value of the fuel in the bed augments.

But there are other causes for increase. The new industries attract people to the field and the customers in the market learn of the new coal region. The coal is its own constant advertisement and it is not long before the holdings pass into the hands of the new arrivals in the field, the users of the coal, or of the jobbers who have learned its value.

The American public shuts its eyes to these facts and believes like some purblind millionaires that coal land of a certain quality should be worth as much as coal territory of the same character elsewhere. They forget that increment demands time for attainment. It is indeed a growth.

The publications of the U. S. Geological Survey, unaccompanied by drillings, cannot give the purchaser of coal land an assurance of profit such as he would have if he saw a department of the coal industry doing a successful business. The excellent but unappealing bulletins of the Geological Survey do not travel into every part of the country like cars of coal. Moreover they can never appeal to the untechnical as can the coal itself, in use or for sale and, needless to say, the Bureau of Publications does not provide the railroads for the marketing of the product which its bulletins describe.

To rely on these bulletins, therefore, to raise the price of coal lands to the fancy figures placed on coal territory by the Department of the Interior is to put a padlock on the states in which coal is found, to restrict their future, and to deprive them of their rights. The intentions of the British Parliament, in those days of lesser enlightenment before the revolution, in suppressing the American iron trade may have been animated by less exalted purposes but did not result in any greater hardship than is entailed by the desire of the Interior Department to acquire an increment which it has not earned and for which it has not waited.

Even if coal land should be sold at the price for which the department haggles, in a few years, it will be still more valuable and the increment will go to the owner because increases in value are products of somebody's use if not of the use of all those who benefit by the increment.

EXAMINATION QUESTIONS

Mine Inspector's Examination, Held at Pittsburgh, Penn., April 1-4, 1913

(*Selected Questions*)

Ques.—(a) Define the term manometric efficiency, as relating to fans. (b) What is the manometric efficiency of a fan producing 2.7 in. water gage, the blowing-in pressure being 2.4 lb. per sq.ft. and the blowing-out pressure 5.5 lb. per sq.ft.?

Ans.—The manometric efficiency of a fan is the ratio of the actual pressure on the air, as indicated by the water gage in the fan drift, to the theoretical pressure or water gage, which, in this case, is represented by the sum of the mine pressure and the blowing-in and blowing-out pressures of the fan, assuming these can be obtained or are known. The mine pressure corresponding to a water gage of 2.7 in. is $2.7 \times 5.2 = 14.04$ lb. per sq.ft. The manometric efficiency is then

$$K_m = \frac{100 \times 14.04}{14.04 + 2.4 + 5.5} = \frac{14.04}{21.94} = 64\%, \textit{ nearly}$$

[N. B.—This is not a practical question, for the reason that it is impossible, practically, to obtain the blowing-in and blowing-out pressures of the fan and these must be assumed.—Ed.]

Ques.—At a certain mine, the temperature of the inlet is 38 deg., and that of the outlet 62 deg. F.; the mine resistance is equal to 15 lb. per sq.ft., and the atmospheric pressure, 14.7 lb. per sq.in. The quantity of air entering the mine is 100,000 cu.ft. per min., and the return-air current is found to contain 4 per cent. of marsh gas. Please state: (a) What quantity of marsh gas is given off in this mine? (b) What is the least amount of decrease in the quantity of air that will render the return air explosive? (c) What increase of gas will render the return air explosive?

Ans.—The intake air, in this case, is expanded in two ways: First, by the increase of temperature from 38 deg. to 62 deg. F.; and, second, by the decrease of pressure, 15 lb. per sq.ft., on the return airway. The expansion due to the increase of temperature is

$$100{,}000 \times \frac{460 + 62}{460 + 38} = \frac{100{,}000 \times 522}{498}$$

$$= 104{,}820 \textit{ cu.ft. nearly}$$

This air is again expanded by the decrease of pressure. Assuming the fan is blowing air into the mine against a mine resistance equal to 15 lb. per sq.ft., the absolute pressure on the intake is $14.7 \times 144 + 15 = 2131.8$ lb. per sq.ft. The pressure on the return air, in this case, is the atmospheric pressure, $14.7 \times 144 = 2116.8$ lb. per sq.ft. The ratio of expansion is equal to the inverse ratio of the absolute pressure; and the expanded volume is therefore

$$104{,}820 \times \frac{2131.8}{2116.8} = 105{,}562 \textit{ cu.ft. (air)}$$

(a) If the return current contains 4 per cent. of marsh gas, there is $100 - 4 = 96$ per cent. of air. In that case, the total volume of air and gas on the return airway is $105{,}562 \div 0.96 = 109{,}960$ cu.ft. per min. Subtracting from this the expanded volume of the return air gives, for the gas generated in the mine, $109{,}960 - 105{,}562 = 4398$ cu.ft. per min.

(b) Assuming the lower explosive limit is reached when the mixture of gas and air contains 7.14 per cent. of marsh gas, $4398 = 7.14$ per cent.; and the total volume of gas and air is then $4398 \div 0.0714 = 61{,}596$ cu.ft. Subtracting this result from the volume of gas and air previously found gives, for the decrease of air necessary to make the return current explosive, $109{,}960 - 61{,}596 = 48{,}364$ cu.ft.

(c) Again, assuming the mixture first becomes explosive when there is 7.14 per cent. of gas present, the proportion of air is $100 - 7.14 = 92.86$ per cent. Then, dividing the expanded volume of air on the return current by this percentage, the total volume of air and gas, at the lower explosive limit, is $105{,}562 \div 0.9286 = 113{,}678$ cu.ft. Now, subtracting from this the volume of gas and air previously found, the quantity of gas necessary to be added, to make the mixture explosive is $113{,}678 - 109{,}960 = 3718$ cu.ft. per min.

Ques.—Twenty-five loaded cars weigh 4600 lb. each; the length of the engine plane is 6000 ft., the weight of the rope, 1.2 lb. per ft., and the grade of the incline, 5 per cent. Find the tension on the rope and the horsepower of the engine required to hoist this trip at a speed of 13 miles per hour.

Ans.—The weight of the loaded trip is $25 \times 4600 = 115{,}000$ lb.; the weight of the rope, $6000 \times 1.2 = 7200$ lb., which makes the total load hoisted, when the trip is at the bottom of the incline, $115{,}000 + 7200 = 122{,}200$ lb.

Calling the angle of inclination a; $\tan a = 0.05$; $a = 2^\circ\ 34'$. The tension or pull on the rope is equal to the sum of the gravity pull and the friction pull; thus,

Gravity pull $= 122{,}200 \times \sin 2^\circ\ 34'$
$= 122{,}200 \times 0.04472 = 51{,}652$ lb.

Friction pull $= \frac{1}{10}(122{,}200 \times \cos 2^\circ\ 34')$
$= \frac{1}{10}(122{,}200 \times 0.89411) = 5{,}732$ lb.

Total pull on rope ..... 57,384 lb.

A speed of 13 miles per hour is $13 \times 5280 \div 60 = 1144$ ft. per min. The horsepower of the engine required to draw this load up the incline at the given speed is then

$$H = \frac{57{,}384 \times 1144}{33{,}000} = 180 + hp.$$

Ques.—What are the chief points to be considered in establishing and maintaining substantial and reliable ventilation in bituminous coal mines?

Ans.—Equip the mine with a well-designed centrifugal ventilator of sufficient power and capacity to supply the required air at the necessary water gage and built reversible. Plan the mine with regard to proper ventilation, drainage and haulage. Build substantial, air-tight stoppings, doors, air bridges and brattices and split the air to give a moderate velocity sweeping all working faces.

DISCUSSION BY READERS

Education in Coal Mining

Letter No. 1—The practical and theoretical education of the miner, in its broadest scope and in its relation to the manner of conducting state mining examinations, is one of the most important questions in present-day mining. I may say frankly that I do not favor giving candidates, in examinations, textbooks or helps of any kind, other than the necessary paper, pencil, rubber, rule, protractor and all the scrap paper they want.

Because there are intelligent men in the mine who did not have the advantages of an education in their early days and who now realize what they have missed and desire to make a short cut to secure their papers, is no reason for making the examination easier or more simple. It would not be fair to one who has made good use of his time, to discount his efforts for the sake of those who are handicapped for lack of early training.

In my opinion, there are few men now in the mines who are capable of studying and who started to work before they were 12 years of age. Recent mining legislation prohibits boys under 14 and 16 years old from working in the mines. The aim of legislation today is to give every boy a chance to educate himself, and after so much has been accomplished in this regard, it is no time to raise the cry to allow the use of textbooks in examinations. Would it not be lowering the standard of the examination to suit them to the needs of those who have not had an early education. If we have missed our opportunities we alone are the losers.

The rapid advance in coal mining, requiring larger and deeper shafts and improved machinery to handle the increased output has brought increased responsibilities for the men in charge, and these increased responsibilities should require greater knowledge on the part of mine officials. There are men in my own district in charge of first-class mines, who could not successfully pass a state examination, but I believe if these men had had the facilities offered them today, to secure a technical education in coal mining, they would have made good and have secured their certificates in the regular way.

But, denying the use of textbooks in examinations, the question arises, what can be done to help those miners who did not enjoy early advantages. I answer, teach them in a way they can understand and that will be interesting, so that they will have a desire to learn. Let the desire for knowledge supplant the desire to pass an examination. It is often discouraging to have men ask the way to work a problem or to answer a question, for the sole purpose of enabling them to pass a coming examination. They expect to obtain their certificates by a few weeks', instead of a few years' study. The question we must answer is: Which is the best for the advancement of coal mining—to lower the standard of the examination or bring these men up to that standard? I would say, lift the men to the higher level.

In dealing with this question of education, can we do better than follow the example of Great Britain and establish schools in every county, where workingmen can secure the needed education. Those who have no chance in early life, let them take ordinary school subjects on certain nights and other more practical subjects other nights. In such schools, in Great Britain, the men study coal mining, surveying, geology, machine construction and drawing, mechanics, mathematics, etc. These subjects are taught every year, in some districts, at a nominal cost, only sufficient to pay for the gas and coal and varying from 25 to 60c. a subject, for the whole term extending from September to April or May. Good teachers are employed. My experience has been that good education at low cost does not overcrowd the school. I remember not over 30 were in attendance regularly, in my home town of 4000 coal miners.

There is a crying need, in this country today, for the education of miners, in technical subjects. The knowledge must be conveyed in an interesting way that is simple to understand and that will develop a love for study. This can only be done by beginning in a simple way, coming down to the level of the student and helping him to rise, step by step. In this way, the ventilation formulas become simple, if the student is first acquainted with the rules and principles of arithmetic, by which he can work out his own formulas and not be obliged to carry them in his head. The same is true in calculations on pumps and steam engines.

The Study Course in Coal Mining just commenced in COAL AGE, is a good start in the right direction; but to get the best results one must attend a school where a teacher can help and explain what is not understood. I enjoyed reading in COAL AGE, Jan. 18, p. 107, how Thomas Thomas, of the Lehigh Valley Coal Co., overcame difficulties and got his education. Just a few weeks ago I met one of the mine examiners (firebosses) in my district, who was going to high school, studying during the day mathematics and physics and examining the mines for gas at night. It is my hope that textbooks will never be allowed in Illinois, in mining examinations, but that the high standard of the examination will be maintained so that one who passes successfully can look upon his certificate with pride, because it was honestly earned without any artificial aid at the examination.

W. L. MORGAN.
State Mine Inspector, 8th District.
East St. Louis, Ill.

Post Timbering at the Working Face

Letter No. 13—The question of post timbering at the working face is important, and its discussion in COAL AGE cannot help but result in great benefit to both mine officials and miners. Firedamp and coal dust are often regarded as the greatest evils in coal mining. All statistics, however, prove this conclusion to be in error. The second annual report of the director of the Bureau of Mines, 1912, gives the loss of life, due to falls of coal and roof, as 1310 in 1910 and 1321 in 1911.

According to the report of the engineers of the Bureau of Mines, the immediate cause of this class of accidents is the delay or failure, on the part of miners, to place sufficient timbers. The reports of the Pennsylvania mine inspectors, for a period of 33 years, show that 59.38 per cent. of all the accidents underground was caused by falls of roof and coal. The report for 1910 shows 63 per cent. of all underground accidents due to this cause. The subject, however, is important not only as a question of safety but as a matter of economy, since the cost of mine timber in many localities makes this the heaviest item in the operating expenses of the mine.

In considering post timber, one of the first requisites is the elasticity of the wood. A good mine post is one that will bend and still retain its efficiency to support the loose fragments of roof, before finally breaking under the maximum pressure. All experienced miners know that the maximum roof pressure is irresistible and that it would be foolish to try to resist such a pressure with timber. The use of dry, brittle timber, in mines, is often the cause of serious accidents, because such timber is broken instantaneously without bending and the roof falls without a moment's warning. A good mine post, by bending, gives the miner warning that danger is imminent and he must either set other timber or seek a place of safety. In this locality, the pine wood of which the Douglas, or red fur, is a specie, will meet these requirements.

Another important point is the thickness of the seam. I consider it a good rule to adopt to make the diameter of the post proportional to its length, other conditions being equal. However, some mine posts are better seasoned and more sound, not being infested with vermin or containing knots. A knot, of course, may upset all calculations of the strength of a mine post, but the rule nevertheless is a good one for general application. The rule that the strength of a mine prop varies as the ratio of the square of the diameter to its length has reference only to the bending strength of the post. The rule first given provides equal resistance to crushing and bending.

Again, it is important to consider the essential principles of timbering. The first of these is to *timber in time.* Never judge of the roof ahead by that exposed to view. The roof ahead is an unknown quantity and may at any moment so change in character from that overhead as to present new dangers. It is a common thing for a stone to fall out of the roof, or for an unsuspected slip to draw back from over the face of the coal in such a manner as to leave the roof suddenly unsupported over the miner. The only safe rule to adopt is: Trust no roof further than is absolutely necessary.

Another essential point is to timber in the line of pressure. In a flat seam, the line of pressure is vertical and posts must be set perpendicular to the roof and floor. In a pitching seam, owing to the tendency of the roof to slide downhill, it is necessary that the posts should be "underset" from 1 to 9 deg., depending on the inclination of the seam. Any slip of the roof downhill will then tighten the post. In every case, post timbers should be set with a "lid" or cap-piece, which should be from 3 to 4 in. thick and at least 3 in. wider than the prop. The length of the cap-piece must be governed by the nature of the roof, but should never be less than 18 in. The cap is a very essential part of the mine prop, as, when the roof "weights," the head of the post sinks into the soft wood of the cap, which then acts as a hoop to bind together the fibers of the post and prevent its splitting.

I believe that the miner should be held personally responsible for the safety of his own place. In this way alone can the coöperation of the miners be secured, for their own safety. To obtain this coöperation is more important than reprimanding the men or imposing penalties for neglect in this regard. It is the duty of every miner, on entering his place, to examine the roof carefully before proceeding to work. If the roof is dangerous, he must secure it in such a manner as to make it safe or come out and fence off the place. A failure to do this is an offence against the Coal Mine Regulation Act. A miner violating this act should be prosecuted and there should be no mistaken sympathy that will prevent such action being promptly taken when required.

J. W. Powell, Mine Mgr.,
Columbia Coal & Coke Co.
Coalmont, B. C.,Canada.

"Red Tape in the Geological Survey"

In connection with the editorial in your issue of Mar. 8—"Red Tape in the Geological Survey"—I may be pardoned for making some comment. There are certain restrictions and limitations in probably all government bureaus which are not appreciated by outside business men who come in contact with them. One of these is the hard and fast, and often restricted, appropriations under which the bureaus must work.

You complain that the topographic maps of the Geological Survey are sometimes reported out of stock. Owing to the inadequate appropriation available for map engraving and printing, not only is new map-engraving work considerably in arrears, but there is involved a tremendous pressure on the engraving division to keep on hand the 2200 topographic sheets which now represent the Survey stock. Furthermore, certain sheets must be at times reported out of stock for the reason that they are being revised and brought uptodate, and with a new issue in sight it is not considered advisable to print the obsolete map. There are at the present time, for these reasons, eight sheets out of stock. In cases where a map is soon to be issued or reprinted, an estimate is given to the correspondent as to the probable date.

You further complain that in filling an order for topographic maps, substitution is sometimes made and that such a procedure would not be contemplated by any editor of a magazine in sending the number immediately preceding or following, in place of the one asked for. I do not consider the comparison a fair one, for the cases are not exactly parallel. You will note that the explanation on the map index, which serves as the public's guide in ordering these maps, states that small substitutions will be made by the Survey; that is, rather than return the 10c. or 20c. remitted with an order for maps, where one or two sheets are out of stock, substitution of sheets covering adjacent territory will be made. The substitution of a map adjoining the one of the area required is apt to be of more service than the issue of a magazine preceding the one which you may order. *If, however, such map substitution is not desired and the correspondent so states in his order, substitutions are not made.*

Furthermore, these substitutions of one or two maps are frequently made strictly in the interest of the re-

mitter, in order to give him the benefit of the wholesale rate. For example, if he remits $3 for 50 maps (the minimum amount which will give him the benefit of the wholesale rate) and two of these are out of stock or have not been published, substitutions are made for the purpose of bringing the order up to the required number, for if the purchase was for 48 maps the price instead of $3 would be $4.80.

I would call attention further to the fact that no "firm" sells for 10c. each, maps worth from $1 to $5 and in fact costing that, if the actual expenditure in field surveys, office editing, and engraving and printing are all included. The Geological Survey does not *substitute* in the case of its book publications, such as the monographs, which are sold at the higher prices.

You further remark that unless one has connections in Washington, to whom he can wire for a map, in case of urgent need, he is sure to be disappointed. My answer to this is that the Survey is in frequent receipt of telegrams from engineers and others requesting maps sent and such requests receive the immediate attention they deserve.

The aim of the Geological Survey is to handle its distribution of publications—maps and reports—on as nearly a business basis as possible. I believe some progress is being made. Ordinary orders for topographic maps, which do not involve some especially difficult conditions, are filled within 48 and many of them within 24 hours. Some of the larger orders require longer to complete because of the time required to assemble from among the 2200 racks in which the stock is stored. During the past winter, due to the numerous misunderstandings, or account of the increase in the price of the maps and because of the receipt of a great number of very large orders, placed during the last two months of the year for the purpose of taking advantage of the old rate, there have been more instances of delay than usual. The normal sale distribution by the Survey of its topographic maps is over 2000 a day.

Concerning your complaint that questions as to when certain reports will be issued are ignored, it is the Survey's practice to give estimates to the public of the issuance of reports whenever it is possible to forecast with any degree of certainty the probable date of such issue. In this matter, however, the state of the appropriation for printing and binding is frequently the controlling factor. The Geological Survey has at the present time sufficient manuscripts of scientific reports, practically ready for printing, to consume a printing fund approximately twice the amount appropriated for the current year. To forecast when these reports will be printed would be worse than guessing.

GEO. OTIS SMITH, Director.

Washington, D. C.

Study Course in Coal Mining

BY J. T. BEARD

The Coal Age Pocket Book

FLOW OF AIR IN AIRWAYS

The flow of air in a conduit or airway is in obedience to an excess of pressure at one end of the conduit over that at the other end. Air always moves from a point of higher pressure toward a point of lower pressure. The moving air is called the air current.

Velocity of Air Currents—The rate of motion or the distance traveled per unit of time is called the velocity of the air current. The velocity is commonly expressed in feet per second or feet per minute, as most convenient.

Relation of Pressure and Velocity—To double the velocity of air in an airway or conduit requires four times the pressure; and since $2 = \sqrt{4}$, the velocity v varies as the square root of the pressure p; thus

$$v \text{ varies as } \sqrt{p}$$

or, vice versa,

$$p \text{ varies as } v^2$$

For example, if an airway in a mine is of such size and length that the presure per square foot at the intake is 3 lb. greater than that at the discharge opening and this difference of pressure produces a velocity of 5000 ft. per min.; it will require a difference of pressure of $4 \times 3 = 12$ lb. per sq.ft. to produce a velocity of 1000 ft. per min. in the same airway.

Solution by Ratios—Expressed as ratios, the solution is always simpler and shorter, because the method admits of ready cancellation, thereby keeping the numbers small and reducing the amount of necessary work. For example, when quantities are proportional their ratios are equal. Or, in this case, the velocity ratio is equal to the square root of the pressure ratio. Calling the first velocity v_1, second velocity v_2; the first pressure p_1 and the second pressure p_2, we have

$$\frac{v_2}{v_1} = \sqrt{\frac{p_2}{p_1}}$$

or, vice versa,

$$\frac{p_2}{p_1} = \left(\frac{v_2}{v_1}\right)^2$$

Example—What difference of pressure per square foot will be required to produce a velocity of 1200 ft. per min. in an airway where the air is moving at the rate of 500 ft. per min., under a moving pressure of 3.5 lb. per sq.ft.?

Solution—Let x = the required difference of pressure; then

$$\frac{x}{3.5} = \left(\frac{1200}{500}\right)^2 = \left(\frac{12}{5}\right)^2 = \frac{144}{25}$$

$$x = \frac{3.5 \times 144}{25} = \frac{0.7 \times 144}{5} = 20.16 \text{ lb. per sq. ft.}$$

The Coal Age Pocket Book

Resistance of Airways—The resistance that an airway offers to the passage of air is of two kinds: frictional resistance due to the rubbing of the air on the inner surface of the airway, and the resistance due to the air striking against obstructions such as timbers, roof falls, sharp bends, etc.

How Resistance Varies—In mine ventilation, the entire resistance of airways is rated on a frictional basis, according to the extent of rubbing surface and the velocity of the air. It is assumed that when the velocity of the air current is doubled, each resisting particle in the airway is struck twice as often and twice as hard, by the passing air, which makes the resistance offered by each particle $2 \times 2 = 4$ times as great as before. If the velocity is increased three times, the resistance of each particle is increased $3 \times 3 = 9$ times, etc. On this assumption, the resistance of an airway varies as the extent of rubbing surface (s) and the square of the velocity ($v \times v = v^2$), or as the expression $s\,v^2$ for that airway.

Unit Resistance or Coefficient of Friction—The amount of resistance, per unit of rubbing surface (1 sq.ft.), for a unit velocity (1 ft. per min.) is called the unit of resistance or the coefficient of friction. The values most commonly adopted for this unit are

$k = 0.00000002$ *lb.* (Atkinson, revised)

$k = 0.00000001$ *lb.* (Fairley)

Calculation of Resistance of Airways—To find the resistance of an airway, for any given velocity, multiply the unit resistance (k) by the rubbing surface in square feet (s), and that product by the square of the velocity in feet per minute (v^2); the final product will be the total resistance (R), in pounds, as expressed by the formula

$$R = k\,s\,v^2$$

Example—Find the resistance of an airway having 60,000 sq ft. of rubbing surface, when the velocity of the air current is 800 ft. per min.

Solution—The resistance, in this case, is

$$R = 0.00000002 \times 60{,}000 \times 800^2 = 768 \text{ lb.}$$

Ventilating Pressure—The ventilating pressure is the total pressure exerted on the entire sectional area of the airway, to move the air or produce an air current. If the sectional area of an airway is $a = 50$ sq.ft., and the pressure created by the ventilating fan is $p = 8$ lb. per sq.ft., the total pressure on the air is $p\,a = 8 \times 50 = 400$ lb.

Unit of Ventilating Pressure—The pressure exerted on 1 sq.ft. of the sectional area of an airway, or the pressure per square foot on the air is the unit of ventilating pressure, often called the unit pressure (p). In speaking of ventilating pressure or the "pressure on the air," either the total or unit pressure, it is the excess of pressure in the intake over that in the return or the gage pressure that is meant.

Absolute Pressure—The absolute pressure is the actual pressure supported by the air; or the atmospheric pressure plus the gage pressure when the ventilating fan is blowing, and minus the gage pressure when exhausting.

SOCIOLOGICAL DEPARTMENT

The Half-Time System

The two documents following are half-time contracts, such as have created so much attention in Great Britain and in certain towns, notably Cincinnati, in the United States. We present them because we feel that they can be easily rendered applicable to mining needs.

The boy of 14 has a taste for labor. He is anxious to be regarded as a man. He soon tires of his new work and indeed it is, at first, quite exhausting, and he needs an occasional release from the hard grind. A day at school reinvigorates him. Thus he is better fitted physically for his daily work and is week by week growing more efficient. The school is frankly vocational. It tells him of the dangers of his work, instructs him in it and makes him a competent workman. His occupation becomes not merely his daily toil, but his life hobby.

For years people have thought that the training in vocational schools was to be urged because it helped a man to rise and displace his fellows, or because it aided the United States to hold its own against Europe. Efficiency, however, is best described as the means by which man wrests from nature the largest spoil possible.

If the boy or man can do a larger work because of his efficiency he can obtain a better living. The wage earner of today earns a larger real wage than the laborer of the 15th century, because by efficiency and machinery he can turn out more in a day than the artisan of that time could in all probability produce in two weeks.

The discontent of the working classes is only to be met by giving them a better living. The only way to provide that desideratum is to teach them to earn it. When men are scientifically expert, are taught to study causes and results, the industries of the world will take a rapid bound forward.

Every mine worker will inspect his own working place and will take a pride in making his part of the task move without friction. Conditions will not arrive at their maximum efficiency till every coal cutter and motorman can make at least the less important adjustments on his machine or locomotive just as every chauffeur is supposed to be able to take care of the automobile he drives.

If our miners were educated, their pride in their order would be increased and the exodus to other trades would cease. The other industries have already a start in this respect. Nothing retains a body of men at their employment so fixedly as a reputation that the trade practiced demands intelligence, that it is something more than a daily grind.

The contracts were presented to us by C. M. McDaniel, superintendent of schools at Hammond, Indiana.

CONTRACT

Articles of agreement made and entered into by and between the School Trustees of the City of Hammond, Lake County, Indiana, party of the first part, and..... of the City of Hammond, Lake County, Indiana, party of the second part:

Witnesseth, that

Whereas, The Board of School Trustees of the City of Hammond, Lake County, Indiana, are desirous that the boys and girls of said City may become more efficient industrially, and that more of them may be able to remain in school a longer period, it is therefore understood and agreed, by and between the said School Board of the City of Hammond, Lake County, Indiana, party of the first part, and..... ..... of the City of Hammond, Lake County, Indiana, party of the second part.

1. That certain boys and girls of said City, over the age of fourteen years and under the age of twenty-one years, are to be given opportunity to devote one-half of each school day in attendance at school and the remaining portion to be devoted to the services and employment of the said..... and that a copy of all contracts with the parents or guardian of any such school apprentice shall be approved by said School Board and signed by the superintendent and become a part of this agreement as fully as though it were embodied therein.

The party of the first part agrees:

1. To submit a course of instruction which shall be offered in the school for the approval of the party of the second part, and to provide proper facilities and competent instructors for the teaching of said course.

2. Not to demand the attendance of the apprentice during the time when he should be in the service of the party of the second part.

3. To employ a competent vocational director who shall be familiar with the work of both the shop and school, whose duty it shall be to see that the terms of this contract are fulfilled.

The party of the second part agrees:

1. Not to employ a school apprentice during the time that he should be in school.

2. To submit a course of instruction in the art or trade to which the boy or girl is to be apprenticed for the approval of the Board of School Trustees, and further agrees to offer this instruction to the apprentice.

3. To allow a representative of the School Trustees entrance to their establishment or factory at appointed times when the apprentices are employed, providing such representative does not interfere directly or indirectly with the work or employees.

The term of this apprenticeship shall be four years. At the end of the apprenticeship each party to this agreement shall issue a diploma to the apprentice if the work has been satisfactory.

In Witness Whereof, the said parties have hereunto set their hand and seal this.....day of .....19...

.....

By.....

.....

By.....

Superintendent of Schools.

APPRENTICE CONTRACT

W. B. CONKEY COMPANY

Entered into between the W. B. Conkey Company, of Hammond Indiana, and . . .
(parent or guardian) of Hammond, Lake County, Indiana.

This Indenture Witnesseth that . . .. of the County of Lake and State of Indiana, has voluntarily, of his own free will and accord, put and bound..... .. of Hammond, Lake County, Indiana, to learn the art and trade of.....and as apprentice to serve from this date for and during and until the full end and term of four years next ensuing; during all which time the said apprentice shall serve his employers faithfully, honestly and industriously,

all lawful commands readily obey, and conduct himself in a modest, courteous and accommodating manner toward his employers and all other persons employed in and about the premises and business of his said employers; at all times protect and preserve the goods and property of his said employers, and not suffer any to be wasted or injured; and that the apprentice may acquire an education, he shall attend the Hammond Public Schools one-half of each day that school is in session, at such time as shall be arranged by the employer and the school authorities, and shall employ himself about the premises of his employers during the time five hours per day during the full term of his apprenticeship, unless otherwise ordered, and the said employers shall use their best endeavors to teach or cause him, the said apprentice, to be taught or instructed in the art or trade of.....and to pay the said apprentice for the first year the sum of ten cents per hour; for the second year of his serviees, the sum of twelve and one-half cents per hour; for the third year of his services, the sum of fifteen cents per hour; for the fourth year of his services, the sum of seventeen and one-half cents per hour.

Beginning the second year of his apprenticeship the W. B. Conkey Company will deposit to the credit of the apprentice one dollar ($1.00) each two weeks with the treasurer of the W. B. Conkey Company. This money will be deposited as a joint account of the apprentice and W. B. Conkey Company. At the completion of the apprenticeship the entire sum to the credit of the apprentice in the treasury of the W. B. Conkey Company plus twenty-five dollars, will be paid him. If for any reason the apprenticeship is not completed, this money reverts to the W. B. Conkey Company. The apprentice will be given a pass-book showing the amount paid in for his account, said pass-book to remain in his possession. It is understood that this money placed in the bank is not in any sense wages or payment for services rendered, but is a voluntary contribution by the employer, to be paid the apprentice in consideration of good behavior and the completion of his apprenticeship.

At the end of his apprenticeship, a diploma will be awarded to the apprentice by the W. B. Conkey Company, stating that he has served the full term of apprenticeship, and giving his status as a workman, and he shall at once be put on the pay-roll at $15 per week, and should said.....be in the employ of the W. B. Conkey Company when he arrives at the age of 21 years, he shall at once be put on the pay-roll at the regular journeyman's wages.

In case the W. B. Conkey Company by reason of destruction of, or injury to, their buildings or their machinery by fire, explosion, necessity for repairs, disturbance of business by strike, or by any calamity or other cause beyond their control, shall find it necessary to shut down their plant or suspend business in the whole or any part, during such time of suspension the W. B. Conkey Company shall not be liable for wages or damages.

And should the said apprentice fail in any of the above requirements to faithfully perform the duties, trusts and obligations required of him then the W. B. Conkey Company may, if they see fit, discharge the aforesaid apprentice and this contract at once become null and void.

Apprentice's signature .....
Address .....
Age .....

Signed .....
Per .....
Witnesses:
.....
.....

I.....(parent or guardian) agree that my son or ward shall serve the W. B. Conkey Company upon terms specified above.

WITNESS my hand and seal this.....day of.....19..
Signature of Parent.....
or Guardian.....

Approved by the Trustees of the School City of Hammond, this.....day of .....19...
By. .....

Miners' Summer School

By H. D. Easton*

The Kentucky University offers the following opportunity to miners, mine foremen, managers and others who desire to improve their knowledge of the principles underlying correct methods of mining.

*Professor of mining, College of Mines and Metallurgy, State University, Lexington, Ky.

1. COAL MINING

(a) The different systems. Laying out the workings. Methods for thin and thick and for flat and pitching seams. Management of squeezes, etc. (b) Mining and blasting. Various explosives. Evils from improper blasting. Dangerous and safe methods. "Safety" powders. Machine mining. (c) Supporting excavations, including the principles underlying timbering; the different methods employed; computing the strength of pillars, etc. (d) Ventilation. Methods of obtaining it and of coursing, splitting, and regulating the current. Its measurement; use of anemometer, water gage, etc. Study of furnaces and fans. (e) Haulage and drainage. (f) Sinking Shafts and Slopes. Safety appliances for shaft and slope mines.

2. MINE GASES AND TESTING

(a) Nature and origin of each and the indications which they furnish of their presence. (b) Testing for explosive and inexplosive gases. Principle of the safety lamp, and various types of such lamps. Use of safety lamps, etc.

3. EXPLOSIONS AND FIRES

Their various causes. Relation of coal dust to explosions, and management of dust. Relation of blasting to coal-dust and other explosions. Demonstration of coal-dust explosions. Prevention of explosions. Causes and management of fires.

4. SURVEYING AND MAP DRAWING

Use of compass (or of transit, as the case may be); putting up sights, marking off rooms at various angles, grading track (use of level), laying out curves, etc. Drawing the mine map. Men may devote all of the course to surveying if they so desire.

5. USE OF MINE RESCUE APPARATUS

Different types of apparatus. Practice in use of the Draeger oxygen helmet, and of the "Pulmotor" reviving apparatus.

The equipment used in demonstrating includes: A mine fan (running either exhaust or forcing), a working model of a Sirocco fan, anemometers, water gage, safety lamps of various types, electric and acetylene lamps, gas-chamber for testing with safety lamps, gas-testing machine, Smith appliance for gas-testing in mines, apparatus for showing characteristics of gases and effect of red-hot coal-dust on carbon dioxide, coal-dust explosion box, spray nozzles, samples of various explosives, mine telephones, pneumatic mine signal, safety, shaft-hoist, Cameron pump (dissected), Harrison coal puncher, coal and rock drills (Nixon ratchet, pneumatic hammer etc.), various makes of pit-car wheels, wire-rope and electric transmission-wire bonds, mine trolley hangers, steel entry sets, 6-ton electric locomotive, surveying instruments, etc.

The session begins May 19, 1913, and ends on July 12. By coming May 15, students can attend the meeting of the Kentucky Mining Institute, which opens on that date. The Board of Examiners of the state mine inspector's office has always held an examination at the close of the practical miner's course, thus avoiding the extra trip to Lexington for this purpose. Fee, $10. Room and board, $2.50 to $3.50 per week.

Garden Awards

The Taylor Coal Co., of Kentucky, offers the following cash prizes to its tenant employees for the best garden and yard cultivated during the season of 1913. The information is furnished us by C. F. Fraser, the mine manager. The mines are situated at Beaver Dam, Ohio County, Ky.

Inspection will be made June 18 and 19 by Messrs. C. M. Barnett, Hartford, Rev. A. B. Gardner, Beaver Dam, and a representative of "Coal Age." The inspectors will take into consideration neatness, kind and quality of crops raised and the natural advantages and disadvantages of the location. All tenants will be entitled to compete for prizes regardless of the amount of ground under cultivation or the kind or style of the houses. No salaried employee will be eligible to compete for any prize.

	In gold
For the best garden cultivated by white tenant.....	$10.00
For the second best cultivated by white tenant.....	5.00
For the best garden cultivated by colored tenant....	10.00
For the second best cultivated by colored tenant.....	5.00
For the best yard cultivated by white tenant.	7.50
For the second best cultivated by white tenant.....	2.50
For the best yard cultivated by colored tenant.....	7.50
For the second best cultivated by colored tenant....	2.50

COAL AND COKE NEWS

Washington, D.C.

The Interstate Commerce Commission has rendered a decision in the case of the New Kentucky Coal Co. vs. the Louisville & Nashville R.R. Co., in which it holds that through rates on coke were applicable to shipments to Chicago and that when reconsignment occurred at Chicago there was no authority for demanding such reconsignment on the basis of the through rate. In dealing with this question the Commission says in part:

Complainant's contention is that under the rule quoted from the Louisville & Nashville Co.'s tariff, that company must be considered as having joined in the reconsignment rules and regulations published by the Chicago, Indianapolis & Louisville and Big Four roads, and that by such rules and regulations reconsignment of carload shipments of coke at Chicago is authorized on basis of the through rates from points of origin to points of final destination.

The Louisville & Nashville Co. contends that reconsignment of coke is authorized by it only under the three conditions named in the circular of instructions referred to. It denies that it was the purpose of the rule in question to join in any reconsignment privilege granted by terminal lines. One of its traffic officials testified at the hearing, as to the purpose of the rule, as follows:

It was put in there simply for the purpose of notifying the shippers under our joint tariff that there might be privileges granted by some parties to those rates, and which, if they were interested, they could look them up and enjoy them if they were entitled to them. That is the only reason that note was ever put in that tariff.

Question. That was put in there, as I understand, for the purpose of enabling the shippers to obtain the benefit of any reconsigning arrangements or any other arrangement, terminal or otherwise, that the lines other than the L. & N., parties to that tariff, were willing to grant?

Answer. Yes, sir. It was simply to give them the privilege, the benefit of any privilege that any individual line was willing to grant.

The circular of the Louisville & Nashville referred to relates primarily to reconsignment of shipments on the lines of the Louisville & Nashville, and does not, in terms or by necessary implication, prohibit reconsignment by connecting lines on the basis of through rates when such rates are in effect. The rules and regulations of the Chicago, Indianapolis & Louisville Co. authorize one reconsignment, without charge, on basis of the through rate, where the identity of the freight is preserved, the point of reconsignment is in direct line to ultimate destination, and the lines over which the shipment moves are parties to the rate. These conditions were met in this case.

The rules and regulations of the Big Four, while providing for reconsignment of carload shipments of coke, further provide that as to shipments received from connecting lines reconsignment which involves change of destination will not be made without authority of the road from which the shipment is received, and they contain no provision for the application of through rates in the event of reconsignment.

Recurring to the Louisville & Nashville Co.'s tariff, we do not find that it contains any authority to connecting lines for reconsignment on a through-rate basis. The rule referred to does not in itself authorize reconsignment at all.

PENNSYLVANIA

Anthracite

Scranton—An investigation conducted by the members of the bureau of mine inspection of Scranton has disclosed the fact that the settling on Pittston Avenue near River Street some weeks ago was not caused by a mine cave, but by the faulty back-filling of a sewer. The commissioners secured entrance to the abandoned workings of the Lackawanna Coal & Iron Co., which have not been in operation for at least fifty years, and found conditions even better than they thought they had any right to look for.

Scranton—The Scranton Coal Co. has dynamited the overflow dam near Keyser Valley in order to prevent a further flood of their workings. The water was rushing into the mine at such a high rate that it gained 9 ft. on the pump in one night.

Wilkes-Barre—The Stanton Colliery, of the Lehigh & Wilkes-Barre Coal Co., has been tied up for over a week on account of the great inflow of surface water during the recent heavy storms, there being several feet of water in the shaft.

Hazleton—In obedience to the request of the Upper Lehigh Coal Co., the residents of No. 3, Upper Lehigh, have moved to another section of the town. It is the intention of the coal company to strip the land in the deserted section of the settlement.

Mahanoy City—Demanding an increase of wages, seventy-five breaker boys employed at Maple Hill Colliery, the largest Reading operation in the Mahanoy City region, are on strike.

Bituminous

Du Bois—Powder exploded in the miners' changeroom, a part of the supply house at the Cascade Coal & Coke Co.'s shaft in Sykesville. The building was destroyed, and two miners out of a number in the changeroom were badly burned. The shed was worth only $300 or $400 and its loss by explosion and fire serves solely to emphasize the importance of taking care of the miners' explosives on leaving the mine.

The men employed at the Eriton shaft of the Northwestern Mining & Exchange Co., returned to work Monday, Apr. 7, when the repairs were declared complete. They had been idle nearly two months. The Union regarded the enforced idleness as a virtual lock-out and distributed nearly a thousand dollars among the needy.

Indiana—Options for 1700 acres of coal between Vintondale and Strongstown have been taken this week by Charles E. Altemus of Morreilville, Penn. The options are said to have been contracted at $115 an acre.

The mutual rectification of the boundaries of the Rochester and Pittsburgh Coal and Iron Co. and of the New York Central interests continues. The exchange will increase the mining facilities of all concerned.

Much activity continues near Heilwood, Indiana County, Penn., where the Greenwich Coal & Coke Co. and the Penn-Mary Coal Co. are competing for options.

Harrisburg—The McDermott bill, to prohibit the use of electricity in gaseous coal mines, is being strenuously opposed by the operators. Representatives of the latter contend that if electricity were prohibited, it would prevent them from entering into competition with mines in states which permit its use and would also force great expense for equipment of mines.

WEST VIRGINIA

Moundsville—The Fort Pitt mine tipple for river shipping has been swept away by the recent flood.

TENNESSEE

Chattanooga—The Continental Coal Corporation recently set aside Apr. 5, which fell upon Saturday, for clean-up day in their camps. On that date, in accordance with circulars which had previously been issued, people were urged to gather up their trash and refuse and otherwise put the villages in a sanitary condition. The company furnished wagons to haul away the litter and plenty of lime for use in bad places. This move is expected to have a pronounced effect in preventing sickness in the camps during the warm weather.

KENTUCKY

Louisville—The Harlan Coal Mining Co. was one of the operating companies of the southeastern Kentucky field which suffered some inconvenience on account of the high water, having lost three piers from under its conveyor structure. This company is considering a number of propositions with reference to leasing parts of its large acreage in the Harlan field, but nothing definite has been announced as yet.

The flood in the Ohio and Mississippi rivers has been turned to good advantage by the Monongahela River Consolidated Coal & Coke Co. The company has shipped out of Pittsburgh several large tows bound for Louisville and the South. The Louisville offices of the company have received advices to the effect that the Sam Brown cleared from Pittsburgh with fourteen coal boats and six barges of coal destined for the Louisville market. Likewise, the steamer "Helen White," of the United Coal Co. has left with seventeen barges, bearing 218,000 bushels, and the Jim Wood and J. A. Donaldson are expected to leave with tows totaling forty-five barges. The Diamond Coal Co.'s steamer "Monitor" has started with seventeen barges, containing 300,000 bushels of coal for Madison, Ind., and Louisville.

OHIO

Columbus—A coal famine in many of the cities and towns of Ohio is threatened because of the inability of railroads to move coal cargoes. This condition prevails especially in the northern part of the state where the railroad connections with the coal mining districts have been broken. It will be some time before normal transportation conditions prevail.

Nothing has yet been done toward a settlement of the strike which has been in progress since January at the Glouster mine of the Hisylvania Coal Co. which has offices in Columbus. The strike was in the nature of a lockout. The managers of the mine wanted the men to protect their own lives to a larger degree and they refused.

The Sunday Creek Co. which has headquarters in Columbus has sustained some damage to a bridge connection with one of its mines in the Hocking Valley owing to the flood. The New Pittsburgh Coal Co. sustained the loss of a trestle which will put one of its mines out of commission for several weeks. The New York Coal Co. also suffered some damage at its mines in the Hocking Valley.

Martins Ferry—The Gaylord mines Nos. 1 and 2 have resumed work in full, together with the Red Bird, Yorkville and Y. & O. mines. Every important mine in this immediate vicinity is now in operation.

ILLINOIS

Springfield—A raging fire which has broken out the bottom of the Capital coal mine has consumed property to the extent of $1000, despite the efforts of the company's men to check its progress; 330 men are thrown out of employment as a result of the blaze.

Harrisburg—On Apr. 5 practically all of the coal mines in the vicinity of Harrisburg had been closed down, and employees were working day and night in an effort to prevent water from getting into the shafts. The back water from the Ohio had covered the entire country surrounding Harrisburg, and levees several feet high had been built up around the air shafts and main shafts of practically every mine in this field. Even with this precaution there threatened to be a tremendous loss by the washing away of mining property, such as timbers, wash houses, etc.

Marion—The cyclone that recently swept over Southern Illinois caused a loss of $3000 at the Illinois Hocking Washed Coal Co.'s mine. The smoke stacks were blown away and the roofs of all the buildings were torn off. The property of the Chicago Big Muddy Coal & Coke Co. suffered a loss of about $8000. The engine room was completely destroyed, the boilers dislodged, stacks blown down and the tipple stripped of everything but the heaviest timbers.

MISSOURI

St. Louis—The largest piece of coal ever taken from a mine in Madison County was hoisted by the Home Trade Coal Co. recently. The piece is 3 ft. square, and weighs 1050 lb. Several months ago a piece weighing several tons was mined, but on account of its size could not be brought to the surface. The coal will be placed on exhibition at Edwardsville.

ARKANSAS

Hartford—Miners working at No. 7 Central mine, better known as the Hoffman mine, have received orders to clean up and put their tools away. It is reported that the company intends installing electric mining machines. Another report is also current that the company intends shutting down mines Nos. 2 and 5. If such is the case, over 500 men will be thrown out of employment temporarily.

COLORADO

Fort Lupton—Another strike in the coal fields of northern Colorado has been ordered, involving over 1000 miners in the employ of the American Fuel Co. The miners claim the company owes them back pay aggregating $20,000. This they have not received.

SOUTH DAKOTA

Pierre—A new find of lignite coal is reported near Isabel. The seam is said to be 12 ft. in thickness, and is especially desirable, as it is covered with only 16 ft. of earth, allowing for stripping operations. Mining by tunneling is not practicable on account of the lack of stone or other substantial covering for a roof.

NORTH DAKOTA

Hebron—There will be $17,500 donated for the maintenanco and permanent improvements at the Hebron Lignite Coal Experimental Station, at the University of North Dakota, according to E. J. Babcock, Dean of the School of Mines.

FOREIGN NEWS

Bridgeburg, Ont.—A dangerous blaze which caused the destruction of hundreds of tons of coal broke out Mar. 26 on the big Grand Trunk coal chute at this place. The western end of the chute was completely destroyed. The loss is placed at $2500.

Manleon, France—Four men were killed and seven others injured by an explosion in a mine at Osser, Mar. 29.

PERSONALS

Edward V. d'Invilliers announces the removal of his general engineering offices to No. 51 Walnut St., Philadelphia, Penn., opposite Independence Square.

Wm. B. Neal, who has been in charge of the New Orleans office of Bonnyman-Norman Coal & Iron Co., has resigned that position to become connected with the sales department of the Central Foundry Co., located at Holt, Ala. His successor has not been announced.

Edward Lynch, of Wilkes-Barre, formerly employed on the U. S. Bureau of Mines Rescue Car, giving instruction in first aid, has accepted a position on the G. B. Markle engineering corps at Jeddo, Penn. The appropriation for this car has run out, and Mr. Jessup, general manager for the Markle Co., secured Mr. Lynch to take charge of the first aid and rescue work of the company.

OBITUARY

Wm. Harding, 83 years old, for many years manager of the Consolidated Coal Co.'s properties, and one of the best known coal operators in the southern Illinois field, died recently at his home at 539 North 13th St., East St. Louis, Ill. Death was due to pneumonia.

CONSTRUCTION NEWS

Wilkes-Barre, Penn.—A. F. Wolf has bought out the interests of the Central Coal Co. of Scranton in a property of 97 acres of coal land in Plains Township near Hudson. His intention is to erect a modern breaker.

Moundsville, W. Va.—The tipple at the Glendale mine of the Richman Coal Co. is being torn down by the Riggs Bros., contractors. The work of building a new tipple has already been started and will be rushed to completion.

Martins Ferry, Ohio—It is understood that the coal territory in the southern part of Belmont County is soon to be tapped by an 80-ft. shaft and Pittsburgh coal will be mined. About $100,000 will be required to install the necessary equipment.

Connellsville, Penn.—Work on the coke plant along the Youngwood branch of the Southwest R.R., is progressing rapidly.

The shaft of the United Coal & Coke Co. has been sunk to a depth of 100 ft.

Wheeling, W. Va.—Extensive improvements are under way at the Johnston coal mine at West Wheeling. Sixteen new entries will be driven in the mine in the near future and a new 8-ton motor has been purchased from the Goodwin Manufacturing Co., of Chicago.

Sturgis, Ky.—The contractors who are working on the branch line being constructed by the West Kentucky Coal Co. to its new shaft, No. 9, have about completed the heaviest part of the work, which was the trestle over Cypress Creek, and the remainder of the work is not expected to take long.

Wichita, Kan.—The Kansas Gas & Electric Co. is rushing to completion a $50,000 traveling grab bucket crane, which will unload coal from the cars. A contract has been let to the Dieter & Wenzel Construction Co., to extend their dock on the river 100 ft. eastward. It is expected that the crane will be completed by Aug. 1.

Susquehanna, Penn.—Scranton capitalists are making good

headway in sinking a shaft on the George Young farm at Port Crane, near Binghamton, N. Y. All the drilling machinery has been set up and the shaft is down twenty feet, work is under the supervision of Engineer Yates, of Scranton.

Hillsboro, Ill.—It is rumored that work may resume at the local mine of the Clover Leaf Coal Mining Co., in the near future. The new airshaft has now been sunk to a depth of 450 ft. and the work of finishing is only a matter of a few weeks. When these improvements are completed it is expected that work will be resumed.

Carbondale, Penn.—The Salem Hill Coal Co.'s property here has been sold to the New England Coal Co., owned by Scranton capitalists. The coal land of the company is located above Wayne street, and the assessed valuation of the breaker and coal lands is in the neighborhood of $30,000. It is the intention of the new company to drive a slope.

Monndsville, W. Va.—The old machinery in the Big Run coal mine, in Ohio, has been replaced with modern electrical equipment. The work to date has cost in the neighborhood of $175,000 and it is expected that before the improvements have been completed the total cost will reach $400,000. Plans for a modern steel tipple are now being drawn up. The Rail & River Coal Co., owner of the mine, plans to double the output.

Uniontown, Penn.—Improvements which will cost in the neighborhood of $40,000 will soon be made in the three mines of the Evans Coal & Coke Co., formerly the Superba Coal Co., at Evans Station. It is understood that plans have already been made and the contracts have been awarded. These improvements will consist of the construction of a 60-oven coke plant and also of a new tipple. It is also the intention of the company to install a big coke crusher. When the three plants are in full operation, about 800 tons of coal will be produced daily.

NEW INCORPORATIONS

Como, Texas—E. G. King, of McKinney, has purchased the stock of the Como Coal Co., incorporated for $40,000.

Birmingham, Ala.—The Alabama Co.; capital stock, $6,919,000; to succeed the Alabama Consolidated Coal & Iron Co.

Chicago, Ill.—The Villija Co.; capital stock, $10,000; coal, wood, ice, etc. Incorporators: M. M. Dudas, L. J. Petrulis and P. M. Dudas.

Nashville, Tenn.—Rhea-Stone Coal Co., Shelby County; amendment changing the name of the corporation to "John White & Son Coal Co."

Fort Wayne, Ind.—The E. W. Williams Supply Co.; capital stock, $10,000; to deal in coal. The directors are E. W. Willams, E. M. Williams and C. S. Tumbleson.

St. John, N. B.—The New Brunswick Coal, Iron & Clay Co.; capital stock, $298,000; to develop the province in Queens County. H. W. Woods is president.

Chicago, Ill.—The Citizens Coal & Supply Co.; capital stock, $100,000; fuel, ice, building material. Incorporators: Ward Zyfarth, F. W. Koenecke, E. E. Zyfarth.

Oklahoma City, Okla.—A charter has been granted to the Omego Oil Gas, Mineral & Coal Co.; capital stock, $15,000. Incorporators: A. C. Ahorn, and others of Omega.

Harboursville, Ky.—Barboursville Blue Gem Coal Co., Barboursville; has been formed with a capital of $200. Incorporators, A. D. Smity, G. W. Tye and Myrtle Tye.

New York, N. Y.—The R. J. Buchholz Coal Co., Inc.; coal and other fuel; capital stock, $25,000. Incorporators: Richard J. Buchholz, Charles E. Buchholz, John V. Koch, Jr.

De Queen, Ark.—A charter has been granted to the Mexico Mining & Development Co. of De Queen; capital, $50,000; incorporators, C. Mendosa, P. Aleman and J. O. Johnson; to mine coal.

St. Louis, Mo.—The American Coal and Ice Co. has been incorporated here, with a capital stock of $5000. The incorporators are W. C. Vogel, A. J. Schmandt, Clara E. Vogel and Edna M Schmandt.

Parkersburg, W. Va.—The Cub Fork Coal Co.; capital stock, $25,000; to develop coal land and oil and timber lands. Incorporators: W. E. Deegans, J. B. Hoffmier, John Faulkner, Wm. Brown and E. C. James.

Wilberton, Okla.—The Gaines Creek Coal and Mining Co. has been organized with a capital stock of $10,000. Incorporators: William J. Hammers, Adamson; David R. Bridges, Wilburton; Martin L. Murdock, Wilburton.

St. Louis, Mo.—The Haddaway-Curd Coal Co. has been incorporated here, to do a wholesale coal business, with a capital stock of $6000. The incorporators, all of Webster Groves, Mo., are J. H. Curd, W. S. and W. J. Haddaway.

Seng, W. Va.—Opperman Coal Co.; to develop coal and timber lands in McDowell County; capital stock, $50,000. Incorporators: J. H. Opperman, of Cambridge, Ohio; Thomas E. Richards, C. Riggs, A. C. Orcutt and S. G. Campbell, of Seng, W. Va.

Phoenix, Ariz.—A charter has been granted to the Western Plaster Company of Phoenix; capital, $100,000; incorporators, Henry Mitchell, G. M. Satterfield and Grant Monical, all of Phoenix; among the objects are to deal in and operate coal lands and mines.

Phoenix, Ariz.—A charter has been granted to the Papago Placer Mining Co. of Phoenix; capital, $500,000; incorporators, Ned Creighton, Roy N. Davidson and H. V. Young, all of Phoenix; company to deal in and operate coal lands and coal mines, and other minerals.

INDUSTRIAL NEWS

Falliston, Ala.—The Eureka Coal Co. will have its new mine in operation by May 15, and will produce the high-grade domestic coal for which the Cahaba field is noted.

Waynesburg, Penn.—James L. Rush, has become the owner of 260 acres of coal located in Center Township. The property was purchased from George G. Gaus, of Uniontown, for $39,000.

Klondike, Tenn.—J. M. Robinette announces that he will develop 200 acres of coal property which he owns in that vicinity. The extent of the operation is not at present definitely determined upon.

Coshocton, Ohio—Joseph Norman of Keene, who discovered a deep seam of coal on his farm near that village about a week ago, has stated that he expects to start developments about June 1.

Lincoln, Ill.—The Chicago & Alton Ry. is now concentrating a large number of coal cars in the field in the southern part of the state, and operators there are planning to run their plants on full time.

Indiana, Penn.—Dr. Charles E. Altemus, of Morrellville, has taken options on 1700 acres of coal land between Vintondale and Strongstown, this county, this being about the only idle tract left in the country.

Owosso, Mich.—The New Haven Coal Co. has sold 196 acres of coal property in the New Haven Township to Wm. McAvoy, and it is expected that local capital will make another attempt to operate the mine successfully.

Louisville, Ky.—The Louisville agency of the Continental Coal Corporation has contracted with the Louisville Water Co. for a year's coal supply for the operation of its river pumping station. About 5000 tons are required.

Morganfield, Ky.—The Drury Coal Co. has sold its mine and 1800 acres of coal rights at Waverly, Ky., which for a time have been operated by A. Maben Hobson, of Birmingham, Ala., to the Hobson Coal Co., of Birmingham, Ala.

Mahanoy City, Penn.—Twenty collieries are idle in this region, owing to the rapidly rising water in the mines. In some instances pumps are runing under water. Preparations have been made to hoist the mules at a moment's notice.

Knightstown, Ind.—During the recent cyclone that cut through the southern part of Indiana, fourteen barges, containing seven thousand tons of coal were sunk at the coal landing here; also a pumping boat. The total loss is over $25,000.

Huntington, Penn.—A large vein of coal was discovered at Rocky Ridge, in the new drift of the Possum Hollow Coal & Coke Co. The vein is 6 ft. 6 in. of pure coal. Mr. Jacobs, general manager, is at the mines and no doubt will make many improvements.

Hazleton, Penn.—Preparations are now being made for the reopening of the Silver Brook mines which were abandoned several years ago. Bids have been prepared for the coal royalties and these will shortly be opened. A large amount of coal remains to be taken from the mine.

Mecker, Colo.—Charles Gates has purchased the big David Morgan place north of here, comprising 8000 acres, the consideration being $160,000. Land is located in the anthracite

section and was purchased for the coal it contains. It will be mined extensively during the coming summer.

Grand Forks, N. D.—An experimental station in charge of the department of the University of North Dakota has worked out a process which makes it possible for railway engines to use lignite coal. The Chicago & Northwestern and Burlington railways are now making practical tests upon 40 locomotives in actual service.

Sebree, Ky.—The Sebree Mining & Development Co. has sold the mine at Sebree, with 1050 acres of coal rights, to Messrs. J. W. Miller and J. D. Smith, of Birmingham, Ala., who will organize a new company to operate the property. The mine is now producing about 300 tons per day and is located on the Louisville & Nashville Ry.

Cumberland, Md.—The Empire Coal Co. of Allegheny County has leased to Geo. C. Pattison and Louis B. Brydon, of Bloomington, the right to mine coal on Military lots Nos. 5 and 6, included in lot No. 1 and No. 2, of Stone Ridge, for a term of ten years from May 1, 1913. The lessees are to pay a royalty of 7c. per ton.

Indinnapolis, Ind.—The coal rates from Indiana mines to Indianapolis are to be advanced 5c. a ton, effective April 14, on the Illinois Central, Chicago, Terre Haute & Southeastern and the Evansville & Terre Haute. The present rate is 50c. a ton. The Vandalia and the Big. Four have not notified the railroad commission that they will follow the advance.

Morgantown, W. Va.—Cleveland capitalists have purchased the holdings of the Kingwood Coal and Coke Co. on the West Virginia Northern and the Morgantown and Kingwood Railroads near Kingwood. The Kingwood company owned 1100 acres there but never installed a plant. The purchasing company will develop the tract at once. Price, $60,000.

Brownsville, Penn.—The Isabella Connellsville Coal & Coke Co. is about to erect another coke plant in this vicinity. The proposed site of the new plant is on the Rush Run branch of the Monongahela R.R. The Isabella Co. refuses to discuss the probability of a new plant, but certain activities in this region by that corporation imply the erection of this plant in the near future.

Connellsville, Penn.—The Titlow Waste Heat Power Co. proposes to utilize the waste heat of the process of coking in the ordinary beehive or rectangular ovens, in making steam and thus developing power for the manufacture of electricity. The plans are covered by patents just issued, after a four-years' struggle, and contemplate the installation of boiler units over the trunnel head of the oven.

Spottsville, Ky.—The mine of the Pittsburgh Coal Co., in the Henderson district, has been flooded rendering operations impossible. Eighty men are employed in the mine, but warning of the rise was received in time to enable all to make their escape before the water reached the shaft. It is stated by Manager Blair that it will be not less than four months before the mine can be pumped out and operations resumed.

Washington, D. C.—The Democratic tariff bill presented by Chairman Underwood of the Ways & Means Committee to the House on Monday, Apr. 7, places coal on the free list. This includes the following grades and materials. Coal, anthracite, bituminous, culm, slack, and shale; coke; compositions used for fuel in which coal or coal dust is the component material of chief value, whether in briquettes or other form.

Waynesburg, Penn.—Two coal deals aggregating more than $1,000,000, and involving lands in this vicinity were closed Mar. 31. The Baily Block, comprising 1500 acres near Carmichaels, has been sold to Pittsburgh operators for $900,000. It is reported that the buyers will open up the coal at an early date. Fifteen hundred acres of coal land in Jackson Township, known as the Nettle Hill Bluff, have been sold to eastern capitalists for $100 an acre.

Birmingham, Ala.—During the week Judge Grubb, sitting in the Federal Court at Birmingham, signed a decree, ratifying the sale of the Alabama Consolidated Coal & Iron Co. to the protective committee, composed mostly of Baltimoreans. This committee prepared the reorganization plan of the company. A new company, known as "The Alabama Co.," has been incorporated under the laws of Delaware, which concern will take over the property of the old concern.

Pittsburgh, Penn.—The Lilly Coal & Coke Co., and the Reliance Coke Co. have entered the West Brownsville field. The former company has about 600 acres of coal under development and its mine and plant are near completion. It is understood that no coke will be made at present. The Reliance Co. will manufacture coke and has already started work on the development of 600 acres. The company is now erecting 230 ovens. Approximately 175,000 tons of coke will be produced annually.

Boonville, Ind.—An important deal in the southern Indiana field has been consummated in the purchase by William T. Blair of 400 acres of coal land for $40,000. The purchaser of the property is reported to represent Indianapolis and Chicago interests. He had options on more than $200,000 worth of coal land in the Boonville district, and the land purchased represents the cream of the lot. It is announced that the coal will be removed by surface mining, which is a new method in that section.

Spokane, Wash.—The annual meeting of the stockholders of the International Coal & Coke Co. was held in Spokane last week and the following officers were elected: A. C. Flummerfelt, Victoria, B. C., president; Hugh Davidson, Vancouver, B. C., first vice-president; D. H. Kiser, of Spokane, second vice-president; John Keegan, of Coleman, Alberta, treasurer; W. G. Grave, of Spokane, secretary; R. W. Riddle, of Coleman, Alberta, managing director. The directors elected are A. C. Flummerfelt, Hugh Davidson, F. H. Graves, D. H. Kiser and W. G. Graves.

Tamaqua, Penn.—Silver Brook is to be reopened. This operation, near McAdoo has an immense body of coal in it which was barely touched by J. S. Wentz & Co. who worked it about 25 years ago. Reading, Lehigh Valley, Jersey Central and others have an interest in the operation. Bids have been prepared for the coal royalties that will be paid and will be opened in a few days. Baird Snyder, of Pottsville, formerly general manager, of the L. C. & N. Co. at Lansford, who is opening a mine on Locust Mountain, near Shenandoah is said to be after the place also.

Louisville, Ky.—The Snead & Meguire Coal Co. is one of the two conceris which will divide the state penintentiary contract, amounting to about 13,000 tons a year. The other contractor is the Gem Coal Co., operating in the Kanawha field along the Big Sandy. This is the first time for six years that rail coal has figured in the penintentiary contract, the installation of a switch into the institution having made this possible. Heretofore the favorable location of Frankfort on the Kentucky river rendered conditions particularly favorable to those having river coal, and practically excluded rail operators and selling agencies.

Greenville, Ky.—It is reported that a lease of 3000 acres is being reopened for operation by George Krouth and others, of Louisville, who own 2150 acres of the property on which the lease applies. Work was started on this tract 3 years ago by the Louisville interests. Coal was originally found on the property at a depth of 135 ft. This seam has recently been entered, and found to be of No. 9 grade, 5 ft. 10 in. thick, with a solid slate roof. Analysis shows the product to be of good quality, and the owners are making preparations to get the coal out in quantities. Machinery will be installed at once for this purpose.

Lexington, Ky.—The stockholders of the Northern Coal & Coke Co., recently met to consummate the sale of that company's properties to the Elkhorn Coal & Fuel Co. Among the other operating coal companies whose properties are likewise to be taken over by the Elkhorn company are the Blackstone Coal Co., the Cokeland Coal Co., the Howard Coal Co. and part of the holdings of the Beaver Creek Co.

The Elkhorn company, which is generally understood to be the operating agency of the recently organized Mineral Development Co., is making active preparations for the beginning of development work on its new holdings, both in coal and timber, especially in the Boone's Fork and Millstone Creek sections in Letcher County.

Mine Rescue Apparatus

S. F. Hayward & Co., 39 Park Place, New York City, announce that they are now the exclusive American agents for the complete line of Westfalia Mine Rescue Apparatus and Oxygen Reviving Apparatus, formerly sold by the Westfalia Engineering Co. of 42 Broadway, New York.

They have a department devoted exclusively to the perfection and manufacture of respirating devices for all the various conditions of service.

The Westfalia apparatus possesses the advantages of being easily adaptable for either mouth breathing or helmet connection, is entirely without valves to impede the circulation and possibly clog with saliva, and has a perfect cooling system, the metal regenerator dissipating the heat without coming in contact with the body of the wearer.

The circulation in the apparatus is not dependent on the wearer's lungs but is actuated and maintained by an injector, thus avoiding additional strain and fatigue on the wearer and insuring a good supply of oxygenated air throughout the whole period of working.

COAL TRADE REVIEWS

GENERAL REVIEW

An unexpected cold spell has created a temporary snap to the market, which is not, however, showing the activity that ordinarily follows the announcement of the spring discounts. However, mining is being carried on at the full-rated capacity, and there are sufficient orders now on hand or in sight to eliminate any necessity for curtailing production through the current month at least. In spite of the generally soft market, a shortage of broken and egg is developing in some sections, due probably to the fact that the companies are putting the large sizes back through the breakers to provide for the increased demand on stove and chestnut. Operations in the mining regions were affected to some extent the early part of last week by the flood, but conditions were restored to normal before the end of the week. Prospects are for a rather inactive market during the summer.

It is becoming obvious that the stiffest kind of curtailment will be necessary to maintain bituminous prices in the East, as some companies are entirely without contracts and there is no further apprehension being felt over the West Virginia labor situation. Occasional cargoes of consignment coal are being forced on the buyer, and quiet discounts are being made on many of the standard grades at a number of points, all of which are rather bad signs. It is generally conceded that the market has been maintained for over a month in the face of a production exceeding the consumption, and the pressure is beginning to tell.

There is a most optimistic feeling in the Pittsburgh district over the season's prospects in the Lake trade. Reports from the upper lake ports are uniformly to the effect that stocks are low, and since the prices realized on the Lake business have been materially higher, in keeping with the general advance in the market, the producers feel they are on the eve of a record-breaking year in this branch. Most of the steam contracts in the Pittsburgh district have been closed at prices which are said to represent a material advance over last year; production for the current week was scheduled to be at full capacity. As noted in the last week's review, the greatest loss to the Ohio trade will be in decrease of tonnage. The industry is slowly recovering from the flood, but it will be several weeks yet before normal transportation conditions are restored. Railroad consumption has been reduced to a minimum, and many factories are out of commission and will probably remain so for a number of weeks in some instances.

There has been a general shading of prices on steam business in the Southern market, due to a shortage of domestic orders for nut, but such a condition is customary at this period of the year. Transportation in the mining regions of the Middle West appears to be at a complete standstill, but as a like condition prevails in industrial circles, the situation about balances itself. Small shipments are being made by roundabout ways, and the railroads are rapidly restoring their tracks, and expect to be in a position to handle most of the traffic by the end of the current week. Arrivals at Chicago are below normal, and prices are showing a tendency to advance as the stocks are depleted.

BOSTON, MASS.

Bituminous—In the absence of any strike news from the New River district the market is decidedly dull, with only a listless interest on the part of buyers; $2.85 f.o.b. Hampton Roads is apparently being maintained, especially since Apr. 1, although there are sceptics to be found. Some of the agencies are practically without contracts and either there must be the stiffest kind of curtailment, or, lower prices. At Providence and Boston there are occasional "market cargoes" being forced on buyers which is a bad sign. It is even a worse expedient than in former years, for a greatly increased proportion of tidewater coal for inland delivery is now handled by concerns that operate their own forwarding plants and are in close business connection with agencies which depend upon them for outlet. There is not so much opening, therefore, for coal that is shipped outside these arrangements.

There is nothing new to report on the situation here with regard to coals from the Pennsylvania and Georges Creek districts. There are quiet discounts here and there to buyers who will take on coal now and this applies to practically all the standard grades. The price of $2.95, f.o.b. Baltimore, for Georges Creek is the talk of the trade. All-rail there is little doing and manifestly some of the operating interests are worrying over keeping their mines supplied with orders.

Anthracite—In the face of what is generally regarded as a "soft" market there appears in certain quarters a shortage of broken and egg. This is due to the companies putting the large sizes back through the breaker on account of the increased demand for stove and chestnut. As a consequence there is even a slight premium being paid for broken for special uses and on large contracts. The movement of anthracite, all-rail and at tide, is about normal for April in a dull year, with perhaps a rather less demand.

Wholesale quotations on bituminous are about as follows:

Clearfields, f.o.b. Philadelphia	$2.35@2.60
Clearfields, f.o.b. New York	2.65@2.90
Cambrias, Somersets, f.o.b. mines	1.25@1.50
Cambrias, Somersets, f.o.b. Philadelphia	2.50@2.75
Cambrias, Somersets, f.o.b. New York	2.80@3.05
Georges Creeks, f.o.b. mine	1.67@1.77
Georges Creeks, f.o.b. Philadelphia	2.92@3.02
Pocahontas, New River, f.o.b. Hampton Roads	2.85 *and less*
Pocahontas, New River, on cars Boston	3.70@3.80
Pocahontas, New River, on cars Providence	3.45@3.78

Boston retail prices were announced Apr. 1 to be as follows:

Broken	$6.50	Pea	$5.50
Egg	7.00	Shamokin	7.50
Stove	7.25	Franklin	8.50
Nut	7.50	Lehigh Egg	7.25

Bituminous, $4.65 to Oct. 1, and $4.90 thereafter. Screenings, $3.00 to Oct. and $3.25 thereafter, all net tons.

PHILADELPHIA, PENN.

An unexpected cold wave the early part of the week, had the effect of instilling a little ginger into the trade, but it still lacks the snap that generally characterizes the business at this season of the year, after the low prices are made effective. Many householders had drawn their fires, and as a consequence, a ton or two of coal from those who usually postpone their purchases until the following winter, had to be ordered, to run over the cold period. Outside of this, there is nothing of moment. It is understood that all of the collieries of the companies are now again working full after a rather trying week, owing to the flooded condition of the mines. Orders are plentiful enough to keep operations at the mines continuous for at least the month of April, but the month of May does not look particularly good.

The demand at present is, of course, centered mainly upon the prepared sizes. Pea coal, while in fairly active demand, is not being entirely absorbed, and as a result, some of this size is going into stock. This is by no means a new feature at this season of the year as the minute fires are drawn there is an appreciable falling off in the demand for this size. Buckwheat coal is still being taken care of, many of the large buildings and apartment houses using this size for their boilers, and as cold weather is still in evidence requisitions for this size are absorbing all that is produced. Rice coal is far from active, and it is understood that much of this grade has been, and is still going into stock; the season just passed has not been a particularly active market for this size, and it is understood that some of the companies have quite large stocks.

The bituminous market still continues in anything but an active condition. Many contractors are still holding off in their purchases, feeling that they will be able to renew at the old figures, at least, and the operators are just as steadfast in their position, that late summer and fall may find the situation such as will make their present contract offerings look acceptable. Much cheap coal is being offered on the market, for current business, but the volume of tonnage sold is not great.

NEW YORK

Bituminous—The soft-coal market is rather quiet and dull, but, on the whole, steady and with prices being well maintained. Contracting continues somewhat slower than the operators would like to see, it being evident that consumers generally believe that they can do better by buying in the spot market for the time being at least. On the other hand, operators are showing no disposition to recede from their determination to obtain higher prices on this year's business,

and this fact is being forced home so conclusively on the buyers generally, that they are gradually signing up for the new year.

The spot market is quiet, the movement being confined almost entirely to contracts. Prices are being well maintained as supplies of soft coal in the open market are restricted. It was feared for a while that the flood situation in the Middle West would divert a large surplus tonnage into the Eastern markets, but such has not proved to be the case so far. Mines are working fairly well, but operators are careful not to overship the market so that some curtailment is being practiced. The local market is not quotably changed from over the past two weeks, and we continue quotations on the following basis: West Virginia steam, $2.55@2.60; fair grades, Pennsylvanias, $2.65@2.70; good grades of Pennsylvanias, $2.75@2.80; best Miller, Pennsylvania, $3.05@3.15; Georges Creek, $3.25@3.30.

Anthracite—Business in hard coal is quite active at the moment, but it is generally conceded that the spring trade is lacking in much of the strength that it has customarily shown in previous years. For the time being, however, there is a good, steady demand, which is absorbing the full possible production of the mines; this is general on all grades and sizes, there being no abnormal surplus or shortage in any particular branch. The steam grades, which ordinarily begin to ease off at this period of the year, have been somewhat stimulated by a short spell of rather cold weather, which created a temporary demand and an advance in prices. Production at the mines was interfered with during the first part of last week, but since Wednesday, mining has been up to full rated capacity, and the outputs are being readily absorbed.

Some individual coal is being offered at 10@15c. below the regular company circular, and, in some instances, such sales are being made for delivery into May and June. The nominal New York market is quotable about on the following basis:

		Individual	
	Circular	Lehigh	Scranton
Broken	$4 50	$4 45	$4 50
Egg	4 75	$4 60 @ 4 70	4 75
Stove	4 75	4.65 @ 4 70	4 75
Chestnut	5 00	4.85 @ 4 95	5 00
Pea	3.50	3.35 @ 3.45	3 50
Buckwheat	2.75	2.15 @ 2 45	$2 50 @ 2.75
Rice	2.25	1.95 @ 2.05	2.25
Barley	1.75	1.30 @ 1.55	1.60 @ 1.75

PITTSBURGH, PENN.

Bituminous—The Lake coal shipping season formally opened today, with all the railroads open to receive consignments. The first movement of Lake coal from the Pittsburgh district occurred about the middle of March, when certain railroads accepted coal destined to be loaded on specific vessels, which would clear later for upper lake ports, but this movement was small, and was entirely interrupted by the floods ten days ago.

A heavy lake movement is expected this season, prospects being that all records will be broken, as, according to all accounts, there are no stocks in the Northwest, and demand is good. Prices realized on Lake coal have been much better than last season, in keeping with the general strength of the market.

The railroads are now fairly well opened for traffic to Western points, since the floods closed practically everything. The main breaks are, that the Pan Handle is not open beyond Dennison, Ohio, while the Ft. Wayne is not open beyond Orrville. It is, however, open to many points beyond through the Cleveland, Akron & Columbus. Lines to the Lakes are all open. Most of the Pittsburgh district mines were scheduled for practically full operation this week, owing to the regular starting of lake shipments.

Nearly all the steam coal contracts for the twelve months beginning Apr. 1 have been closed, and it is claimed that in practically all cases full circular prices have been obtained, representing a very decided advance over prices in the past two seasons, and promising, with the large tonnage in prospect, by far the best year the Pittsburgh district coal industry has had for many years.

Premiums on slack disappeared several weeks ago, and the market now stands at the regular price, while there may be some cutting later on account of heavy production of slack during the season of lake shipments. We quote regular prices well maintained, as follows: Slack, 90c.; nut and slack, $1.05; nut, $1.25; mine-run, $1.30; ¾-in., $1.40; 1¼-in., $1.55 per ton at mine, Pittsburgh district.

Connellsville Coke—Regular channels are now open for coke shipments to almost all regular consuming points, but the furnaces have not been getting into operation very rapidly, and as they had coke on the way the shipments early this week have not been up to normal. The coke market has stood the sudden cessation of shipping facilities to points West, involving about half the total output of the Connellsville region, very well indeed, since there has been no open offering of standard furnace coke at less than $2.25, the market before the floods having been $2.40 to $2.50. It is possible a few special deals have been made whereby operators unloaded coke on furnaces at cut prices, the furnaces merely stocking the coke, but there is no evidence that much of this was done, and the open market is clearly quotable at $2.25 for standard furnace coke, both prompt and contract. Foundry coke, prompt and contract, is quotable at $3 and $3.50, depending on brand and tonnage.

BALTIMORE, MD.

Interference with shipments to Western points, on account of the floods, resulted in the local market being overstocked and prices were considerably lower than had conditions been normal. Western consumers prefer the two- and three-inch gas coal, and ordinarily, this kind of fuel will bring from 10 to 30c. more in that section than in the East. In marketing this they were compelled to meet the prices of three-quarter gas coal, which commands a readier market in the East. Toward the end of the week, the movement improved considerably, and the trade believes that by the time Lake traffic opens, transportation conditions will be normal.

Contract renewals continue, but some consumers are still holding off, preferring to take their chances for some weeks to come in the spot market. The car situation is satisfactory and the movement East good. The warm weather prevents any improvement in the anthracite business. The demand for coke has slackened, and the output has also been reduced; operators say that just enough coke is being produced to meet present requirements.

It is not believed that the damage done by the flood will materially affect the coal business in the West and Middle West, which means a great deal to the Baltimore companies. More contracts were renewed during the week, but a number of the larger consumers are still holding back, preferring to supply their current needs in the spot market. Cars were plentiful all the week. In many instances the supply was much greater than the demand, and this will continue until operations become normal again in the West.

There was no pronounced change in the coke market during the week; there is still a curtailment in output. Freezing weather the first half of the week, improved the anthracite market.

BUFFALO, N. Y.

Bituminous is quiet as usual at this time of the year and the weather for the past few months has created a surplus of anthracite. The railroads have for some time contributed to the bituminous surplus and, in this section and beyond, at least, they are still doing so, for the flood conditions did not last long enough in this section to seriously interrupt the movement. Reports from various Canadian points state that bituminous coal is still pouring in from the stranded shipments of some weeks ago. If the present stand of the leading shippers continues, there will be no further decline in prices.

In fact, the firmness in the bituminous market has been maintained for a month or more in the face of a demand less than the recepits, so that the trade is quite well satisfied as a whole. The opening of the Lake trade is at hand, though it is not now expected that much, if any, through sailing will be done till after Apr. 15. Buffalo Harbor has now about 150,000 tons of anthracite afloat, and rates have been made on the basis of 30c. a net ton to Lake Superior and 35c. to Lake Michigan, with an extra charge to minor ports. It is expected that more coal will be shipped to the upper-lake ports than ever before. There is still considerable bituminous on the market at cut prices, but the general trade holds up well to former quotations, $2.80 for Pittsburgh lump, $2.65 for three-quarter, $2.55 for mine-run and $2.15 for slack, with Allegheny Valley about 25c. lower. Coke is not very strong, but prices hold on the basis of $5 for best Connellsville foundry.

Facilities for moving coal northward over the Buffalo and adjacent routes are steadily improving, though possibly no faster than the traffic increases. The two coal-car ferries across Lake Erie are active and the one across Lake Ontario at Charlotte is to be enlarged. An arrangement is in operation by which coal for Canada over the Pennsylvania R.R. will no longer be stopped in Buffalo, but trains will be made up on the Pennsylvania line and run to the Canadian side of the Niagara intact. This will stop much of the complaint of coal being stranded in the city, while in process of rerouting for Canadian points.

Just now the local coal trade is commenting on the outcome of the tender for bids on the city waterworks coal sup-

ply. On the day for opening it was found that only one bid had been put in and that for $2.15, which was something like 30c. more than it usually is. Specifications were for "nut and slack," a sort of antiquated way of asking for slack and a little better. The lack of bidders and the high price is a direct protest against the practice of testing the coal and docking the contract severely on account of some supposed excess of ash. Coal men grew to regarding this practice as unfair and unjust to them.

COLUMBUS, OHIO

The coal trade here is slowly recovering from the effects of one of the most disastrous floods in the history of the state. While the damage done to coal mines directly was comparatively slight, still the loss to the industry as a whole will be large, this will be due mostly to the cessation of trade and the fact that railroads are not able to move coal cargoes promptly.

The flood caused quite a rush of small orders from dealers who either sold their stocks to take care of flood victims or had them floated away by the high waters. This business demanded immediate delivery, which the mine owners and the railroads were unable to make. It will be several weeks before all the railroads resume normal operations, and in the meantime the market will be more or less interfered with.

Prices became firmer under the influence of the flood, but operators and jobbers did not take advantage of the situation to boost quotations. Instead, they were content to let prices remain at the level which has prevailed for some time. There is a good demand for both domestic and steam grades with the latter becoming heavier as the temporary flood wants are satisfied.

Many factories were put out of commission by the high waters and it will require several weeks to get ready for operation. In some instances their stocks of coal were floated away and this will mean re-stocking at once. Railroads have not been taking a large tonnage because of their inability to run trains, but the demand from that source is expected to increase soon. Some railroad fuel contracts are pending, but little has been done recently toward closing them. It is generally supposed that prices on railroad contracts will be much higher than last year. There is a fair demand for the fine sizes and prices on those grades have advanced materially.

While the flood has interfered with the movement of coal, active preparations for the Lake trade are going on. Considerable coal has been loaded on boats at the lower Lake ports and it is believed that navigation will be formally opened by Apr. 15 and possibly earlier. The Northwest is anxious for the shipments to start.

Retail trade was active immediately after the waters subsided, but that condition is expected to be only temporary. Natural-gas connections in many places was cut off and this made an additional market for coal. Dealers' stocks are depleted and there is expected to be scattering orders from this time on.

Quotations in the Ohio fields are as follows:

	Hocking	Pittsburgh	Pomeroy	Kanawh
Domestic lump	$1.50	..	$1.50	$1.40
¾-inch	1.35	$1.20	1.35	1.30
Nut	1.30	..	1.30	
Mine-run	1.15	1.10	1.15	1 10
Nut, pea and slack	0.90	..	0.90	0.90
Coarse slack	0.80	0 75	0.80	0.80

BIRMINGHAM, ALA.

The only feature in the market during the current week was a general shading of prices on desirable steam-coal business. This adverse condition is due principally to a shortage of domestic orders for nut and this surplus, thrown on the steam market, has made it top heavy. No serious alarm is felt, however, as this condition usually appears annually about this season of the year. Relief will come as soon as dealers begin taking in regular tonnages of nut coal for stocking purposes.

The best grades of 72-hr. foundry coke are quoted at from $3.90 to $4.25 per net ton f.o.b. local ovens, with furnace-coke prices running from $2.75 to $3.25. The supply and the demand seem to be well balanced.

LOUISVILLE, KY.

While the flood waters have been subsiding now for a week or more, the railroads are in such poor condition that receipts at the consuming centers are far below normal. The coal industry suffered both directly by damage to operations, and by the interference with transportation on the railroads; with the mail and passenger service so completely demoralized as it has been, coal shippers have, of course, received little consideration. The heavy Lake shipments which should be well underway by this time are at a complete standstill.

As a result of the crippled railroad service many operators themselves, or their agents, are being forced into the market to obtain tonnages with which to maintain their contract agreements. This forced buying has inflated the market, and prices as high as $1.35 and even $1.50 f.o.b. the mines are being freely reported. Many of the distributing companies in the river towns and cities are entirely out of commission, their plants being from 100 to 300 ft. from the present shore line. This has, of course, had its effect on the wholesale trade. Western Kentucky mine-run has been eagerly taken up at 80 to 85c., although this grade seldom gets into the market except when screened. It is believed shipments for storage will be actively underway as soon as the transportation companies regain their grip on the situation.

INDIANAPOLIS, IND.

When, on Mar. 25, the flood waters in Indiana began carrying away railroad bridges, they stopped further shipments of coal to most of the industrial cities of the state. As a large number of factories were under water, however, the immediate arrival of coal was not of consequence. After two weeks, the railroads are beginning to haul freight again and small shipments of coal are coming in by roundabout ways, but the bulk of that moving is for the railroads themselves and for public utilities. Practically no coal is going through Indianapolis, which was the main sufferer by the flood. Operators believe that within another week they will be able to resume normal operations and shipments.

Indianapolis happened to be well supplied with coal, and as the weather was mild, the domestic needs were moderate and some of the largest steam users were incapacited by the floods. There were some large stocks of coal in the city, the Pennsylvania R.R. having the largest. No reports have reached here yet of flooded mines, but there is considerable damage in trackage washed away, etc. Mail, telegraphic and telephonic communication was cut off several days, as well as facilities for traveling, so that sales departments have had a vacation. Coal dealers have not raised prices and are selling at a discount, or giving coal away to flood sufferers.

DETROIT, MICH.

The general trade in and about Detroit, is suffering from a slump due to a between season condition, and coal operators and shippers are turning their attention to preparations for a large season in the lake trade. At the present time, the market is decidedly weak; however, it is predicted there will be quite a movement in steam trade, because all coal-carrying roads south of this point have been washed out by the floods. This is liable to cause a serious shortage in steam coal if the conditions are not remedied shortly.

The lake trade is drawing considerable attention from the operator. It is predicted that there will be some trouble in getting coal moved by cargo; on the other hand, it depends largely upon the way coal comes from the mines. Shippers say that if the mines and railroads are able to furnish as much coal as they would like throughout the season Lake Michigan consumers will not buy freely unless the rate is satisfactory to the vessel men; that 30c. per ton will not be attractive, is certain.

The following quotations prevail today:

	W.Va.	Gas	Hocking	Cambridge	Ohio No. 8	Pocahontas	Jackson Hill
Domestic lump	$1.50	..	..	..	..	..	$1 90
Egg	1 50	..	..	..	..	$1 75	1 90
Nut	1 40	..	$1 50	..	..	..	..
1¼-in. lump	1 20	..	..	..	..	..	..
¾-in. lump	1 10	$1 10	1 10	$1 10	$1.10	..	..
Mine-run	1 00	1 00	1.00	1 00	1 00	1 25	..
Slack	0 85	0 85	0.85	0.85	0.85	1 05	..

CHICAGO

As a result of the floods, shipments of coal to the Chicago market have been curtailed and storage piles are diminishing rapidly, while quotations on a number of varieties of coal have been advanced.

There has been an increase of 10c. a ton in the price of screenings. Lower-grade screenings from central Illinois have been commanding from 95c.@$1 a ton, and the price of other fine coal has been on a proportionate basis. Almost all of the fuel arriving in Chicago is being used for steam-making purposes. As a general proposition, it may be said that the supply is not more than two-thirds of the normal amount. It is expected that several weeks will elapse before the shipments of Indiana coal will be up to the average. The mines south of the Wabash and the White Rivers have been shut out of this market as a result of the floods.

Much difficulty has been encountered by Illinois operators in meeting the demands made upon them, due to lack of transportation facilities. The market for coke is strong.

Prevailing prices in Chicago are:

	Springfield	Franklin Co.	Clinton	W. Va.
Domestic lump	$2.07	$2.40	$2.27	
Egg		2 40		$3.95
Steam lump	$1.92@1.97		2.17	
Mine-run	1.87@1 92	2.20@2.30	1.97	3.30
Screenings	1.77@1.82	2.00@2.05	1.77	

Coke—Connellsville and Wise County, $6@6.25; byproduct, egg, stove and nut, $4.45; gas house, $4.75@4.85.

ST. LOUIS, MO.

There has been nothing out of the ordinary in the coal market here for the past week, and weather conditions are not such to make the future look encouraging. Prices are still the same, with practically no demand, and coal still comes in under demurrage. Several of the mines in the southern Illinois field have been put out of commission on account of the high waters, and this, of course, has had a tendency to keep a small tonnage out of the market for the present.

There is a rumor to the effect that certain Chicago operators are making arrangements to take over several Franklin County properties and consolidate them. However, there is some question as to whether this deal will go through on account of a difference of $75,000, it is rumored, between what one owner wants and what the Chicago people are willing to give. The property in question has never been considered a paying one, and it is possible that the stockholders may differ with their agent and let the property go. If an arrangement of this kind went through, it would be a wonderful help to the Franklin County operators by putting the scavengers of the coal business at the present time out of the way.

The anthracite companies are not as popular in this section as heretofore, and especially in this so with the jobbers. After the business in Illinois had been worked up by the jobbing interests in St. Louis, the anthracite combine has advised them that jobbers will be no longer allowed a discount off the circular, as the anthracite shippers are going after the small one-car customer direct themselves. However, it is a question as to whether anthracite will be in favor in the future on account of the utter disregard shown this market during the past winter. The preparation and sizing of practically all the anthracite shipped west this winter was poor.

One of the most discouraging features developed during the week was the price war between two or three of the retail anthracite dealers. At the moment the coal is being delivered consumers at the same price demand f.o.b. tracks.

The prevailing circular is:

	Carterville and Franklin Co.	Big Muddy	Mt. Olive	Standard
2-in. lump				$0.90
3-in. lump			$1.25	
6-in. lump	$1 20 @ 1 25		1.35	1.10
Lump and egg	1 25	$2 25		
No. 1 nut	1 10 @ 1 15			
Screenings	0.90 @ 0.95			0.65
Mine-run	1 05 @ 1.15			0.85
No. 1 washed nut	1 40 @ 1.50			
No. 2 washed nut	1 35 @ 1.45			
No. 3 washed nut	1 25 @ 1.30			
No. 4 washed nut	1 15 @ 1.20			
No. 5 washed nut	1 00 @ 1.05			

MINNEAPOLIS—ST. PAUL

Like the preceding months this year, March proved itself a disappointment to the coal trade and especially the wholesale end of it. While the retailers have been doing a fair business some of them will have to carry certain grades over to next year. In a number of towns in the Northwest, dealers have been unable to get hard coal during the past two or three months, while in other places, retailers stocked so heavy last fall that they will be forced to carry anthracite over for next year.

Steam users are reluctant about signing up contracts and at present are ordering sparingly, evidently expecting a repetition of last year's erratic market. While it is true contracts were taken at any price last year, the leading wholesalers in this territory are talking firm quotations, and it is thought the strife for tonnage will not be repeated again this year.

PORTLAND, OREGON

There is nothing new of particular interest to report in this district, excepting that spring weather has set in and the demand for fuel for domestic purposes is consequently lighter. Australian and Wyoming coals are quoted at $10, retail, delivered within a reasonable distance of the city center. While no Australian coal was imported here during the winter the supply is said to be abundant for whatever business may be expected until new shipments can be secured.

FOREIGN MARKETS

GREAT BRITAIN

Mar. 28—There is more inclination to enter into fresh business, although it is evident that the holiday influences have not been altogether overcome.

Quotations are approximately as follows:

Best Welsh steam	$4.68@4.80	Best Monmouthshires	$4.26
Best seconds	4.44@4.56	Seconds	4.08@4.14
Seconds	4.44@4.50	Best Cardiff smalls	3.78@3.84
Best dry coals	4.44@4.50	Seconds	3.54@3.60

The prices for Cardiff coals are f.o.b. Cardiff, Penarth or Barry, while those for Monmouthshire descriptions are f.o.b. Newport; both exclusive of wharfage, and for cash in 30 days—less 2½%.

FRANCE

Production of coal in France for the year of 1912 was 43,227,647 as compared with 41,229,090 tons for 1911. Production of coke in 1912 was 2,603,965 tons as compared with 2,487,183 tons for the year previous. Briquettes manufactured during 1912 amounted to 2,649,380 tons and in 1911, was 2,519,144 tons.

French Imports and Exports for January of this year and last were as follows:

	Imports 1912	Imports 1913	Exports 1912	Exports 1913
Coal	1,303,900	1,351,300	151,412	95,287
Coke	186,000	286,400	14,680	20,842
Briquettes	98,500	78,800	12,944	9,611

SPANISH IMPORTS

Imports of coal into Spain for January of the current year were 192,390 tons as compared with 194,789 tons in 1912. Coke imports were 25,327 tons in January of this year and 37,956 tons for the same month last year.

COAL SECURITIES

The following table gives the range of various active coal securities and dividends paid during the week ending Apr. 5:

Stocks	Week's Range High	Week's Range Low	Week's Range Last	Year's Range High	Year's Range Low
American Coal Products	87	87	87	87	87
American Coal Products Pref.	109½	109½	109½	109½	109½
Colorado Fuel & Iron	37⅛	34¼	36⅜	41⅜	31
Colorado Fuel & Iron Pref.			155	155	150
Consolidation Coal of Maryland	102½	102¼	102¼	102¼	102¼
Island Creek Coal Pref	86	85	85		
Lehigh Valley Coal Sales	225	210	210		
Pittsburgh Coal	21¼	19	21¼	24¾	19
Pittsburgh Coal Pref.	85½	84	85½	95	80½
Pond Creek	23⅞	22	23⅞	28¼	22
Reading	167¼	160⅝	165⅛	168¾	152⅜
Reading 1st Pref.	92	91	92	92	89⅜
Reading 2nd Pref.	94¼	91	94	94¾	87¼
Virginia Iron, Coal & Coke	49	47	49	54	44¼

Bonds	Closing Bid	Closing Asked	Week's Range or Last Sale		Year's Range	
Colo. F. & I. gen. s.f.g 5s	98¼	Sale	98¼	99	98	99¼
Colo. F. & I. gen. 6s			107¼	June '12		
Col. Ind. 1st & coll. 5s. gu	79½	80¼	78⅜	80	78¼	85
Cons. Ind. Coal Me. 1st 5s			85	June '11		
Cons. Coal 1st and ref. 5s		94	93	Oct. '12		
Gr. Riv. Coal & C. 1st g 6s		100	102⅜	Apr. '06		
K. & H. C. & C. 1st s f g 5s			98	Jan. '13	98	98
Pocah. Con. Coll. 1st s f 5s		87½	87½	87¼	87¼	87¼
St. L. Rky. Mt. & Pac. 1st 5s	77	79	76	Mar. '13	76	80
Tenn. Coal gen. 5s	100	102¼	100¼	Mar. '13	100¼	103
Birm. Div. 1st consol. 6s	101	102½	101	101	101	103
Tenn. Div. 1st g 6s		103½	102	Feb. '13	102	102
Tenn. C. M. Co. 1st g 6s		104	110	Jan. '09		
Utah Fuel 1st g 5s						
Victor Fuel 1st s f 5s		84	79½	Feb. '13	79½	79½
Va. I. Coal & Coke 1st g 5s	94	97½	94¼	Mar. '13	94¼	98

No Important Dividends were announced during the week.

The Lehigh Valley Coal Sales Co.—This company, which was incorporated last January, as a subsidiary of the Lehigh Valley Coal Co., in order to comply with the provisions of the Hepburn law preventing a railroad from carrying commodities owned by itself, declared its initial dividend of 2¼ per cent. recently. The company has a capital stock of $6,080,800 outstanding.

Roby Coal Co. (Cleveland)—The authorized capital stock of this company is $800,000, all of one class. It is an Ohio corporation, which, in January, 1902, increased its capital stock from $100,000 to $400,000, and in August, 1905, to $800,000. It is said to be producing at the rate of 1,000,000 tons per year.

PRICES OF MINING SUPPLIES

THE MARKET IN GENERAL

Business was better at the end of March than at the beginning. Sentiment improved more in the first week of April than in any month this year. This was not without several adverse factors, which would ordinarily force business in a contrary direction, but apparently the tide of pessimism has run its course, for the time being at least, and merchants and manufacturers are willing to take more risk in business, and assume more responsibility.

The settlement of disturbances in Europe helped matters materially, and the averted squeeze in money in Germany resulted in Europeans taking more interest in American affairs.

In pig iron, there is no discernible improvement. Prices have declined slightly, due in some instances to an oversupply and lower prices for coke, and a reluctance on the part of consumers to speculate in the market. The floods in the Middle West have, of course, upset all calculations in the last ten days, but it is evident that the damage to the large industrials particularly the iron and steel, is going to be much less than was at first believed.

The situation in metals has improved much more rapidly than any other line of industry. In the copper market there have been large sales, prices have advanced, and exports to Europe, the key of the copper situation, have been at record-breaking figures. It is believed now that copper will be still higher within the next few months as surpluses are being rapidly reduced.

LABOR

Labor all over the country is well employed, particularly rough labor, and it is almost impossible to secure enough competent men to do the work planned for this summer. Miners are in especially good demand. All the labor agencies in New York are reporting more orders for this class of help than can be filled. There is also a large inquiry for handy men and workers around mines.

Unrest among skilled workmen is not general, and aside from the firemen's strike, or the controversy over wages raised by them, there seems to be little dispute among the better paid employees. An extension of time has been granted to the arbitrators in the firemen's strike, and award will not be made for three weeks at least. One of the bitterest strikes in some time is that of the street car operators in Buffalo, N. Y., and another strike exists in New York among the employees of the International Harvester Co. or one of its subsidiaries. It will be recalled that last fall there was much discussion that the wages paid in this plant were extremely low, but that may have been largely due to politics. The demand for miners continues large, and exceeds the supply. Surface workers are also in excellent demand.

IRON AND STEEL PRODUCTS

Numerous features of interest developed early in the month of April in the iron and steel market. The chief of these was the flood of a number of plants in Ohio. This had a greater effect on the finished materials than on the blast furnaces, but in such districts as Hanging Rock, most of the furnaces were out of blast and one company had 55 furnaces out of blast at once. The American Sheet & Tin Plate Co., the largest manufacturer of tinplate and sheets, at one time was operating to only 40% of its tinplate capacity, and the sheet situation was almost as bad. Not as many wire mills were affected as others, but enough to have an effect on the situation. The floods will exert another potent influence on the market to buy in the near future, increasing the demand considerably for finished products. These will be used for rebuilding, and while the entire loss is estimated at a quarter of a billion dollars, it will not be replaced at once, and only a portion of it is covered by iron and steel, still there is a great deal of steel which will be used in replacement. Another factor of prime importance is the introduction in Congress of a new tariff bill which reduces duties all along the line in the iron and steel industry, as well as in the metal trade. While tariffs are never finally disposed of until they are signed by the President, it is now as good a time as any to take account of conditions, and from the present state of the market in both the United States and abroad, the new tariff will have little effect on iron and steel prices. It may be that some of the commodities used by large consumers along the Atlantic seaboard and the Pacific Coast will be imported rather than purchased from mills in this country. These, however, will in no way effect the coal trade.

Rails—The buying of rails was neglected by the railways during March, and only a few thousand tons were disposed of. The demand for light rails, however, was large, and mills rolling this kind of shapes have practically all the work on their books that they care for, for a few months to come. At the same time, street railway companies have been buying rails in large quantities, and this will take a good deal of the capacity from the T-rail rolls. Deliveries are not at all satisfactory, being made in eight and twelve weeks after orders are received.

Quotations continue unchanged at 1.25 cents per lb. for standard sections weighing 50 to 100 lb. per yard; 1.21 cents for 40- to 50-lb. rails; 1.30 cents for 16• to 20-lb. rails; 1.35 cents for 12- to 14-lb.; 1.40 cents for 8- to 10-lb. rails. These quotations are in carload lots f.o.b. Pittsburgh. In Chicago, 16- to 20-lb. rails are 1.30 cents; 12-lb., 1.35 cents; 8-lb., 1.04 cents. Relaying rails in Chicago sell at $24 per gross ton, and at times these rails can be had for delivery other than Chicago.

Track Supplies—The demand for track material has been unusually heavy. Before the floods, all the railroads of the country were trying to get as much material as possible, and since that time there has been such an urgent demand for prompt deliveries that railroads have reshipped material from one point to another. Spikes are held at 2.10 cents base for large lots, track bolts with square nuts, 2.40 to 2.50 base, and tie plates at $34 to $36 per net ton. These quotations are for Chicago delivery. In Pittsburgh, angle bars at 1.50 to 1.60 cents; spikes, 1.95 to 2.15 cents, and as high as 2.25 has been paid for prompt delivery.

Structural Materials—Structural mills are now figuring on much replacement work for the railroads, and as this is heavy material, and the orders come from their best customers, it will be pressed through, regardless of any other work. For this reason, deliveries for the next few months are bound to be slow, and for fabricated work of a light character, prices will be correspondingly higher. This applies only to the fabricating of the work, and not the actual steel. Some of the mills are not disposed to make contracts for the delivery of roof trusses and other light work until they learn how much bridge material will be required. Similar conditions apply to the plate market, although not as urgently as in the market for other structural shapes.

Quotations are unchanged at 1.50 cents, Pittsburgh, for future shipment, and 1.75 cents for prompt shipment. In Chicago, the quotation for future shipments is 1.68 to 1.73 cents, and prompt delivery from $1 to $2 per ton higher. Plates are 1.55 cents. In Chicago, plates are 1.68 to 1.73 cents on contract, and 1.78 to 1.83 for near-by shipments. All of these prices are per 100 lb. in carload lots and over.

Pipe—The flood damage affected several of the pipe mills, but it was not as serious in heavy lines as in other cases. The demand for pipe is large, especially the smaller sizes. Mills are making fairly prompt shipments, and within a month should be doing considerably better.

Discounts continue unchanged as follows: Steel pipe, 1½-in., in large lots from mill, black, 77%; galvanized, 66⅔ ¾- to 2-in. black, 80%; galvanized, 70½%; 2½- to 6-in. black, 79%; galvanized, 70½%.

Based on these discounts, the net prices of pipe are as follows in carload lots, f.o.b. Pittsburgh:

Size, inches	Cents Black	Cents Galvanized
¼	2 30	3 40
⅜	3 40	4 85
½	4 60	6 55
¾	5 50	7 70
2	7 40	10 30
2½	11 50	16 70
3	15.40	21 75

Sheets—The sheet mills of the country are more seriously affected by the floods than any other line. At one time, fully 50% of all the sheet mills operating in the country were compelled to close on account of high water, lack of power, or lack of material. Some of the mills, which for the

last month have been making low prices, were compelled to close on account of the high water. This removes the feature of weakness in the market, and prices may be expected to advance. Those of the trade who recall the San Francisco disaster, will remember at that time, there was a tremendous demand for sheets for temporary structures. While this present disaster is somewhat different, there will undoubtedly be a large inquiry for sheets in the affected districts. Deliveries can be made on contracts in about eight weeks. The general quotations are $1 per ton higher than last month. The following prices are for lots of a few bundles f.o.b. Pittsburgh and Chicago. This should not be confused with the quotation for carload lots, which is based on a price of $2.30 f.o.b. Pittsburgh for No. 28 black.

	Cents per Pound			
	Pittsburgh		Chicago	
	Black	Galv.	Black	Galv.
Nos. 22 and 24	2 75	3 55	2 70	3 50
Nos. 25 and 26	2 80	3 70	2.75	3 65
No. 27	2 85	3 95	28.0	3 90
No. 28	2 90	4 00	2.85	2 95

WIRE PRODUCTS

Wire—Activity in this line continues, and the fact that a great many wire mills in the Central West were put out of commission by the high water has stimulated interest in this market to a marked degree. Quotations are $1 per ton higher and considerable delay is experienced in securing delivery. For large lots, quotations are as follows: Painted barbed wire, $1.80 Pittsburgh; galvanized, $2.20; annealed fence wire, $1.60; galvanized, $2.05. In Chicago, annealed fence wire is $1.78, and galvanized $2.18. Barbed fence wire in that market is held at $1.98, and galvanized at $2.38. All of these quotations are per 100 lb. in fairly large lots. In small quantities, prices are advanced about 25c. per 100 lb.

Wire Rope—Business is more active, but prices are unchanged. Two-inch rope is held in Pittsburgh at 57c. per lin.ft., 1¼, 23c., ¾, 10c. These quotations are for the highest grade, and for large lots. Cheaper grades can be secured at slightly lower figures.

Telegraph Wire—The demand has been much larger than usual. Deliveries are slow, and it is practically impossible for small consumers to buy from manufacturers, and they are compelled to secure supplies from outside interests. Prices are as follows in cents per pound for wire measured in the Birmingham wire gage: "Extra Best Best," Nos. 6 to 9, 4¾c.; Nos. 10 and 11, 4½c.; No. 12, 4⅝c.; No. 14, 5⅛c.; "Best" Nos. 6 to 9, 3½c.; Nos. 10 and 11, 3⅜c.; No. 12, 3½c.; No. 14, 4c. Actual freight is allowed from Trenton, N. J., where it does not exceed 25c. per 100 lb.

Copper Wire—The market is much better, the demand large, and deliveries slow. Quotations have advanced ½c., and the base price of copper wire in fairly large lots is now 16½c. per lb.

HARDWARE

Bar Iron and Steel—Prices are firm, and stocks are fairly well assorted, and consumers secure supplies desired with little difficulty. Quotations from jobbers' store in New York and Chicago are as follows:

	Per lb.
Refined iron:	
1 to 1¾ in., round and square	2 15c.
1¼ to 4 in. x ¼ to 1 in.	2 15c.
1¼ to 4 in. x ¼ in. to ⅞ in.	2 35c.
Norway bars	3 60c.
Soft steel:	
¼ to 3 in., round and square	2 10c.
1 to 6 in. x ¼ to 1 in.	2 10c.
1 to 6 in. x ¼ and ⅞ in.	2 25c.
Rods—¼ and ⅜ in.	2 20c.
Bands—1½ to 6 x ⅛ in. to No. 8	2 40c.
Beams and channels—3 to 15 in.	2 25c.

Nails—While the demand for nails is not especially heavy, there is a shortage in the supply, due to the flooding of many nail manufacturing plants in the Middle West, and, at the same time, railroads are unable to move supplies from mills that have not been flooded, so there has been a fair amount of anxious buying among consumers who wished to secure supplies promptly. Quotations are higher at $1.80 Pittsburgh for large lots, and $2.08 in Chicago. In New York, wire nails from store at $2.10, and cut nails from store are at the same price In other jobbing centers, prices prevail equal to those in New York.

Rivets—Deliveries of rivets are unsatisfactory, because of the inability to get raw material promptly. Quotations are without change at $2.20 for structural rivets and $2.30 for boiler rivets. These prices are per keg of 100 lb. in carload lots, f.o.b. Pittsburgh.

Chain—Prices of chain are firm, but the buying has not been especially large. Ruling quotations per 100 lb., f.o.b. Pittsburgh, are as follows:

⅜ in	$7 50
½ in	4 95
⅝ in	3.95
¾ in	3.40
⅞ in.	3.20
1 and 1⅛ in.	3.00
1¼ and 1⅜ in.	2.90
1½ and 1⅝ in.	2.80
1¾ and 1⅞ in.	2 70
1 to 1¼ in.	2.60
Extras for BB	
⅜ in.	1 50
½ in.	1.50
⅝ in. and larger	1 25
Extras for BBB	
⅜ and ½ in	2c.
⅝ and larger	1 75c.

METALS

Copper—Seldom has feeling so changed concerning any single commodity, as has been the case in the copper market during the last month. Prices are now advancing steadily, and copper is selling at around 15½c. compared with 14¾c. a month ago. The exports to Europe during March were the largest on record, totalling nearly 42,000 tons, and the report of the Copper Producers' Association was especially satisfactory, showing a decrease in American stocks of over 18,000,000 lb. American consumers have bought largely, not only for present, but for future, delivery, and it is evident that they will have to buy more in the near future. The market for copper sheets is steadier, and sheet copper is selling at around 18½c. base in New York, and slightly higher prices at interior points. Quotations on copper sheets are for comparatively small lots.

Tin—Prices of tin advanced steadily, and in wholesale weights, tin is selling at around 5c. per lb. New York and Chicago. Solder, half and half guaranteed, sells at 27½@28c.

MISCELLANEOUS

Horse and Mule Shoes—The price of iron shoes f.o.b. Pittsburgh is $4.10 per case of 100 pounds. Steel shoes can be had at $3.85 per keg of 100 pounds.

Brattice Cloth—Seemingly, there is little change in the market for brattice cloth compared with last month, and although consumers are looking for lower prices, there is little hope of this for several months to come. Deliveries are somewhat better: at least, importers are promising better deliveries and while the demand is large, the supply is greater than two months ago. The new tariff as now planned, will not have any great effect on the brattice cloth market, and while it changes the method of levying the duty from a flat rate to a percentage rate, this does not at present operate in the consumer's favor.

Portland Cement—Makers of cement have more business on their books than ever before. All of the cement companies are holding prices very firm at around $1.58 in Pittsburgh and New York. This corresponds to a price of 90 to 95 cents per barrel in bulk at the mills, with an additional charge of 40 cents for bags or barrels. It would not be at all surprising if there were a serious shortage in cement later in the year, especially in the Middle West, for the consumption there promised to be larger than ever before previous to the flood.

Rope—It has been a number of years since the prices of rope have been as high as those now recorded. This is due to the world wide demand for all kinds of hemp and Manila products, and prevailing prices are nearly double those of last year. Best grades of Manila rope sell at 15 cents per pound in New York, while second grade is at 14 cents per pound. Sisal sells at 9 to 10½ cents.

Bars, Concrete Reinforcing—The market is active, and shipments are being urged by consumers of all classes. Stocks in the warehouse are considerably better than two months ago, but they are not at all large . Quotations from warehouse stocks in comparatively small lots are as follows:

PITTSBURGH PRICES IN CENTS PER POUND

	Warehouse Stock
¼-in.	2 00@2 10
½-in	2.05@2 15
¾-in.	2.10@2.20
⅞-in.	2.25@2.35

Triangular Mesh—Business continues active, and makers of this material have little difficulty in making prompt shipments From mills in De Kalb, Ill., quotations are 18c. per 100 lb. higher than those quoted below, which are 100 sq.ft. f.o.b. Pittsburgh. These are for lots of less than 10,000 sq.ft.

No. 23	$1 23	No. 32	$2.62
No. 23	2 05	No. 36	1.05
No. 26	1 42	No. 40	3.25
No. 28	1 97	No. 41	2 48

COAL AGE

Vol. 3 NEW YORK, APRIL 19, 1913 No. 16

Breakers Ahead!

IT is about time that some of the lookouts in the coal-mining industry shouted a warning: "Rocks ahead!" In a half-dozen states today, legislative programs have been proposed, which, if enacted into laws, would paralyze the coal business.

This is no time to sit idly in our hammocks and smoke the pipe of peace. The industry as a whole is asleep. The most it has done in years is to wiggle a toe or bat an eye when some "Idol of the People" has jabbed a harpoon into its anatomy.

Supposing all the citizens in Ohio knew that the "Green" bill, which seems about to pass the legislature of that state, is a measure that eliminates all premium on skillful mining. Under this act the men can shoot the coal to atoms if they please, and they will do this if the bill becomes a law.

Talk of conservation—can anyone conceive an act more inimical to all that the term means? Miners as a whole are as decent, as careful, and as intelligent as any other class of labor. But they are working for dollars, not fun, and when they are paid as much for dust as for lump coal, they will let explosives do the work, regardless of the quality or size of their product.

We stake our reputation that the result will be as follows: The percentage of slack coal will increase from 10 to 30 per cent, and the large sizes will decrease that same amount. The price of lump coal to the consumer will advance materially. More timber will be needed; more lives will be lost and general operating costs will increase.

If the miners of Ohio want more money for their labor, and can prove the justice of their claim, let them get it in some other way.

The "Green" bill is a step backwards, and in the end will not add luster to the fair name of coal mining in Ohio. The citizens will hold Mr. Green and his colleagues responsible when it becomes evident to all that the consumer has to pay the added freight.

Glance for a moment at Arkansas and Oklahoma, where, in addition to being shot from the solid, the coal is paid for on a mine-run basis, such as is suggested in Ohio. Since the law went into effect, screenings have gone up from 30 to 55 per cent. of the total output, and the price of lump coal has increased nearly 70 per cent.

Fortunately the solid-shooting law in Oklahoma has just been replaced by a bill recently enacted and to become effective July 1, which forbids any more coal to be shot unless it is first undercut. Legislation, some years ago, resulted in placing Oklahoma a decade behind Ohio in common mining practice. Proposed new legislation in Ohio may reverse the order of the two states.

Coal Age has always maintained its absolute independence and has based its every action on what seemed fair to miner and operator alike. We have never violated our belief that the industry can make no permanent headway except on lines of unquestioned integrity. Our policy has ever advocated fair wages and decent treatment to the men in return for honest labor.

We have been heart and soul with the miners in many of their fights for better conditions. However, in such matters as the "Green" bill in Ohio, and the 200 petty strikes that have occurred in the anthracite field since the recent wage agreement was signed, we question not only the honesty of the men, but the sincerity of President White and the Union officers in the different states concerned.

IDEAS AND SUGGESTIONS

Efficiency Improvement through Education

Education in basic principles increases the efficiency of the workman in all other handicrafts and professions, and one would be greatly surprised to learn that coal-mining was outside the scope of its influence.

The arbitrary popular division of industries into those requiring some skill in the manipulation of tools, or the exercise of some degree of mental dexterity in directing their peculiar operations; and those in which it is alleged brute force and a somewhat instinctive action alone are needed in their pursuit, is, of course, a mistaken one, with a mischievous prejudice as the result.

We have yet to be convinced that the skill considered requisite to carve a piece of wood, cut a block of stone along geometrical lines, apply the necessary temperature to the welding of iron, or direct the operations of the machine that reduces pieces of steel to symmetrical proportions, differs in aught else than degree from that necessary to the mining and blasting of a section of a coal-seam, in an atmosphere which may carry a deadly agent, whose detection depends upon the skillful handling of such a delicately adjusted piece of mechanism as a safety lamp.

There are incompetent masons and carpenters, just as there are inefficient miners, men who are a source of concern and loss to their employers, and whose bungling attempts to earn a livelihood are a menace to whole communities.

In either case the predisposing cause, as a rule, is directly traceable to lack of knowledge of a special kind.

From being an industry distinguished by the great simplicity of its operations, coal mining is rapidly being transformed into one of remarkable complexity, and its successful pursuit calls for special knowledge of a wide and varied character on the part of workmen and officials, and a general mental alertness that educational processes in theory and principle alone can provide.

It is no argument against education to aver that many apparently superior practical men have attained marked efficiency without much, if any, assistance from schools or text-books.

The uneducated efficient man does not exist.

Time and again some weak link in the chain of his arduously acquired experience gives way, and exposes his incompetence with terrible consequences to himself and others.

I have wrought alongside many so called practical men who boasted of their independence of theory, and who professed a contempt for book-knowledge. I rarely parted from even the best of such individuals without an opportunity for demonstrating the value of some despised principle, or theory, presenting itself.

It is education and its theories that have enabled the mine worker to displace the pick with the machine, the wedge with the explosive, the furnace with the fan, steam with electricity, the mule with the motor, the tallow-dip with the safety-lamp. It has enabled the miner to raise himself from the degradation of a chattel, through successive grades of improving self-respect, to the position he occupies today, where labor challenges the supremacy of capital, and calls for recognition on terms of equality when issues that affect the destinies of the industry are at stake.

In some mining districts in Scotland there is an agitation afoot to have instruction in the principles of mining incorporated in the elemetary schedules of the common schools.

In this matter it is the miners themselves who are moving; and they reason that in a mining community where the majority of the boys must inevitably follow the calling of the mines, many of the principles whose possession will be essential to their efficiency as bread-winners in after years, may be as successfully inculcated at the schoolbench as at the face of the coal-seam.

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Is the Mine Telephone a Failure?

By Sim and William H. Reynolds

The foreword in Coal Age of Feb. 8, on the mine telephone, or rather on the neglect of the mine telephone generally, should be of universal interest to mining men.

For some unaccountable reason many coal operations try valiantly, if foolishly, to get along without its invaluable aid. It is a safe assertion that not 5 per cent. of the coal mines in the Pennsylvania bituminous regions have telephones in running order. During the past year I have had occasion to visit, in a business way, more than 100 mines in the states of Pennsylvania, Ohio and West Virginia, and I, therefore, speak from observation.

While there are few modern mines that have not had a telephone system in use at one time or another, in dozens of them only the remains are to be seen today. Sometimes we find that the same official who had it installed has allowed it to disintegrate, but more often a shift in officials is the cause. If it were possible to interview all the foremen and superintendents who have had mine telephones and given them up we would probably find their reasons were: "Out of repair too often"; "Wires broken too frequently by falls"; "Too much moisture"; "Someone fooling with the line all the time." We have the first to find yet who did not acknowledge the great convenience and actual necessity of the system, and we have interviewed many on the subject. But because of one or more of the above reasons the upkeep was allowed to become neglected and final abandonment was the result.

In our opinions the failure of most mine telephone systems is because the management fails to recognize that it must be given the same consideration as a trolley line or a pipeline. If a wire carrying power to the mine is short-circuited or broken, somebody is "on the job" immediately. If a rail is broken or a pipe "busted" or a

pump "bucking," somebody is generally held responsible for getting it into shape again. But pity the poor telephone line; it is usually installed and then left to take care of itself, which is something mine equipment of any sort does not generally do.

Yet this is not because the utility of the system for mine use is not understood. There are too many hours of messenger service, too many bits of quick action can be taken, when quick action means money in the owner's pocket, for its practical qualities to be denied.

Several years ago the foreman of an old drift mine in Ohio found that the main haulage motor was losing a great deal of time because the motorman when in one of his two sections, which were a mile and half in, did not know what the conditions were in the other. Many times the motor waited for loads at one sidetrack while the drivers were waiting for empties at the other. At other times, near the finish of the day, when the motor had barely time to make another trip, the driver would err on the safe side (for himself) and not start in, for fear of meeting the drivers coming out, when if a telephone had been in service he could have notified the trapper at the sidetrack that he was coming. The loss of this last trip at that mine meant a great deal in the cost of the day's output. This was but one phase in the daily work where the need was urgent. The workings being so far removed from where the supplies for the mine were kept, caused a great deal of inconvenience and expense, and was a decided drawback to the proper management of that mine. So the foreman determined on having a telephone system rigged up, as the "made-for-the-mine" outfits were not on the market then as they are today, and the installation of a system which would serve for mine use was largely a matter of ingenuity, and subject to a great many discouragements. This one was no exception, and for sometime was very irregular in its service. Like Finnegan's report it was "Off agin, on agin" quite often. Sometimes a little fall would break the wires; at other times somebody would twist them together just for pure oneryness, and, on one occasion someone, evidently thinking the batteries were not strong enough, ingeniously connected a fine wire to the trolley line and "burned her up!"

But the foreman of that mine stuck to it, and finally placed the entire responsibility of keeping it in running order on a certain employee. He had that man make an examination of the entire line every morning, and *on foot*. And that system is in good use yet, though it has never consisted of anything more complex or expensive than the ordinary wooden case as used on the surface, protected from the mine air by a large box made by the mine carpenter, the latter being heavily coated on the inside with pitch, and covered on the outside with tarred roofing paper. The outfit consisted also of a good tight-fitting door, with ordinary steel wire for the line.

Aside from its advantage as a business proposition in the equipment of a mine the utility of a telephone system as a safety device can hardly be overestimated. This service alone should impel mine managers to install the 'phone. Instances innumerable are recorded where not only have accidents been avoided but relief brought more promptly when they did occur, and much valuable time saved when minutes meant both dollars and life. One instance we recall at a mine in West Virginia, where the man in charge had installed a telephone from the engine room at the shaft into the workings two miles underground.

A driver was injured by getting his head between a mine car and a post, and rendered unconscious. His fellow workmen notified the superintendent on the surface, who in turn called up the hospital two or three miles distant. As a result the hospital ambulance was on the spot before the injured man reached the shaft top, and within an hour of the accident the victim had received expert attention just in time to save his life.

Another instance we recall of a large mine fire in one of Pennsylvania's largest mines. A gas feeder was ignited as the machine cut into it; ordinary methods of fighting it proved futile, and flames were soon rolling back yards from the face. The mine telephone was put into action and the manager on top hurriedly decided to borrow a thousand feet or so of hose from the local fire department, and rushed it into the mine on a motor. Connection was made to a large pump line and the fire put out before it had a chance to get the entire section, if not the whole mine going.

Coal Prices at Suez and Panama

In a review of investigations by the United States as to the supply and relative cost of coal on the Suez and Panama routes to the far East, the *Manchester Guardian* notes that American and British coal will be brought into sharp competition, and prices at the coaling stations will, in many cases, determine whether the new or the old route will be taken by vessels sailing to the Orient, Australia and some ports of South America.

From Europe to Australia and the Orient generally the advantage of distance will be with the Suez route, but if, as is anticipated, in certain quarters, coal prices at stations on the new route can be maintained materially below those on the old, it will be cheaper for many vessels to make the longer voyage.

Prices of British coal at Suez are relatively high, ranging from $5.10 to $6.30 per ton, whereas it is expected that American coal will be supplied at Panama for $4.60 at the outside, and that in due time the price may be gotten as low as $4.15, or thereabout, at the Pacific end of the new canal.

Obviously if good American coal can be bunkered substantially below $4.90 a ton, many vessels will be inclined to take the new route to the Orient, Australia and New Zealand. At Norfolk, New River coal is only $2.70 a ton, and the freight rate from there to Panama is about $1.10. It is expected that eventually the government will be able to make contracts on the basis of $2.65 Norfolk, and with $1.10 for freight, and 50 cents to cover charges for storage, labor, etc., the coal can be supplied f.o.b. at the Atlantic end of the Canal at about $4.60 a ton, and that the price at the Pacific end will not exceed $5.

In 1913, the contract price for Welsh coal at Port Said was $6.33 per ton, the price to those companies renewing previous contracts being $6.21. It is probable that the United States government can profitably sell coal at Christobal for about $4.75, and at Balboa for $4.25 less than the price charged at the Suez Canal. This will be made possible, however, only by the government maintaining coaling stations at the Canal termini and by selling the coal at cost or with but very slight profit.

Mining in the Pocahontas Field

By Audley H. Stow*

SYNOPSIS—The Pocahontas district has long occupied a preëminent position among the famous bituminous coal fields of the world and the methods adopted there are watched with interest. The best portions of the district are controlled by two holding corporations who lease the land on a royalty basis to the operating companies. To insure the maximum recovery, under these leases, exhaustive studies into the best methods of mining have been conducted, and the results are quite interesting.

The famous Pocahontas coal is characterized more particularly by its relatively low percentage of volatile matter, as compared with other bituminous coals. It is, however, somewhat soft and friable, so that under the rather strenuous methods of modern mining and handling the

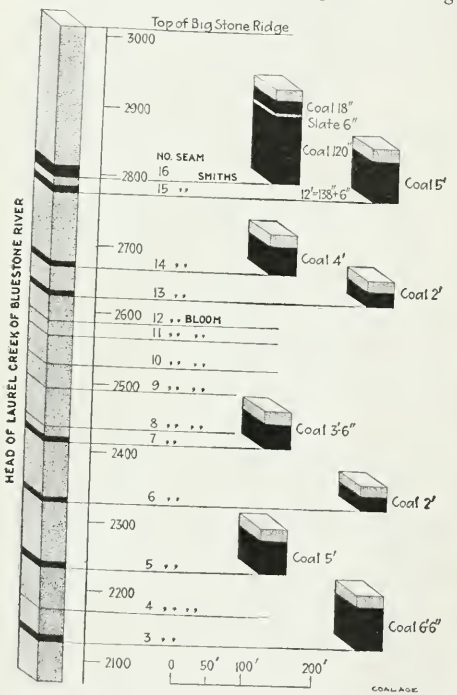

Fig. 1. Section of the Pottsville Measures, Showing the Pocahontas Seams

percentages of lump, egg and nut are not always as high as would be desired. In texture and appearance, Pocahontas coal resembles the Kentucky, Elkhorn or Jenkins seam of the Consolidation Coal Co.'s new operation, although, on the other hand, the latter has a high percentage of volatile matter, resembling the Pittsburgh coal in this respect. The analysis of the Pocahontas and certain Welch coals is much the same in regard to volatile matter, although as to physicial characteristics, hardness

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more particularly, they are the direct antithesis of each other.

The physical features of the Pocahontas field are unusually interesting. The mountains here, as in a considerable area in both West Virginia and Kentucky, are the result of erosion. The district was doubtless at one

Fig. 2. A 12-Ft. Outcrop of the Famous Pocahontas Coal

time an immense plains country, which was lifted to a great elevation, with a pitch of three feet in a hundred, toward the Ohio River. Erosion has since been rapid and with the exception of narrow bottoms along the creeks,

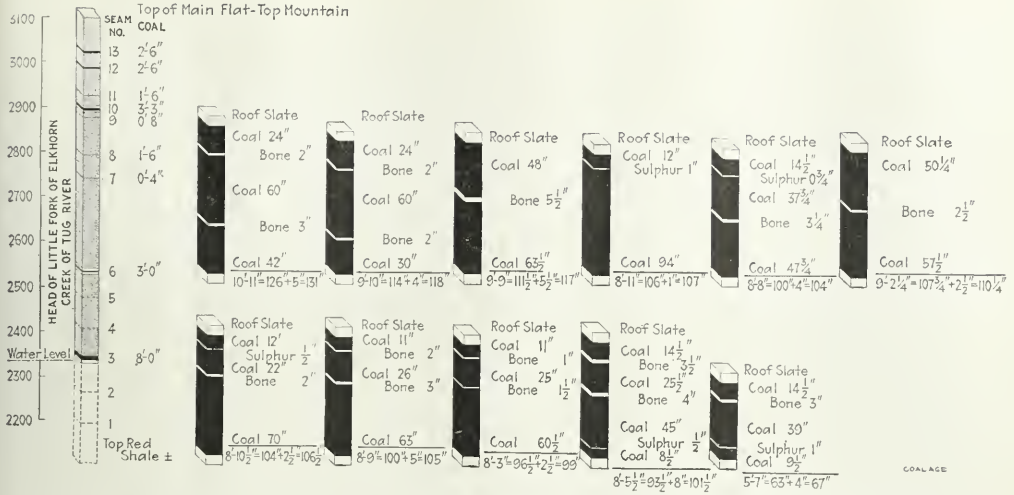

Top of Main Flat-Top Mountain
SEAM NO.
COAL
HEAD OF LITTLE FORK OF ELKHORN CREEK OF TUG RIVER
Water Level
Top Red Shale ±
Roof Slate
Coal 24" Bone 2" Coal 60" Bone 3" Coal 42"
10-11"=126"+5"=131"
Coal 24" Bone 2" Coal 60" Bone 2" Coal 30"
9-10"=114"+4"=118"
Coal 48" Bone 5½" Coal 63½"
9-9"=111½"+5½"=117"
Coal 12" Sulphur 1" Coal 94"
8-11"=106"+1"=107"
Coal 14½" Sulphur 0¾" Coal 37¾" Bone 3¼" Coal 47¾"
8-8"=100¾"=104"
Coal 50¼" Bone 2½" Coal 57½"
9-2¼"=107¾"+2½"=110¼"
Coal 12' Sulphur ½" Coal 22" Bone 2" Coal 70"
8-10½"=104½"+2½"=106½"
Coal 11" Bone 2" Coal 26" Bone 3" Coal 63"
8-9"=100½"+5"=105"
Coal 11" Bone 1" Coal 25" Bone 1½" Coal 60½"
8-3"=96½"+2½"=99"
Coal 14½" Bone 3½" Coal 25½" Bone 4" Coal 45" Sulphur ½" Coal 8½"
8-5½"=93½"+8"=101½"
Coal 14½" Bone 3" Coal 39" Sulphur 1" Coal 9½"
5-7"=63"+4"=67"
COAL AGE

FIG. 3. THE POTTSVILLE MEASURES ON ELKHORN CREEK AND SECTIONS OF THE POCAHONTAS NO. 3 SEAM

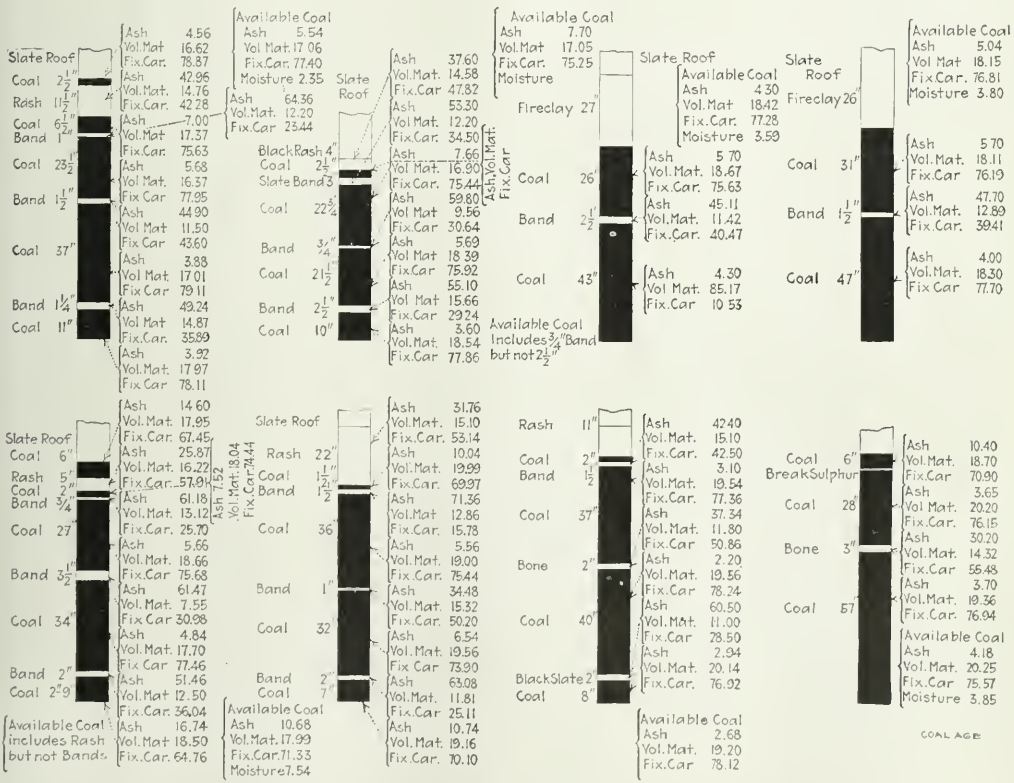
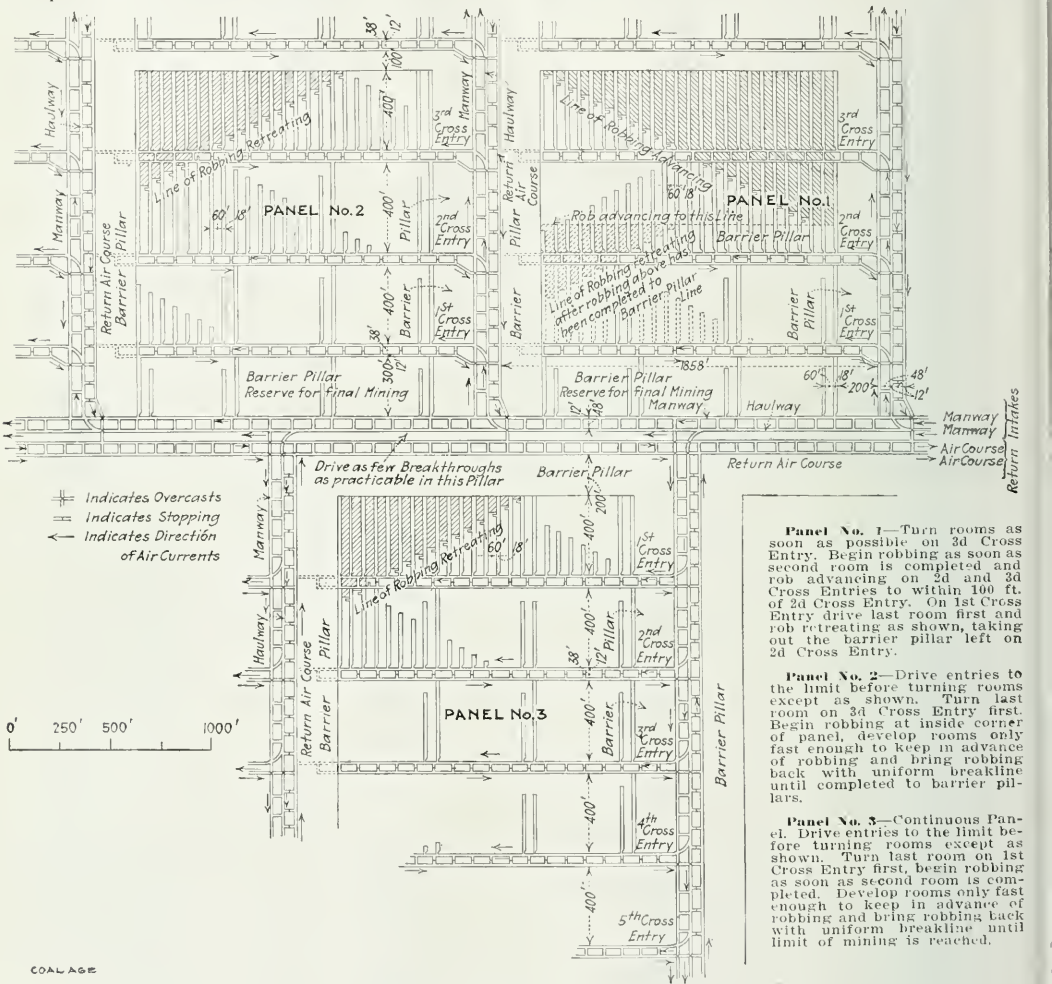

Slate Roof
Coal 2½" Rash 1½" Coal 6½" Band 1" Coal 23½" Band 1½" Coal 37" Band 1¼" Coal 11"
Ash 4.56 Vol.Mat 16.62 Fix.Car. 78.87
Ash 42.96 Vol.Mat. 14.76 Fix.Car. 42.28
Ash 7.00 Vol.Mat 17.37 Fix.Car. 75.63
Ash 5.68 Vol.Mat. 16.37 Fix Car 77.95
Ash 44.90 Vol Mat 11.50 Fix Car 43.60
Ash 3.88 Vol Mat 17.01 Fix Car 79.11
Ash 49.24 Vol Mat 14.87 Fix.Car. 35.89
Ash 3.92 Vol.Mat. 17.97 Fix Car 78.11
Available Coal Ash 5.54 Vol Mat 17.06 Fix.Car. 77.40 Moisture 2.35
Ash 64.36 Vol.Mat. 12.20 Fix.Car 23.44
Slate Roof
Black Rash 4" Coal 2½" Slate Band 3" Coal 22¾" Band ¾" Coal 21½" Band 2½" Coal 10"
Ash 37.60 Vol.Mat. 14.58 Fix.Car 47.82
Ash 53.30 Vol Mat 12.20 Fix.Car 34.50
Ash 7.66 Vol Mat 16.90 Fix.Car. 75.44
Ash 59.80 Vol Mat 9.56 Fix.Car 30.64
Ash 5.69 Vol Mat 18.39 Fix.Car 75.92
Ash 55.10 Vol Mat 15.66 Fix.Car 29.24
Ash 3.60 Vol.Mat. 18.54 Fix.Car 77.86
Available Coal Ash 7.70 Vol.Mat 17.05 Fix.Car. 75.25 Moisture
Fireclay 27"
Coal 26" Band 2½" Coal 43"
Ash,Vol.Mat. Fix.Car
Available Coal Includes ¾" Band but not 2½"
Slate Roof
Available Coal Ash 4.30 Vol.Mat 18.42 Fix.Car. 77.28 Moisture 3.59
Ash 5.70 Vol.Mat. 18.67 Fix.Car. 75.63
Ash 45.11 Vol.Mat. 11.42 Fix.Car. 40.47
Ash 4.30 Vol Mat 85.17 Fix.Car 10.53
Slate Roof
Fireclay 26"
Coal 31" Band 1½" Coal 47"
Available Coal Ash 5.04 Vol Mat 18.15 Fix.Car. 76.81 Moisture 3.80
Ash 5.70 Vol.Mat. 18.11 Fix.Car 76.19
Ash 47.70 Vol.Mat. 12.89 Fix.Car. 39.41
Ash 4.00 Vol.Mat. 18.30 Fix Car 77.70
Slate Roof
Coal 6" Rash 5" Coal 2" Band ¾" Coal 27" Band 3½" Coal 34" Band 2" Coal 2'9"
Ash 14.60 Vol.Mat. 17.95 Fix.Car. 67.45
Ash 25.87 Vol.Mat. 16.22 Fix.Car. 57.91
Ash 61.18 Vol.Mat. 13.12 Fix.Car. 25.70
Ash 5.66 Vol.Mat. 18.66 Fix.Car 75.68
Ash 61.47 Vol.Mat. 7.55 Fix Car 30.98
Ash 4.84 Vol.Mat. 17.70 Fix Car 77.46
Ash 51.46 Vol.Mat 12.50 Fix.Car. 36.04
Ash 16.74 Vol.Mat 18.50 Fix.Car. 64.76
Available Coal Includes Rash but not Bands
Ash 7.52 Vol Mat 18.04 Fix.Car 74.44
Slate Roof
Rash 22" Coal 1½" Band 1½" Coal 36" Band 1" Coal 32" Band 2" Coal 7"
Ash 31.76 Vol.Mat. 15.10 Fix.Car. 53.14
Ash 10.04 Vol.Mat. 19.99 Fix.Car. 69.97
Ash 71.36 Vol.Mat 12.86 Fix.Car. 15.78
Ash 5.56 Vol.Mat. 19.00 Fix.Car 75.44
Ash 34.48 Vol.Mat. 15.32 Fix.Car. 50.20
Ash 6.54 Vol.Mat. 19.56 Fix Car 73.90
Ash 63.08 Vol.Mat. 11.81 Fix.Car. 25.11
Ash 10.74 Vol.Mat. 19.16 Fix.Car. 70.10
Available Coal Ash 10.68 Vol.Mat. 17.99 Fix.Car. 71.33 Moisture 7.54
Rash 11" Coal 2" Band 1½" Coal 37" Bone 2" Coal 40"
Black Slate 2" Coal 8"
Ash 42.40 Vol.Mat. 15.10 Fix.Car. 42.50
Ash 3.10 Vol.Mat. 19.54 Fix.Car. 77.36
Ash 37.34 Vol.Mat. 11.80 Fix.Car 50.86
Ash 2.20 Vol.Mat. 19.56 Fix.Car 78.24
Ash 60.50 Vol.Mat. 11.00 Fix.Car 28.50
Ash 2.94 Vol.Mat. 20.14 Fix.Car. 76.92
Available Coal Ash 2.68 Vol.Mat. 19.20 Fix.Car 78.12
Coal 6" Break Sulphur
Coal 28" Bone 3" Coal 57"
Ash 10.40 Vol.Mat. 18.70 Fix.Car 70.90
Ash 3.65 Vol Mat 20.20 Fix.Car. 76.15
Ash 30.20 Vol.Mat. 14.32 Fix.Car 55.48
Ash 3.70 Vol.Mat. 19.36 Fix.Car. 76.94
Available Coal Ash 4.18 Vol.Mat. 20.25 Fix.Car 75.57 Moisture 3.85
COAL AGE

FIG. 4. ANALYTICAL SECTIONS OF THE POCAHONTAS NOS. 3 AND 4 SEAMS IN THE MINES OF THE UNITED STATES COAL & COKE CO., AT GARY, W. VA.

there now remains practically no level land, outside of a few comparatively small areas on the Flat-top Mountains. It is hardly plausible, either, that these areas or plateaus represent the surface of the original plains country.

The geology of the Pocahontas field, which is substantially the same as that of the New River, is well known and even the general statement that these measures are the equivalent of the Pottsville Conglomerate is almost that of the great No. 3 seam, as is shown by Fig. 1. Judging by sections shown later, large areas of the upper seams, equal in development perhaps to the New River field, have been eroded.

It is considered that the Pocahontas field is a shore deposit. However this may be, the No. 3 seam increases in thickness from Welch, the county seat of McDowell County, W. Va., toward Pocahontas, Va., where it reaches its maximum of 16 ft. in the No. 3 operation of the



Panel No. 1—Turn rooms as soon as possible on 3d Cross Entry. Begin robbing as soon as second room is completed and rob advancing on 2d and 3d Cross Entries to within 100 ft. of 2d Cross Entry. On 1st Cross Entry drive last room first and rob retreating as shown, taking out the barrier pillar left on 2d Cross Entry.

Panel No. 2—Drive entries to the limit before turning rooms except as shown. Turn last room on 3d Cross Entry first. Begin robbing at inside corner of panel, develop rooms only fast enough to keep in advance of robbing and bring robbing back with uniform breakline until completed to barrier pillars.

Panel No. 3—Continuous Panel. Drive entries to the limit before turning rooms except as shown. Turn last room on 1st Cross Entry first, begin robbing as soon as second room is completed. Develop rooms only fast enough to keep in advance of robbing and bring robbing back with uniform breakline until limit of mining is reached.

FIG. 5. GENERAL PLAN OF MINE DEVELOPMENT FOR THE POCAHONTAS COAL & COKE CO.

superfluous. The main producing horizon in the Pocahontas field is, however, nearer the underlying red shales than in the New River field. If, however, the Davy field on the Norfolk & Western Ry. be considered a part of the Pocahontas, then we also have what is nearly the equivalent of the New River field.

In certain portions of the holdings of the Pocahontas Consolidated Collieries Co., in the Pocahontas field, some of the upper seams have a development of coal rivaling Pocahontas Consolidated Collieries Co. This development of the seam is, however, abnormal, a more average thickness being 8 to 9 ft., although this is often considerably exceeded, as shown by Fig. 2, taken along the outcrop at Pocahontas, Va.

We have not, however, reached the Abbs Valley fault, where our No. 3 seam is turned up, rather abruptly, and stands on edge. Whether the location of this fault bears any relation to the original limit of the field, that is, of

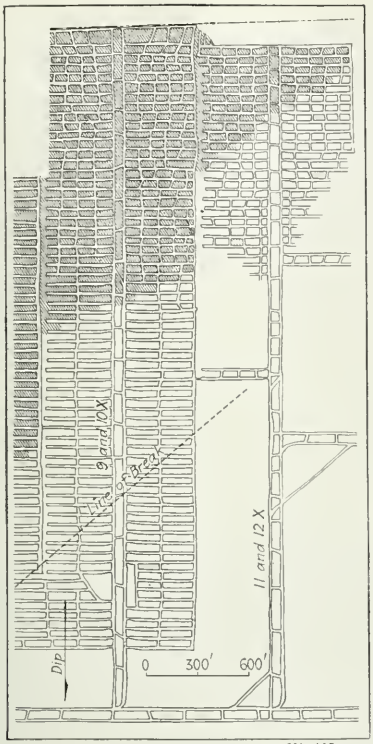


Fig. 6. Plan Showing Double-Entry System of the Upland Coal & Coke Co.

the ancient shore line, is a question of some interest; if this seam continued to increase in thickness on past the Abbs Valley fault, a rare and valuable body of fuel has certainly been lost. The fault line, however, is certainly the limit of the field on this side and may have also been substantially the original shore line; therefore, it is at least possible that it is also the limit of the somewhat thicker portion of the earth crust on which the Pocahontas coal was formed or deposited.

Beginning at a point on Bluestone River, say 25 miles down stream from Pocahontas, the No. 3 seam increases in thickness until the town is reached, but shows no further increase beyond, although it apparently holds its own.

Limits of the Field

The Pocahontas field proper is a relatively well defined area, bounded on one side by the Abbs Valley fault, and on the opposite by a line approximately parallel to this fault, and crossing the main line of the Norfolk & Western Ry. at the town of Welch, the county seat of McDowell County. The limits along this line are Susanna, on the Dry Fork, in one direction, and Pineville, the county seat of Wyoming County, on the Guyandotte River, in the other. This is the western limit adopted by the Pocahontas Coal & Coke Co., the Norfolk & Western Ry. in their car-allotment distribution, and by J. J. Lincoln in his tabulated statements of the annual shipments. This limit, however, is not an entirely satisfactory subdivision, as the measures of the No. 3 seam, for instance, really extend still further westward, getting, however, deeper and probably thinner, while the water and gas to be contended with, are necessarily considerable.

The two remaining and opposite sides are less sharply defined. In going from Pocahontas down Bluestone River, the seam becomes rapidly thinner, reducing to

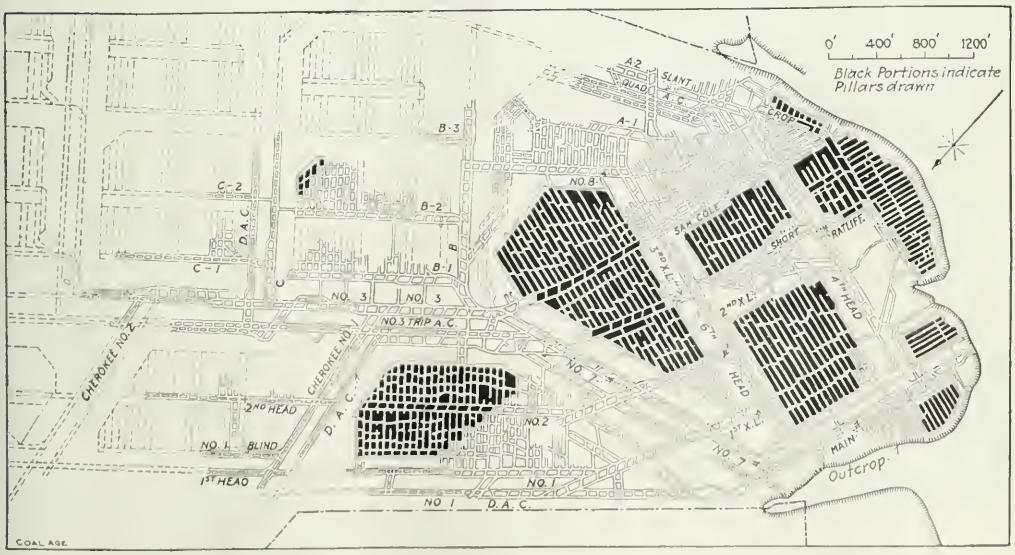


Fig. 7. General Plan of the Pocahontas Consolidated Collieries Co.'s Angle Mine

about 4 ft. in thickness, although it remains above drainage level, so that there is no gas to contend with. In the opposite direction from Pocahontas, along the Abbs Valley fault line, the No. 3 seam becomes deeper and deeper, finally going below water level, and, insofar as I have been able to ascertain, it is no longer found beyond a certain point.

Dip of Strata

From Welch to Pocahontas is nearly directly up the maximum pitch, which is about 3 per cent, or 150 ft. per mile. From Bluestone River to Pocahontas, and along the Abbs Valley fault, is roughly along the general strike of the measures.

There is one feature here that is of considerable interest from a mining standpoint and one which I have never seen referred to elsewhere. With the Caswell Colliery (Pocahontas Consolidated Collieries Co.) as a center, there is quite an area of the field in which there is practically no general dip. The local hills and hollows in the seam are very moderate and might be likened to the waves of the sea, or rather as the long ground swells on a calm day.

From the Caswell Colliery toward, and past, the town

Fig. 8. Surface Plant at the Original Pocahontas Tipple

of Pocahontas, roughly on the line of strike, a zone is reached between the Abbs Valley fault, and the usually regular dip toward the Ohio River, in which there is a marked change in the general dip of the strata; a broad anticline having a gentle slope is developed here, along the summit of which the No. 3 seam is locally eroded. From this anticline toward the Abbs Valley fault the pitch is again sharply reversed, immediately at the fault line, resulting in a syncline, one side of which is almost vertical near the surface.

The sections of the No. 3 seam shown in Fig. 3 were obtained in the vicinity of the Pocahontas Consolidated Collieries Co.'s property and are typical of the best of the field in which this company is located. The thinner sections of the No. 3 seam are due to a split that occurs near the top of the seam at different points, Welch, for instance. However, there is, roughly, 6 ft. of coal, divided into three benches, one of 4 ft. and two of 1 ft.; the partings are about 10 in. thick, so can hardly be termed partings, in the usual sense of the word. In spite of the fact that this field was almost entirely bought up 25 years ago, the number of inquiries for strictly number one, low-priced properties, is certainly amusing.

The sections shown on Fig. 4 are from the holdings of the U. S. Coal & Coke Co. and were furnished by Howard N. Eavenson, chief engineer.

Plans of Mining

The entire Pocahontas field proper is practically all leased out on royalty by two large holding companies, the Pocahontas Coal & Coke Co. and the Crozer Land Association. Under the lease contracts, the holding companies have reserved the right to define the method of working, and the result, on the whole, has been highly satisfactory to all concerned.

A standard plan of mining, by Thomas H. Clagett, chief engineer of the Pocahontas Coal & Coke Co., is shown in Fig. 5; this is largely followed by their lessees, although in instances materially modified, due to local conditions. This large holding company owning or controlling some 275,000 acres of Pocahontas coal, has in active operations some 45 leases, covering about 145,000 acres. The Pocahontas Coal & Coke Co. and the Crozer Land Association control about 75 per cent. of the Pocahontas field, proper, the holdings of the former extending over into the head waters of the Guyandotte River. The Virginian Ry. traverses the northeastern part of the Pocahontas field.

One of the special advantages of the system of mining

Fig. 9. Angle-Norfolk Collieries of the P. C. & C. Co.

adopted by Pocahontas Coal & Coke Co. is the relatively quick recovery of the pillars, and the panels are so driven that the rooms and all entries split the pitch; thus if the maximum pitch is 3 per cent., then the maximum for the workings will not exceed 2 per cent. and may be even slightly less.

The method of working adopted by the Upland Coal & Coke Co. on one of the Crozer leases, as furnished by John J. Lincoln, chief engineer, is shown in Fig. 6. Were the crop line shown on this plan it would be evident that the break line is carried in from the crop and does not involve, strictly speaking, breaks in the solid. There may be several "lifts" where the width of lease is too great to admit of one lift only, as shown. This plan of mining, Mr. Lincoln states, was evolved from a number of years of revisions and has been found entirely satisfactory under all conditions. The main entry is to be driven as near the line of the strike as possible, in order that the reverse grade against the loads may be negligible. If the cross entries are turned off at more than 90 deg. from the main, and the rooms are less than 90 deg. off the cross entries, grades in favor of the loads may be obtained. The Crozer Land Association has 12 operations under active mining.

The Pocahontas Consolidated Collieries Co.'s Angle colliery, as of July, 1912, is shown in Fig. 7. Soon after

taking up the work of the old Norfolk Coal & Coke Co. (which was essentially the nucleus of the Pocahontas Consolidated Collieries Co.) in 1904, the work of revising the systems of mining was taken up in detail. One of the first improvements adopted was the introduction of the multiple air-course system, as illustrated in *The Engineering and Mining Journal,* Jan. 26, 1907, under the title of "Ventilation in Flat Coal Seams." After further discussion, James Ellwood Jones, then general manager of the old Norfolk Coal & Coke Co., and now of the Consolidated, finally approved and authorized the panel system, which was afterward illustrated in a series of articles by myself, in *The Engineering and Mining Journal.*

The Pocahontas measures are not merely the geological equivalent of the Pottsville Conglomerate, but they are also in many instances actually like it, particularly toward the top, where the hard, flawless sheets of sandstone are studded with white quartz pebbles. Even where the pebbles are absent, the sandstone is about as low and dense, the thickness being commonly 50 to 80 or 90 ft. without the smallest trace of cleavage or bedding planes. The shearing force of these great sandstones must certainly be enormous and materially affect the pillar work, owing, in part, to the absence of sufficient soft material to pack and thus aid in carrying the weight. The immediate overburden is at times disintegrated, particularly when the surface has been eroded fairly close down to the coal, but squeezes are usually of a vicious nature, if such an expression may be used in this connection. It is due to this that the barriers are much larger than would be necessary in many mining districts.

In my opinion, 1000 or 1200 ft. square is the minimum area that can be safely robbed, in the solid, under these conditions; that is, without a free edge. The second panel, entirely in the solid and with, say, 500 ft. of cover, as shown in Fig. 7, has been almost completed. In the Angle mine, as in the Norfolk, this method of robbing has, so far, been entirely satisfactory. It need hardly be said that the smaller the panel the quicker the returns that may be had from a given territory.

Tipples

There is, essentially, a Pocahontas type of tipple, not that there are two in the field (except, possibly, the U. S. Steel Corporation tipples) that particularly resemble each other, in detail, yet the "family resemblance" between many of them is quite noticeable. The Pocahontas tipples are a compromise between the simple low structure common to Ohio and Indiana where several grades of coal are screened directly into the railroad cars, and an anthracite breaker.

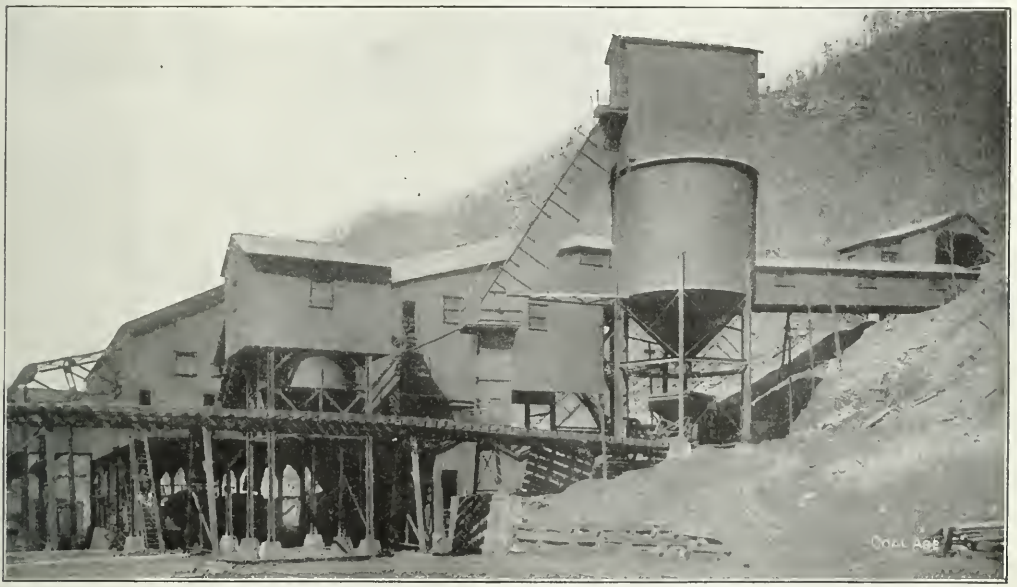


Fig. 10. General View of the Empire Coal & Coke Co.'s Surface Equipment

Quite a few of the more influential engineers in the Pocahontas field in the earlier days, were from the anthracite field. Our valleys are quite narrow and by the time a bank of railroad coke ovens with tracks and miner's houses and other buildings were arranged for, it is not difficult to understand that room for a two-track tipple in the earlier days, appeared to be about the limit; thus storage was necessary for the other grades. In the Pocahontas type of tipple either egg or nut, and slack are usually stored, and commonly all three.

The egg and nut coals thus stored were screened over top screens just before being loaded into cars, so that the slack accumulated in storage was removed, and returned to the slack bin, to be coked. The loss in size of the stored coal at that time appeared negligible, while the slack thus recovered was just that much less to be crushed.

Today the constant conversion of, say, ½-in. egg coal,

into slack at a time when the former may be selling at a fancy price, with perhaps little or no demand for coke, appears a serious loss, compared with which the additional outlay for two or three extra tracks where same are at all practical, is a relatively small item.

The original Pocahontas tipple and a new steel tipple, both within the limits of the town of Pocahontas are shown in Fig. 8. Fig. 9 shows the Angle-Norfolk tipple, and Fig. 10 the Empire Coal & Coke Co.'s new steel tipple in which breakage in handling is thought to be reduced to a minimum. The Consolidated has already authorized a new tipple, with two others underway, in

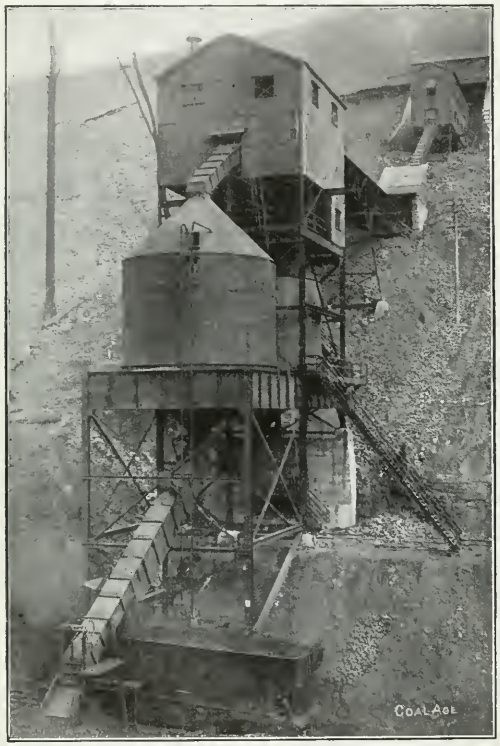


FIG. 11. THE NO. 4 TIPPLE OF THE U. S. C. & C. CO.

which there will be at least four, if not five, loading tracks.

The steel tipple at the No. 4 works of the U. S. Coal & Coke Co. is shown in Fig. 11. In this tipple, after the coal is dumped, it goes to a picking table, and from there through a chute and then over a rubber belt conveyor; it is then either crushed, going into a bin, to supply the ovens, or is sent without crushing into another bin, to be stored as mine-run. In a general way, the main output of the U. S. Coal & Coke Co.'s works is at present crushed slack.

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Coal was for a long time mined extensively on the west coast of British North Borneo on the island of Labuan, but owing to misfortune work was abandoned and the machinery taken out about two years ago. The only mine now worked in North Borneo is at Silimpopon on the east coast near the border of Dutch Borneo.

Production of Coal and Coke

The advance sheets of the report of C. B. Ross, mine inspector for the second bituminous district, in Pennsylvania, shows 53 out of a total of 54 mines in operation; of these, eight are gaseous and 45 nongaseous. Three new mines were opened and one mine abandoned during the year. The total production of coal for the district, during the year, was 8,521,201 short tons, of which 7,102,581 tons were produced by pick mining, 1,072,954 tons by compressed-air machines and 345,666 tons by electric coal-cutting machines. The total number of persons employed inside the mines was 5472; the number of fatal accidents in the mines 29, and nonfatal 53. The coal produced, per fatal accident inside, was 293,834 tons, and the number of persons employed inside, per fatal accident, 188. The number of coke ovens in operation was 4679 out of a total of 5791, and the coke produced was 2,395,393 tons; number of persons employed at the manufacture of coke, 1450.

The advance report of W. H. Howarth, mine inspector for the 16th bituminous district, in Pennsylvania, shows 37 mines in operation out of a total of 43, of which 28 are gaseous and nine nongaseous. The coal produced during 1912, in this district, was 7,634,497 short tons, of which 3,469,935 tons were produced by pick mining, 2,007,773 tons by compressed-air machines and 2,156,789 tons by electric coal-cutting machines. There were 5224 persons employed in the mines and a total number of 24 fatal accidents occurred, making the number of tons of coal produced, per fatal accident inside, 318,104 tons. The number of persons employed, per fatal accident inside, was 217. There were 5487 coke ovens in operation, out of a total of 5987; while the coke produced was 3,679,233 tons and the number of persons employed at the manufacture of coke, 1165.

⁂

Binders for Fuel Briquettes

Experience in European countries and investigations made at the fuel-testing plant of the United States Geological Survey at St. Louis, and later by the Bureau of Mines at Pittsburgh, have shown that lignite may be successfully briquetted without the use of any additional binding material, and that the most satisfactory binders for anthracite, semi-anthracite, bituminous and subbituminous coals are coal-tar pitch, gas-tar pitch and asphaltic pitch, or inexpensive cementing mixtures that are practically waterproof.

Of the 19 briquetting plants in commercial operation in the United States during 1912, 10 used as a binder coal-tar pitch, or mixtures in which it is the chief ingredient; one plant used asphaltic pitch, two used water-gas pitch; four used mixed binders whose composition is not made public, and two (one operating on peat and the other on carbon residue) used no binder. The number of plants using coal-tar pitch as a binder exceeded all the others put together.

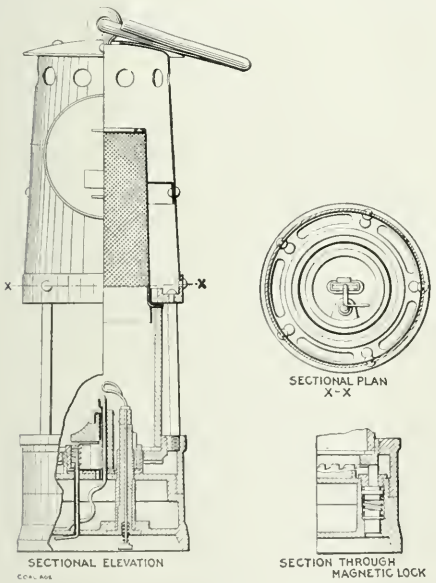
Inorganic binders, such as cement, have not given satisfactory results, for, although they may form efficient binders they have the serious objection of increasing the ash and adding nothing to the combustible elements of the fuel. Binders made of organic material, however, such as pitches from coal-tar, gas-tar or asphalt, contribute combustible material and do not increase the amount of ash.

Our British Coal-Mining Letter

Special Correspondence

SYNOPSIS—A review of recent improvements in by-product coke-oven processes and tar distilling. Power can be made at a low price by using gas from coke ovens. Electricity from coke-oven gas is sold in Belgium for less than 7 mills per kilowatt-hour despite the high cost of the fuel used. Much oven gas is purchased by the city of Ghent. The "minimum wage," as provided by arbitration, is so low as to have inappreciable influence on wage scales. Power cables in shafts should be light and unarmored. Some lamps are described which are approved for use by the British Home Office.

Reference has already been made* in a previous issue to a paper on the "Progress in Byproduct Recovery at Coke Ovens" read by F. E. Christopher before the Manchester section of the Society of Chemical Industry, and since



The Hailwood Lamp Approved by British Home Office

published in the Journal of that society. The following is a summary of his remarks.

The recent changes in coke ovens are in the direction of increase of size and decrease of coking time. In the United States, ovens of the Semet-Solvay type, utilizing the continuous regenerator system, are being built, 5 or 6 flues high, of such size and duty that they will coke 16 tons of coal within 24 hours.

Tar Is Removed Mechanically

Some of the newer byproduct plants remove the tar particles at a relatively high temperature and then pass the gas thus purified through sulphuric acid, thus saving much of the heat and complication and reducing the waste liquor. In the Simon-Carvé system, the heavier tars are removed by passing the gases through a cyclone extractor without moving parts. The rapidity of the rotation throws the drops of tar to the periphery and causes their deposition. Only the lighter tars go to the extractor. Here the rapid motion of vanes removes the light oily globules and concentrates them centrifugally. To Mr. Christopher, the separate extraction of light and heavy oils seems to be based on correct principles.

The really direct process of making ammonium sulphate, thus briefly sketched, appears to have tempting advantages as far as thermal losses are concerned. The gases contain all the water originally to be found in the slack and that due to the combination of the elements of water in the coal. If these are kept at a temperature above 176 deg. F., the dew point will not be reached and the water will be carried without deposition through the various processes to the place of combustion.

Difficulties with Benzol Recovery

When benzol is not to be recovered, the direct process is clearly the best to adopt. To obtain the benzol, the gases must be reduced to 77 deg. F. This causes the water vapor to condense but the effluent is clear because of the mechanical removal of tar which precedes such cooling. As no additional water is used in the absorption of the ammonia, that retention being effected chemically by the sulphuric acid, the effluent is only one-half that usually formed.

Fuel Savings in Tar Stills

Tar distillation is now receiving more attention from designers and several coke-oven firms are also erectors of tar plants. In a coke-oven plant of the Evence Copper Co., fuel is saved by using the heat in the vapors from the latter portion of the distillation to drive off the water and oils in the earlier part.

The Hennebutte process of tar distillation is now being installed by the Coke Oven Construction Co. Several plants on the continent of Europe are using the process. The tar is first heated by an inclosed steam coil. Then it is passed on to a still, into which air is injected. Some of the hydrogen in the tar combines with the oxygen to form water. The heat thus liberated is amply sufficient to provide for distillation.

Little change can be observed in the design of benzol plants. The tendency today, however, seems toward the production of refined products at the works.

Power at 3 Kw.-Hr. for 2 Cents

Contracts have been signed for the supply of coke-oven gas to the existing municipal gas-works at Ghent. The gas is to be supplied from ovens of the Semet-Solvay type and the contract is for 105 to 210 million cubic feet per annum at a price equivalent to 10.8c. per thousand cubic feet. Power is also to be supplied at 0.66c. per kilowatt-hour for a guaranteed consumption of 3 to 6 million kilowatt hours.

The importance of the byproducts is shown by the fact that the relative values of the output of an oven are:

*"Coal Age," Mar. 22, Vol. 3, , 452.

coke 60 per cent., byproducts 25 per cent. and gas 15 per cent.

The Minimum Wage Not Harmful Because Ineffective

It was explained by G. A. Mitchell in a lecture at Glasgow University on "The Minimum Wage in the Coal Trade," that the men at the face are usually paid on contract, because supervision is impracticable. In Scotland, the minimum wage is about $1.50 per day for every man and boy employed underground. Owing to the advance in miners' wages in Scotland, since the act was passed, the minimum-wage rates have had little effect on wages.

It may be anticipated that when times again become normal the act may (1) destroy, to some extent, the incentive to work, (2) cause many workmen to lose employment, and (3) result in men losing earnings by being sent home frequently from their work. The workmen, in the view of Mr. Mitchell, will not gain any great advantage by the act, except in some cases where the day-wage rates have been raised by its operation. There is no margin of profit to pay the increase of cost, and it must be passed on to the consumer if the collieries are not to stop.

Increased prices might cause a loss of export trade and hamper home industries, unless increases in wages in Great Britain are accompanied by increases in competing countries or lower cost is brought about by improvements. The workmen should coöperate for their own advantage with the operator in reducing costs instead of hampering him by working short time and by opposing labor-saving devices.

Cables for Mine Shafts

At the present time in Great Britain much attention is being directed to the use of electric cables in the mines; and among other papers, one has been read by E. Kilburn Scott before the Association of Mining Electrical Engineers. Briefly some of his points are: (1) The weight of shaft cables is a most important factor in their design, and in order that it may be reduced, high-tension aluminum cables should be used without steel armoring. (2) The place of the latter as a return-current path can be taken by continuous metal work already in the shaft, or by old haulage ropes suspended for this purpose. Cab tire sheathing may be employed to give more flexible and impermeable mechanical protection than ordinary steel armoring. (3) Telegraph poles sawn longitudinally are more suitable than plank casing, such as has hitherto been used. Such casing would be cheap and easy to erect, and it would form a complete protection to the inclosed cable.

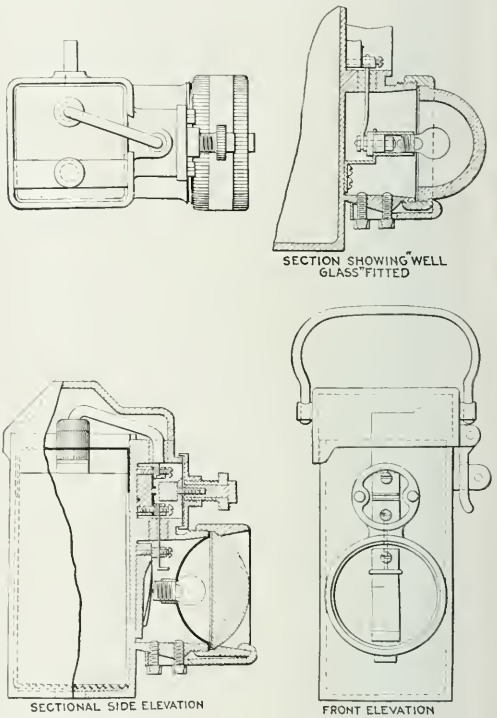
Saccharine for Preserving Casing for Cables

It is better to impregnate wood for casings or cleats with saccharine than with tarry or other chemical substances, because it has no action on insulation or metals. When wood is impregnated with both saccharine and arsenic it is proof against white ants. In a New South Wales mine the armor on a shaft cable was rendered useless by the atmosphere in less than six months, and in Great Britain a steel rope, used in a shaft as the earth return, became so corroded that a special copper cable had to be put in its place.

In discussion the British Electrical Inspector of Mines, Robert Nelson, declared that he was not in favor of aluminum cables for shafts.

Approved Safety Lamps

The first lamps approved by the Home Secretary under the Coal Mines Act for use in all mines to which the Act applies are the Hailwood Lamp No. 1 (made by Ackroyd & Best, Ltd., Morley, near Leeds), and the Oldham "Emergency" Electric Lamp (made by Oldham & Son, Denton, near Manchester). The Hailwood lamp is approved, provided that the strength of material and at-



The Oldham "Emergency" Electric Lamp Approved after British Official Test

tachments throughout the lamp are not less than in the sample submitted to the mechanical tests; that the oil and wick used in the lamp are such that it can maintain all around in a horizontal plane a light of not less than 0.30 cp., as determined by a pentane standard throughout a period of not less than ten hours; that the glass is of an approved type and its dimensions within stated limits.

The Oldham lamp is approved, provided that its total weight is not more than 4.5 lb.; that the strength of material and attachments throughout the lamp are not less than in the sample submitted to test; that the lamp is capable of maintaining a light of not less than 1.5 cp. throughout a period of not less than ten hours; that the lamp is used only for the work of rescue or exploration in the case of an accident or other emergency or by officials.

Use of Purchased Power in Coal Mines

By H. C. Eddy*

SYNOPSIS—The writer shows that the central station has most power to sell at the time of day when the operator has most need of it, so that a low price is possible for the coal-mining requirements. Many of his arguments apply equally well to the establishment of private central stations with high-tension current.

The ideal corporation may be defined as a coöperating aggregation of individuals of specialized ability.

The practical application of this idea has produced industrial companies whose activities frequently become so extensive and so diversified as to make it desirable to separate them into component parts, each exercising those functions which it is especially fitted to perform. Thus we find the huge industrial organizations of today made up of a number of departments, each complete in itself and each virtually a corporation, in the sense of the definition given above.

Competent Heads of Departments Impoverish Small Companies

This division and segregation of corporate activities is practicable only in comparatively few instances, as the cost of thoroughly competent heads of departments becomes too great a burden for the companies of less than extraordinary size to carry. In the majority of cases it becomes good business policy to carry out this division of effort by depending upon outside agencies, whose sole function is to supply, in the most economical way, some certain requirement.

Thus the function of public-utility companies is to supply transportation, transmit information and distribute electricity, water and gas, each a highly specialized branch of service calling for the expenditure of much capital, technical knowledge and broadgage thought, to reach the fullest possible development.

There is then a sound fundamental basis for the existence of an organization whose sole business is to make and sell power in both large and small quantities.

However sound the abstract theory of the central station as a power merchant may be, its continued existence depends upon its ability, in practice, to supply power on a basis which shall be reasonably profitable to both parties concerned in the transaction.

An analysis of the conditions of use of power in the bituminous coal mines in Pennsylvania and Ohio discloses certain general facts which are decidedly favorable to the purchase of power, when available, as compared with the operation of independent plants.

Mine and Domestic Demands for Power not Synchronous

There are but few mines in these fields that operate more than sixteen hours per day, and many that run but a single shift. The double-shift basis of operation is, however, sufficiently common to be considered typical. The load curve of such a mine shows that approximately two-thirds of the total kilowatt-hours per day of twenty-four hours, is used between 7 a.m. and 4 p.m., the remaining one-third being used between 6:30 p.m. and 1 a.m.

During the working day the demand is quite variable, fluctuating between wide limits for short periods. The widely different conditions existing in the individual mines make it practically impossible to give accurate values to the various elements of load. In one mine the grades may be in favor of the loads to be hauled by the locomotives, while in another case the reverse may be true; tipples may be above or below the level of the mine opening; fan operation may be required continuously at a high rate of air discharge or the reverse. Notwithstanding all these variables, the general characteristics of the total load are quite uniform in being removed from the central-station peak.

The application of alternating-current motors to mine equipment is not general, practically all mines operated by electric power using direct current at either 250 or 550 volts. This necessitates the use of either synchronous converters or motor-generator sets when power is purchased. When the latter are used it is the general practice to specify synchronous motors, on account of the somewhat better efficiency to be obtained, as compared with induction motors, and also for the improvement of the power factor.

Power Companies Covet Coal-Mine Business

The advantages to the central station which justify low prices for mine power, may therefore be summed up as follows:

The considerable amount of power used.

The "off-peak" load.

The extensive application of synchronous motors, tending to raise the plant power factor, with the attendant advantages.

From the standpoint of the mine operator the advantages of purchased power are more numerous.

Coal Mines Should Use Purchased Power

The most important consideration is that of cost. It is obvious that in this presentation of the subject, no comparisons of actual figures can be made, but it lies within my province to indicate the essential reasons for a relatively high cost of operation of independent mine power plants.

The controlling element lies in the load factor, which may be defined as the ratio of average use of the equipment required to meet the maximum load conditions.

The daily load factor is much higher than the monthly ratio due to the fact that during the month the average number of working days ranges from 15 to 20, due to car shortage, market conditions and temporary labor difficulties. The annual load factor is even lower, due to the same general conditions, but upon a more extended basis.

The result of this condition is that the investment in power plant and equipment is idle for much of the time, and as interest, depreciation and taxes are continuous charges, the result is that the actual output of

Note—Paper read at the Pittsburgh meeting of the American Institute of Electrical Engineers, Apr. 18 and 19, 1913.

*Contract agent, American Gas & Electric Co., 30 Church St., New York, N. Y.

the plant carries a very high fixed charge per kilowatt-hour.

This condition does not exist when power is purchased, except so far as it applies to the current-transforming apparatus. The cost of equipment per kilowatt of capacity being much lower than the cost of complete plant equipment, there is a substantial saving to be effected in this item of power costs.

The actual manufacturing cost, exclusive of overhead charges, under conditions of widely varying load and intermittent use of generating equipment, becomes much higher than would be found with exactly the same apparatus working more continuously.

The Necessity for High-Tension Distribution for Economy of Operation

The individual mine plant is usually located at the least favorable point, considered electrically, i.e., at the mouth of the mine. As the mine is developed the electrical center of the load recedes from the plant location and the losses in the distributing system constantly increase. The extent to which it is advisable to increase the investment in copper to minimize voltage losses can be determined only by a careful survey of the conditions applying to each particular installation.

Aside from the actual copper loss, the low voltage obtainable at the point of delivery of current brings in its wake a high maintenance cost for motors on locomotives and coal cutters, chiefly in the form of armature and commutator repairs. These troubles are directly traceable to the abnormal volume of current required by reason of the less than normal voltage. Aside from this actual expense there is the loss of possible output due to reduced capacity of motors brought about by the unfavorable conditions of current supply. This loss is far greater than the actual cost of repairs and its magnitude is often unappreciated by mine operators.

These conditions may be remedied to a great extent, if not practically eliminated, where power is purchased, by placing converters or motor-generators so that the mine distributing system may be fed at several points, thus materially reducing line losses, equalizing line voltage, and bringing it up to the normal working voltage of the motors in use. As the mine is developed and new conditions arise with respect to the distributing system, the location of the conversion equipment may readily be changed. This flexibility is impossible with a complete steam plant.

In Any Mine Low-Tension Station Equipment Soon Becomes Useless

In any successful concern the growth of its operations is ordinarily greater than originally expected. The coal-mining industry is no exception to this general rule, and operators are periodically faced with the proposition of extending and enlarging individual plants to meet the greater demands for output.

Usually this problem is solved by adding boilers, engines and generators, with a resulting greater investment of capital than would be required by the addition of a motor-generator set. The capital invested in plant equipment in excess of the cost of motor generators would earn much more per year, if put into strictly mining machinery.

The Intelligence Charge

The operators of mine plants are ordinarily handicapped by the character of labor available for power-plant operation. In some cases mines are so located with regard to living conditions that really skillful engineers may be obtained and kept. In more instances, however, the conditions of work and locality of the mines do not prove attractive to the best men except as a temporary expedient. It is more often than not, a case of a more or less regular procession of engineers through the cycle of being hired, endured and "fired."

As a natural result the average mine plant receives less than an ordinary amount of skilled attention, when, by reason of the severe conditions under which it operates, it should receive more. Under such circumstances it is to be expected that the cost of maintenance and repair will be high. Aside from labor conditions the item of boiler repairs and replacement is usually excessive on account of the bad water conditions that are so commonly found in coal districts.

Where power is purchased the care required by conversion apparatus does not call for an expert man in constant attendance. The ordinary daily care required may be furnished by the necessary switchboard operator.

It is obvious that the employer's liability hazard, so far as power supply is concerned is greatly reduced when power is purchased than when a steam plant is operated.

The tendency of labor and other costs entering into the production of power is upward. This can only be met and compensated for in the case of the central station through the use of generating equipment of the very highest economy, by the securing of business of a diversified character of use, enabling the operation of the plant under good load conditions each hour of the twenty-four, and through quantity production.

Summary of Advantages to the Purchaser

The advantages gained by the mine operator by the purchase of power are direct and may be summed up as follows:

Reduction of fixed charges on investment.

Reduction of actual operating costs due to the fact that only power is paid for, without stand-by charges due to intermittent operation, and by reason of the higher efficiency of electrical apparatus at any load, as compared with steam-generating equipment of the character available for mine work.

Material reduction of distribution losses.

A considerable increase in the output of mining machines and locomotives due to maintenance of speed through normal voltage.

Flexibility of location of motor-generators, enabling them to be placed at points giving the best operating results, and to be readily and cheaply moved as conditions change.

Reduction of labor costs for attendance.

Elimination of high maintenance, repair and replacement costs for boilers, piping and engines.

Reduction of cost of superintendence, enabling the mine superintendent to devote his entire attention to securing output.

Reduction of liability.

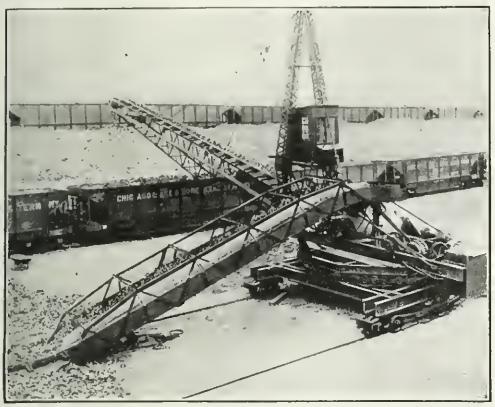
Insurance against constantly increasing power costs, through term contracts at fixed rates.

Additional coal available for sale.

Storage and Reclaiming Machine

On page 572 of our issue of Apr. 12, we published a description of the Jeffrey-Hamilton storage and reclaiming machine, together with a line drawing of a possible installation.

We illustrate herewith one of these machines which was designed by William E. Hamilton, built for the Illinois Steel Co. and installed at Stockton, Ill. This machine is identical with that illustrated in our previous issue with the exception that it is for a wider gage of track. It has successfullly loaded 2000 tons of coke per day which is equivalent in bulk to 3000 tons of coal and it can be used with equal facility for either piling the material upon the storage yard or reloadiug it into railroad cars.



Machine Reclaiming Coke from Yard

Nearly all storage systems in use today break the coal more or less, making careful rescreening and regrading necessary. This may be quite an important item in the cost of coal storage. As an illustration, let us take the case of anthracite coal which we will assume has an average value, including the freight charges, of $5 a ton. The breakage and degradation resulting from ordinary methods of storing and rehandling is often as much as 10 per cent., causing a depreciation of from 30 to 50c. per ton in total value.

By using a storage machine of this kind in conjunction with a rubber-belt conveyor if necessary, the breakage in storing and reclaiming is practically nil and this item alone, the manufacturers claim, will, in many cases, pay the first cost of the machine in a single season.

So Near and Yet So Far

There is a tiny hamlet in southern Alaska, called by the natives Katalla, boasting of a few hundred inhabitants, which really knows what the high price of coal means. Each and every ton burned in that town costs exactly $21.75. And within 25 miles is one of the richest coal deposits in the world. It is the famous coal region about which the Pinchot-Ballinger-Cunningham-Guggenheim controversy was waged. The Federal government now controls those deposits, and the inhabitants of Katalla are prevented, through this control, from mining their fuel needs, which total only 60 tons annually, and are forced to depend upon fuel mined many hundreds of miles away.—*The Wall St. Journal.*

The Two Wise Pumpmen

By J. K. Allardyce

(Written expressly for "Coal Age")

You fellows who would like to learn
Just how to run a mine,
Get near the pumpman and his pal,
When these two worthies dine.

They know it all from A to Z,
And "never had no school";
Where clean-drilled talent cautious creeps,
They rush without a rule.

And while they munch their bread and cheese,
Or wrestle with a chop
The whole mine scheme is up for trial,
From motor to a prop.

Hank lights his pipe, and slowly puffs,
While Slade tucks in a chew—
'If coal is what they want, says Slade,
I know what I should do."

The mine is on the bum—that's clear—
And faster, every day,
Things peter to a little point,
Where some fine morn they'll stay..

Hank dumps the ashes from his pipe,
And fills it up again
From Tim, the trackman's sack; and says—
"I can't make out our men."

"I told the boss the other day—
Says I—it's strange to me
How that wet west can ever pay."
"You mind your pumps," says he.

It happened once, this clever pair
With complex problems wrought—
When through the trap door popped a light—
The boss was on the spot—

"Six men, says he, have just gone home
From water in the south."
Slade's chew went down, and Hank's old pipe
Slid from his nerveless mouth.

Pennsylvania Bituminous Examinations

Examinations of candidates for the office of mine foreman, assistant mine foreman and fireboss, in the bituminous region of Pennsylvania, will be held, May 6, 7 and 8, by the examining boards in each of the several inspection districts.

Central-Station Power for Mines

By J. S. Jenks

SYNOPSIS—Abstract of an address before the Pittsburgh meeting of the American Institute of Electrical Engineers. The paper is devoted chiefly to a historical sketch tracing the development of the West Penn system from its original installation of 120 hp. to its present aggregate of 15,000 hp. in coal-mining service alone.

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This subject covers such a broad field that it would be folly to undertake to cover more than a limited portion of any particular branch; hence I will deal only with the historical side of the question as it has to do with the development of central-station service in connection with coal mining on the West Penn system.

Central-station power for mine service has been greatly handicapped by the prejudice of some engineers and mine inspectors who have actually fought the installation of such power, stating that it was not as reliable as an isolated plant, was more dangerous on account of the high voltage and more costly.

In order to overcome these objections it was necessary to prove the reliability and advantages of central-station service. The objection of the mine inspectors was the hardest to overcome. Even after the operators were convinced that purchased central-station service was more economical and were in favor of installing it, the inspectors frequently prohibited its adoption for some uses in and about the mines, particularly for fan service.

They contended that mine ventilation was of such importance that no mining company should be dependent on another corporation for its power for fan operation. It was only after years of successful employment in all other classes of mine service that we were able to overcome this prejudice and succeed in getting the mine inspectors to approve central-station service for fans, much less recommend it.

The engineer, and the electrical employees, opposed central-station service for obvious reasons, one of which, frequently frankly admitted, was, that with its adoption they would have no job. The truth of the matter has been that it has actually enlarged their field of labor, as more mines are being electrified every day on account of the many advantages which it offers, thus requiring the services of an engineer and electricians to most efficiently install and operate central-station power.

The first installation of central-station service in a mine on the West Penn system was made at the Larimer mine of the Westmoreland Coal Co. in 1896. It consisted of a 120-hp., 4000-volt, single-phase, 133-cycle, induction-type synchronous motor, belted to a 100-kw., 500-volt, direct-current, multipolar generator.

The switchboard consisted of a standard direct-current marble panel with ammeter, voltmeter, circuit-breaker and switches. The alternating-current board consisted of a wooden panel having mounted on it a small two-pole oil switch for controlling the large motor, a two-pole knife switch for the starting motor, pilot and synchronozing lamps. This apparatus was located in an underground substation as it was feared it might be damaged by employees during strike periods if it were above ground.

In order to supply this service there was installed at the power house of the Irwin Electric Light & Power Co., at Manor, one 150-kw., single-phase, 2000-volt, 133-cycle alternator and a 125-kw. transformer for raising the generator voltage to the transmission and motor voltage.

The line consisted of two No. 4 insulated wires carried by glass insulators on a two-pin crossarm over private right-of-way from Manor to the substation located near Circleville, except through the town of Irwin, where the pole line was on the street. The length of this line was about five miles. A telephone line consisting of duplex insulated wire was strung on a ridge pin on the top of the pole.

The entrance to the underground substation was made by sinking a bore hole through which lead cables were carried to a tunnel which led to the machine room. In order to protect the lead cable where it entered the ground, a high circular stone wall was built around the bore hole.

The apparatus supplied from this substation consisted of six mining machines, a 10-hp. pump and a 60-hp. haulage, but no fan service was supplied for reasons already explained.

The first trouble that developed was the falling in of the substation roof, which not only damaged the apparatus, but put the mine out of service for some time until the débris could be removed and a brick lining put in to prevent a recurrence of similar trouble. This brick lining sweated so that it made all the apparatus wet, which resulted in frequent burnouts of the starting motor. In order to insure reliability, duplicate starting motors were provided and at times it was a problem to keep one in condition for service. This difficulty was partially overcome by putting a wooden lining inside the brickwork.

The next difficulty arose from a breakdown in the lead cable, caused by lightning. This had the effect of charging everything in the substation. It was overcome by removing the lead from the cable and supporting it on glass insulators, except where it passed through the bore hole.

The next weakness developed in the oil switch which consisted of eight ½-in. brass rods working through small brass bushings, mounted on a wooden board submerged in oil. This two-pole switch had eight breaks of about ¾ in. each and was contained in a tank 8x10x9 in. and operated by handwheel and pinion. This made a slow-operating switch, with which it was difficult to synchronize. After numerous interruptions, caused by failures of this apparatus, a make-shift device consisting of an ordinary two-pole, two-break, knife switch on a marble base was mounted on insulators in the bottom of a half barrel. The switch handle was removed and a broom stick tied to the crossbar with a belt lace. Leads were brought over the edge of the barrel and connected to the switch. The barrel was then filled with oil, and the switch operated by pulling or pushing on the broom stick.

This switch was so much more easily operated and such improvement was made in the time of synchronizing that the consumer would not have it changed and it re-

mained in service until the substation was finally abandoned on account of the mine being worked out.

The Irwin Electric Light & Power Co. was acquired by the West Penn interests and in 1905 the 133-cycle power house at Manor was discontinued and service established from a 60-cycle turbine station at Connellsville through 28.52 miles of 22,000-volt transmission lines and a substation at Manor. This necessitated the reconstruction of the motors from 133 to 60 cycles. The work on the large machine was done in the field and the starting motors were sent to the factory one at a time. This reconstruction had the effect of reducing the capacity and resulted disastrously in the case of the starting motors, making it necessary to provide larger machines.

The next trouble to develop was rather peculiar in that the large motor started to drop out of step without any apparent cause and would do so when pulling practically no load. This was a puzzling circumstance and no amount of adjusting by the attendant seemed to remedy the trouble. It was found, however, when the supply from Connellsville was generated by a single unit that this departure from synchronism was most pronounced. Later it was discovered that there was a splice in the belt between the motor and generator that caused a jerking which would get in step with the governor mechanism on the turbine, causing the latter to hunt. This hunting was exaggerated in the motor, making it drop out of step. The remedy consisted in direct connecting the motor and generator, which happened to be the same speed.

On account of the high voltage of the motor it was necessary to have its frame insulated and a satisfactory insulating coupling became necessary. This was solved by turning the shafts end to end, setting the pulleys about six inches apart, drilling and tapering their rims and laying a piece of belt around inside of both pulley rims and securing it in place with capscrews. This proved a satisfactory flexible insulating coupling, which gave no trouble and operated for a number of years until the mine was worked out.

Notwithstanding the difficulties enumerated, this installation proved a satisfactory one to the mining company, and led to many other large installations.

The first mine where West Penn service was used for fan operation was at the Penn Gas Coal Co.'s mine near Penn Station, and consisted of a 100-hp., 500-volt, direct-current motor, belted to the fan. This was installed about 1901 when the mine was completely electrified with direct current. The equipment consisted of numerous pumps, mine machinery and a large haulage. The fan operated until 1907 when this motor was replaced by a 200-hp., alternating-current, two-phase, 60-cycle machine. This installation, which originally consisted of about 500 hp., has been increased from time to time until it now has about 1250 hp. in electric motors.

In 1907 our first high-tension installation was made at a coal mine. This was at the Naomi mine of the United Coal Co., near Fayette City. In this case the Coal Co. built its own substation and bought current at 22,000 volts, installing three 200-kw., 22,000- to 440-volt transformers, one 300- and one 150-kw. synchronous motor-generator sets, one 150-hp., alternating-current haulage, a 100-hp. chain lift, two 75-hp. fan motors, alternating-current pumps and numerous haulage locomotives and mining machines.

Another prominent example of a coal-mine installation where the most minute detail was worked out by the engineers in charge with the idea of producing the most efficient results is illustrated by the Keystone Coal Co.'s installation at its Crows Nest substation. Here 1500 hp. is delivered at 2300 volts from 22,000-volt transformers installed in the substation, together with the necessary switches and lightning protection. This installation consists of a 750-hp., alternating-current haulage, two 300-kw. synchronous motor-generator sets, two 150-hp., alternating-current pumps and many locomotives, mining machines and small motors.

While the growth of central-station service was slow at first, it is now growing rapidly, and from the original installation in 1896 of 120 hp. we have steadily added all kinds of mine installations until at the present time we have in operation 76 coal mines, consuming 14,831 hp. and have contracts with 10 companies which aggregate 5701 hp., which is being installed as rapidly as possible. This will make a total of 20,532 hp. In addition to this we are at the present time figuring with a number of coal companies and have every reason to believe that in a short time we will have under contract more than 10,000 hp. additional, which will increase our total to over 30,000 hp. in coal-mine service only.

The Alaska Land Frauds

SPECIAL TELEGRAPHIC CORRESPONDENCE

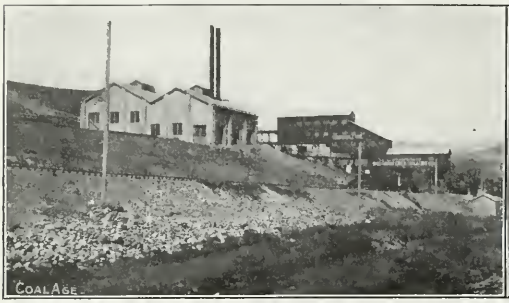
The cases of Raymond Brown and William Dunn, of Spokane, Wash., Charles Doughten, formerly of Spokane but now of Los Angeles, Calif., Charles Mackenzie, of Seattle, Wash., Donald Mackenzie, of Washington, D. C., Seattle, Wash., and Alaska, who were indicted in the federal court at Spokane, November, 1910, charged with conspiracy to defraud the government out of valuable Alaska coal lands, will not go to trial as Attorney-General Townsend will ask that the cases be dismissed.

Coincident with the filing of this petition, similar petitions were entered at Seattle and Tacoma, Wash., Portland, Ore., Boise, Idaho, and Juneau, Alaska, desiring that prosecutions be dismissed against other persons indicted for Alaska land frauds during the winter of 1910. The action of the Attorney-General results from the failure of the government to convict Albert C. Frost in Chicago on a similar charge. Townsend planned in case of a conviction of Frost, to press the Western cases through trial during the summer and clear the criminal docket.

The land involved in the present cases consists of 20,000 acres in the Kayak district, valued by the government at many millions of dollars. There are 131 claims, each of a quarter section, which the government declared had been fraudulently obtained. These claims will not be lost to the present owners, among whom are John H. McGraw, ex-governor of Washington, James N. Gillett, ex-governor of the state of California, and Henry T. Oxnard, of New York City, president of the American Beet Sugar Co. These men are assignees of the original claimants.

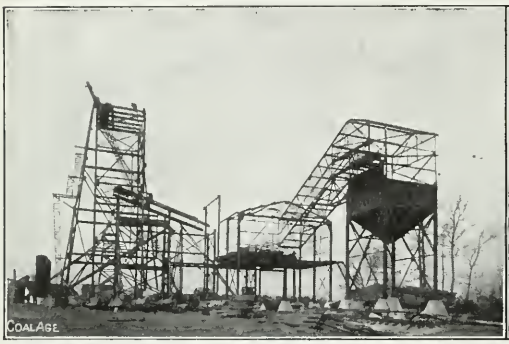
About 4100 square miles of the state of Tennessee are underlaid by coal measures and about half of this area contains workable seams. It is calculated that these beds originally contained 25,665,000,000 short tons of coal.

SNAP SHOTS IN COAL MINING



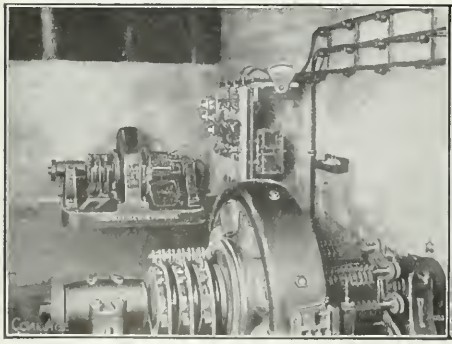
Power House and Tipple at Carbondale Mine of the McGillivray Creek C. & C. Co.

Miners at Pit Mouth, Carbondale Mine, at Carbondale, Alberta, Canada

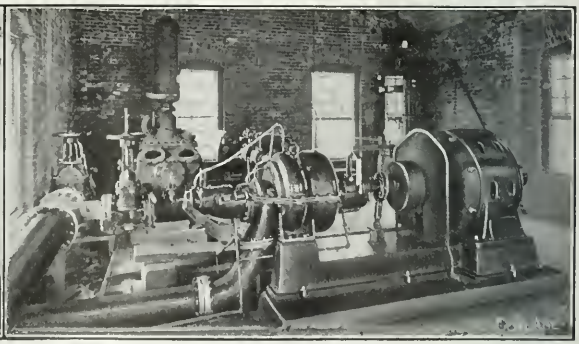


Showing the Chicago, Wilmington and Vermillion Mines under Construction, Five Miles Southeast of Christopher, Ill., on a Switch Running Out from the C., B. & Q. Railway

Four Vertical Water-Tube Boilers Set Upon Concrete Foundations Preparatory to Bricking In. A Part of the Plant Shown at the Left of This Photo.



Rotary Converters in Substation at Woodward Mine of the D., L. & W. R.R. Co



1200-G.P.M. Two-Stage Centrifugal Pump at Truesdale Colliery, Being Driven by G. E. Synchronous Motor

EDITORIALS

"Fools Butt In—"

The upright and most righteous mayor of Boston, Mass., recently wired in great excitement to the President of the United States that "anthracite tonnage was curtailed by restrictive measures for the purpose of preventing a surplus accumulation of coal, according to one of the coal-trade journals." The mayor further asserts that the public was compelled to submit to a heavy increase in the price of coal, owing to a lack of production last summer and hopes that the President will include in his message to Congress "pertinent suggestions in regard to the anthracite trade."

The mayor would do well to look over a few statistics before placing himself on record in such an absurd light. As a matter of fact, there was a tremendous shortage in the supply of anthracite coal last year, due to the suspension in mining during the labor conferences in April and May. But immediately following the fixing of an agreement, the hard-coalers began straining every nerve and concentrating all their powerful resources on the task of overcoming the deficiency with the result that there was a general and consistent smashing of all production records, month after month, during the late summer and early winter. Furthermore, they made every effort to allay the fears of the public that there would be a shortage (which fears speculators were trading upon to their own profit) by issuing periodical statements to the effect that they had the situation well in hand and that there were no prospects whatever of any suffering from a lack of fuel—a boast which as everyone now knows they made good.

Has Boston *another* Lawson?

Hydraulic Stowing

The remarks of George S. Rice, chief mining engineer of the Bureau of Mines at the recent meeting of the American Institute of Mining Engineers, have a large degree of timeliness. He stated that:

"In the Upper Silesian coal field, about one-half of the collieries are using hydraulic filling. About fifty independent plants provide for this feature of colliery activity. At one mining plant 5000 cu.yd. of sand are being stowed every day.

"In Westphalia, 27 collieries have adopted the system with 10 independent installations; in Belgium, ten collieries have such plants and in France, several such flushing operations are installed."

Mr. Rice says it will cost American coal-mine owners 30 to 40c. per cu.yd. to make such filling. We hope he is too conservative in this estimate, and that it will be found that when we decide to do the work, we can perform it more rapidly and efficiently than our European competitors.

We get three tons of coal in the anthracite region for every man employed, whereas in Belgium barely half a ton is obtained per man engaged. Applying the rule of three, the Belgian labor in stowing should be divided by six in the American fields.

This law of proportion, of course, may not hold good, but if stories of the pernicious extent to which division of labor has been carried in Europe are true, we can well believe that here, where there is no such demand for arbitrary divisions, there should be no difficulty in reducing any European costs. Especially should this be the case in the rural districts, where the opposition to the overlapping of trades has not destroyed the efficiency of labor.

But even if Mr. Rice is right, and flushing proves as costly as he anticipates, yet in many places that practice would pay today, by its preservation of the surface, its saving in coal, its extension of the effective life of the colliery and mining town, its complete use of headings and tunnels which must be constructed in any event, its assurance of continued profit to the railroad which has been built to handle the colliery output, its delaying of the time at which the longer hauls with long transmissions of compressed air or electricity will have to be made, its saving of the cost of coal and of drilling, its reduction of the area exposed to fires and favoring the accumulation of firedamp and its effect on beds not yet workable.

The value of a ton of coal in place is more than the royalty payment. Coal should be worth all the outlay which has been expended on its development, whether the expenditure be direct or indirect. In fact, from a broad community point of view, factories and non-company mining towns may be regarded as integral parts of the expenditure on the coal, for on the continuance of coal supply their usefulness largely depends.

Furthermore, we may recall that in Silesia, it has been customary in some places to fill the workings only in certain parts of the whole excavated area and that practice may be possible here. This will largely reduce the cost of flushing per ton mined.

Another Coal-Dust Explosion above Ground

There are still a number of persons who do not believe that coal dust is explosive and others who have an utter disregard of its dangers above ground as can be seen in many crusher rooms where dust is made in great quantity and no system of suction is used to remove it or to dampen the deposited dust. That some precautions were taken at the plant where the accident occurred which we are about to describe only emphasizes the danger to which men working in a dry, dusty atmosphere are exposed.

The accident occurred at the Hays yards of the United States Steel Corporation's Homestead works on Saturday, Apr. 5. Five men were shoveling coal into stoker cars from a pit 15 ft. deep. At these works, 10 cars of coal are ground every day for use in the rotary stokers of the steel plant. At 4 o'clock, the coal dust ignited and an

explosion occurred; the workmen near-by rushed up to the pit and saw the five men writhing in the smoke on the floor. The men were pulled out by their fellow-laborers at much risk to themselves. Four are dead and the other is dying.

The Breaker Boy and Other Youths

The Republican State Committee of Pennsylvania has prepared a second tentative draft of an act to regulate the employment of minors in Pennsylvania. One of the provisions puts the breaker "boy" into past history. He must now, if the law be passed, be at least sixteen before he goes to work.

The committee appends the following footnote to the clause which prohibits youths under sixteen from working in breakers:

"This section provides a list of occupations all of which are more or less dangerous or injurious, especially to children. Children have been found to be more liable to accident than adults on account of inexperience or carelessness; moreover, through lack of development and physical strength they are more seriously affected by injurious and unhealthful occupations."

A Solomon has indeed come to judgment. Can any statement be less reasonable than that youths should be prevented from working because of inexperience. Surely such lawyers as constitute the state committee, who have repeatedly grilled witnesses on the stand, know that experience is the result of years of practical use of certain materials or of actual performance of specified duties. How can anyone have experience as a beginner? Consequently because there is danger in beginning, why bar youths from labor? The risk of the green hand cannot be avoided. It is, however, to be supposed that the committee really referred, not to inexperience, but to immaturity of judgment.

We are about to present some figures. They are not conclusive because all American statistics are collected in a most incomplete manner and cover only a few parts of human activity. But seeing that they all run counter to the committee's conclusions, they largely weaken the reasoning of that political caucus.

The State Department of Mines of Pennsylvania shows the following numbers of juvenile deaths among outside mine workers at the following stated ages in 1911:

DEATHS OF JUVENILE OUTSIDE MINE WORKERS, PENNSYLVANIA 1911

	Boys of the following ages						
	14	15	16	17	18	19	20
Anthracite	0	1	5	4	5	7	7
Bituminous	0	1	0	0	2	1	1

The evidence of these figures is that the youth of 14 has the advantage of the adult of 20. He is probably not so careless, is not placed in so dangerous a situation and is more carefully watched. This is even more apparent underground. In 1911, only five youths working inside the anthracite mines were killed at 16 years of age whereas 20 were fatally injured at 19 years. The evidence shows therefore that forces other than legislative are already protecting the adolescent labor around the mines.

The statement that "through lack of development and physical strength, boys are more seriously affected by injurious and unhealthy occupations" is generally admitted, although, indeed, not by any means, is it necessarily true. In fact, it is probably absolutely false. In digesting the following figures our readers must remember that in 1900 a still larger amount of child or youthful labor than today, was everywhere in existence, yet the federal statistics show a continuous and well marked increase in the death rate from all causes from the ages of infancy onward.

POPULATION AND DEATHS IN THE UNITED STATES IN 1900

Years Inclusive	Population	Deaths
5–9	8,889,339	2,986
10–14	8,091,951	3,663
15–19	7,577,324	10,647
20–24	7,402,483	17,765
25–29	6,583,206	17,606
30–34	5,591,545	15,053
35–39	4,988,601	13,706

From these figures we see that if we would employ the most resistant persons only, to do the world's work, we would require a period of idleness or mental culture between 20 and 30 and put the children and youths to work.

These figures are backed up by known facts as to the effects of disease. Parents are rather desirous than not that their children shall contract measles and mumps for these diseases have a milder effect on children than on adults and do not recur when once their time has run.

Similarly the American and English statistics show that tuberculosis of the lungs is more fatal in adults than in children:

DEATHS FROM CONSUMPTION IN EARLY LIFE

Years Included	Consumption United States Totals	Consumption England—males per Million
5–9	525	205
10–14	719	134
15–19	3274	161
20–24	6839	676
25–29	7154	1858
30–34	6285	2114
34–39	5686	1964

Moreover, authorities have shown that while children are more responsive to typhus fever, they cast it off with far greater facility than adults. In England, many years ago, when fevers were less adeptly treated, children under 15 years of age who had developed the fever had a death rate of 5 per cent., while adults over 50 years old had a fatality rate of cases incurred of 46 per cent.

But specifically, is mining peculiarly harmful to the young? We apologize for using the figures of the federal census in 1900, so incomplete and so old are they but there is no recourse.

DEATH RATE OF MINERS

Years Inclusive	Percentage of All Deaths of Miners	Death Rate per Thousand Miners
15–24	13.9	5.4
25–44	46.4	7.8
45–64	21.7	13.1
65 and over	17.7	116.6

Clearly the young have more resistance than those in early manhood.

Our figures and our argument should not be pressed too far, but we would urge that reasonably healthy labor for children above the age at which they are willing or are compelled to go to school is not detrimental but advantageous. It braces them physically, mentally and morally and this wealth of labor should not be thrown away. The product of the human race is the pay of the race. He who legislates against labor robs the pay envelope of its purchasing power.

The neurotic's assumptions that children are being ruthlessly hurried to an early grave has never been subjected to careful proof. We need information which will enable us to take a safe and sane action in regard to labor, and the coal industry would welcome a scientific inquiry, which would ascertain the proper course of procedure.

SOCIOLOGICAL DEPARTMENT

Rescue Work in Fifeshire, Scotland

SPECIAL CORRESPONDENCE

It is now a legal requirement in Great Britain that collieries provide breathing apparatus and all the equipment for rescue work, including carefully trained brigades, or they must make arrangement with some central rescue stations within easy call, so that a fully equipped brigade may be available at short notice.

Some time ago the Fifeshire Coal Owners' Association appointed a committee to make inquiries regarding rescue apparatus for use in mines. Among other matters, the committee reported:

1. That a central station equipped with about 20 sets of apparatus ready for use in case of emergency is necessary for the needs of the county of Fife. This station should be in telephonic communication with every colliery in the district and located at Cowdenbeath.

A MOTOR CAR FOR A SCOTCH RESCUE STATION

2. That a certain number of sets of apparatus (say not less than five) should be kept ready at every colliery.

3. That at least 20 men at every mine, including all the officials who are acquainted with the workings, should be instructed in the construction and use of the apparatus.

4. That an intelligent man should have the care of the central station. He should be capable of instructing the men in the use of the apparatus and in the manner in which it should be kept in condition.

It almost seems unnecessary to remark that a central rescue station, however well it may be equipped in other respects, would be of little avail in time of need if it were not furnished with the means of speedily getting to the colliery from which the call for help may come. In view of this, the various central stations have been provided with specially fitted rescue motor cars. The Fife and Clackmannan Coal Owners' Association has purchased a car for the Dunfermline Station from the Albion Motor Car Co. A photograph of this truck accompanies this description. The car resembles an ambulance wagon.

The inside of the car is arranged to seat ten persons, and there is also accommodation for two passengers on the chauffeur's seat outside. Beneath each seat inside the car, there is space for a set of rescue apparatus.

At the front end within the car a space is provided for three oxygen cylinders, and in cabinets, also on the forward end, four smoke helmets are carried, with three cases of caustic potash and two ambulance boxes. Two stretchers are suspended from the roof. On the floor in the center of the car a hand pump is placed, so arranged that passage is not obstructed in passing to or from the wide doors at the rear of the car.

The body is built throughout of best ash and oak framing with mahogany panels. It is painted an artistic shade of gray with red lines, the inside dimensions being 9 ft. 9 in. by 5 ft. 9 in., complete with canopy over the chauffeur's seat and two windows in the center at either side with louvers above.

The chassis upon which the body of the wagon is mounted is a 32-hp. Albion of four-cylinder, chain-driven type, with single solid tires on front wheels and twin solid tires on the rear.

There are several groups of plants, in the United States, which should combine to provide a car of this kind. They are situated so far from a locomotive yard that an engine is not always available for use. The adoption of motor cars has been delayed, however, by the fact that most large coal corporations are affiliated with railroad companies and naturally rely on rail connections in planning their rescue work. Another obstacle has been found in the condition of the roads which a rescue motor car must travel.

A Census of Benefit Funds

The *Dodge Idea* contains the following statement, entitled "Benefit Funds for Factory Employees" and written by W. L. Chandler. This paper is published monthly by the Dodge Manufacturing Co., of Mishawaka, Iowa. The editorial staff of the journal has recently sent out twelve inquiries to which those controlling over 100 funds replied. The information has been extended by the use of the reports of the Bureau of Commerce and Labor in reference to over 400 funds:

1. Does a Company Profit by Having a Benefit Fund among its Employees?

Thirty per cent. of the funds which have reported, receive regular contributions from the operating company, but this seems only to lower the cost to members, as no reasons are apparent why all the funds cannot be entirely self-sustaining.

Four cases were found where funds controlled by employees alone had disbanded. The failures, as far as investigated, were not of such a character that they should influence others against the starting of benefit funds.

The membership of all funds comprised on an average 48 per cent. of the total number of employees of the factories at which the funds were established.

2. Should a Fund Insure against Temporary Disability due to Sickness?

Ninety-three per cent. of the funds provide this feature and such as do not are organized for the purpose of paying death benefits only, except one which only provides for permanent disability and superannuation and two which only pay superannuation pensions.

Of all funds (comprising about 350,000 members) the average cost per member per year for temporary disability due to sickness and accidents combined (these cases not being reported separately) was $3.42. The amounts paid weekly and the duration of the payments were so varied as to make it impossible to strike an average. Dues and benefits will be discussed later.

3. Should a Fund Insure against Temporary Accidental Disability?

Ninety per cent. of the funds now pay such benefits regardless of compensation paid by the operating company. They settle with the fund membership much as other accident insurance companies adjust the claims with their clients. Of these funds 22 per cent. are managed, at least in part, by the firms which have created them. Some establishments reimburse the funds for any mony paid out to compensate members who may have been hurt at work. This is done in lieu of direct payments to the injured. Some of the funds do not pay for any accidents for which the establishments are liable under the law.

Ninety-three per cent. of the funds, managed by employees alone, pay temporary disability benefits for accidents. A few funds restrict the accident benefits to cover only certain definite accidents such as those which are incurred when at work or when going to or from work or when not on duty, etc.

Ninety-one per cent. of the funds managed entirely by establishments or jointly by employees and the employing firm now pay temporary disability benefits for accidents.

It remains to be seen what may result later from the enactment in various states of employers' liability laws and workmen's compensation acts.

4. Should a Fund Insure against Permanent Disability Resulting from Sickness?

Twelve per cent. of all funds pay benefits for permanent disability and one-third of these, or 4 per cent., apply the benefits to cases due to sickness as well as accidents.

Of the funds paying benefits for permanent disability (sickness and accident cases not reported separately) a quarter of one per cent. of the members received such benefits in one year.

The average cost per member covering botn sickness and accident for the year was 48c. The various schedules of benefits are too varied to permit of averaging.

5. Should a Fund Insure against Permanent Accidental Disability?

Data given with the previous question should be considered here also. It will be noticed that twelve per cent. of the funds now have such provision. It remains to be seen what effect may follow the enactment of employers' liability laws and workmen's compensation acts.

6. Should a Fund Insure against the Death of a Member through Sickness?

Eighty-three per cent. of the funds have this provision. The amounts which in these funds are payable at death of a member (sickness and accident cases not reported separately) vary from ten to one thousand dollars, but the average death claim paid in one year was $209.76, or an average of $1.45 for each member of all funds paying death benefits. The death rate per 1000 members of all funds reporting their deaths was 6.7. This is lower than the general death rate of the country, because only able-bodied persons can gain or retain employment in a majority of establishments.

7. Should a Fund Insure against the Accidental Death of a Member?

Figures given above for amounts paid for death benefits apply here also, as the funds did not distinguish in their reports betwcen sickness and accident.

Ninety per cent. of all funds have benefits for members dying from the effects of an accident. Ten per cent. of these apply it only for accidents when on duty.

8. Should a Fund Insure against the Deaths of Members' Wives?

Twenty-two per cent. of all funds have this provision. The average annual cost to these funds for death benefits for members' wives averaged 25c. per member. This experience covers 65,889 members.

9. Should a Fund Insure against the Deaths of Other Dependents of the Members?

Ten per cent. of all funds have this provision. The average annual cost of these funds for benefits for death of dependents other than wives, average 28c. per member. This experience covers 44,381 members.

10. Should Any Distinction Be Made between Salaried Employees and Day Workers?

Of the funds under observation there seem to be few which make any distinction.

11. Should Membership Include both Males and Females?

Eleven funds divide the sexes and provide separate regulations for each, covering dues, benefits, etc. Of the total membership of all funds, 10 per cent. are females, and of the members of funds reporting female members, 11 per cent. are females. Fifty-six per cent. of the establishments where more than five females are employed have a provision for female members. The suffragettes may have something to say on this question.

12. Should Membership Be Compulsory?

Where funds were managed by employees only 30 per cent. of the employees of the establishment were enrolled.

Where the management rested with the establishment, 75 per cent. were enrolled and where the firm and employees managed jointly 66 per cent. enrolled. Of all the funds, 15 per cent. had more or less compulsory membership. Various exceptions are found; some excuse office clerks, boys and girls, those employed before the organization of the fund, and those earning less than a fixed sum per day.

Twenty-five per cent. of compulsory funds were managed by employees but were evidently strongly endorsed by the establishments, while 50 per cent. were managed jointly by employees and the firm for which they worked.

One fund writes that they had 95 per cent. of their employees enrolled before compulsory membership was required of all employees.

Some establishments having pension funds, require membership in the benefit funds to entitle employees to pensions, thus stimulating the employees to accept membership in these funds.

Swimming Pools

It is reported that the H. C. Frick Coke Co. is so well pleased with the experimental erection of a swimming pool and amusement hall at Leisenring, that it purposes establishing pools, measuring 75 ft. by 40 ft., and building gymnasiums at all its plants. Instructors will teach the employees how to swim. Cinder tracks will also be built for track events.

West Virginia Mining Institute

The executive committee of the West Virginia Coal Mining Institute has selected Morgantown as the place for holding the summer meeting, which will be in session June 24, 25 and 26.

Papers will be read and discussed on the following subjects:

"Gasoline Motor Haulage in Mines"; "A New Type of Undercutting Machine"; "Welfare Work in the Mining Communities of West Virginia"; "The Qualifications of a General Manager from a Superintendent's Point of View"; "Hydro-Electric Power in Mining; A Description of the Cheat River Installation."

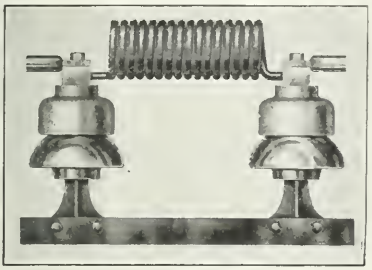
The program is so arranged that approximately one-half of the three-day session will be spent in sight-seeing and pleasure-seeking. Papers and discussions will occupy Tuesday and Wednesday mornings. On Wednesday afternoon, the members of the institute will be conveyed by automobiles to Mt. Chateau, a noted summer resort along the Cheat River, and from there to Sabraton, where an inspection will be made of the tin-plate plant of the American Sheet & Tin Plate Co. and the mammoth glass industries. The return to Morgantown will be in ample time to enjoy a banquet to be tendered by the city board of trade.

Thursday will be devoted to visiting the most representative mines in the Connellsville coke region. This will permit an examination into the methods of mining and coking the celebrated Connellsville coals, and furnish bases for comparison with the conditions and methods at home plants. Committees, selected jointly from the local membership and the city board of trade, are actually preparing to provide for a large attendance at the summer meeting.

Choke Coils and Disconnecting Switches

The choke coils and disconnecting switches illustrated herewith were recently bought out by the Electric Service Supplies Co., Philadelphia, Chicago and New York, and several unique points in the design of this apparatus deserve comment.

The bases of both the choke coils and disconnecting switches are of standard 3-in. channel iron. These bases permit the apparatus to be installed either inside or out, to be attached to switchboards direct, to cross-arms, to poles, to pipe or to any other suitable means of support.

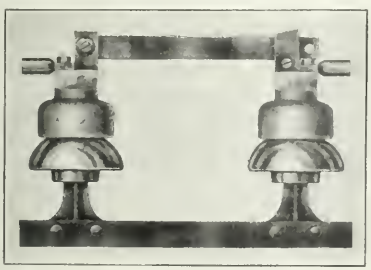


Choke Coil

Iron pins are riveted to this channel, and insulators cemented to these pins support galvanized iron tops, cemented to them, which tops in turn support brass terminal blocks for either the choke coil or the switch mechanism.

Choke coils are sweated into these blocks, which in every case are provided with separable terminals. The coils are air-insulated between turns; this is advantageous, because if arcing should occur between adjacent coils, the insulation (air) is immediately reëstablished after the passage of the discharge.

The manufacturers claim that these choke coils are rugged in construction, possess great electrical and mechanical strength, and that their design has been worked out so that they afford great protection to electrical apparatus when used in conjunction with their standard types of lightning arresters. They are made for voltage ratings up to 23,000 and for all standard ampere capacities.



Disconnecting Switch

In the disconnecting switch, the clips are sweated into the brass terminal blocks, and are made of machine finished, pure, hard-drawn copper. The blades are hung in the clips as shown, and tension screws are provided at each end to secure proper contact. Separable terminals are provided on these switches for all capacities.

These disconnecting switches are designed and intended for use not only as lightning-arrestor disconnectors, but also as switches for disconnecting and controlling high-voltage lines, branch feeders, emergency feeders, etc., and for other purposes for which such switches are required.

They are made for voltage ratings up to 23,000, and of ampere capacities to meet any operating condition.

A Good Boiler Test

The Narragansett Electric Light Co., of Providence, R. I., recently ran an eight-hour boiler test on a 390-hp. Babcock & Wilcox boiler equipped with a Riley self-dumping underfeed stoker with five retorts, during which 216.3 per cent. of the builder's rating of the boiler was developed.

The boiler in question was 16 ft. long, 12 tubes high and 18 tubes wide. It was operated throughout the test at a pressure (practically without variation) of 175 lb. per sq.in.

Nineteen thousand seven hundred and five pounds of coal were fired, thus making the rate per hour 2463 lb. Analysis of this fuel showed 77.44 per cent. fixed carbon, 15.42 per cent. volatile matter, 5.46 per cent. ash and 1.68 per cent. moisture. As fired the coal contained 14,728 B.t.u. per lb. The weight of water fed to the boiler was 217,600 lb., the average temperature being 196.6 deg. F. The actual evaporation per pound of coal as fired was 11.04 lb. of water, the equivalent evaporation from and at 212 deg. F. being 11.81 lb.

The stoker was narrower than the boiler, so much so that two more retorts could have been installed which would probably have given correspondingly greater consumption of fuel and evaporation of water. The boiler was 12 years old and was one of a battery of two, the other being cold at the time of the test.

The fire appeared to be in about the same condition throughout the entire trial and the boiler was kept on the line after the test was over. One notable advantage was that there was no period of dumping as the stoker automatically cleaned itself of ashes continuously and thus avoided fluctuations incident to periodic ash removal. The coal was thoroughly burned, there being but a slight excess of air.

First Aid at Old Forge Colliery

The contests of the first-aid teams of the Old Forge Colliery, of Jermyn & Co. were held on Saturday evening, Apr. 5. The outside team won first prize, making 91 points out of a possible 100. Inside team No. 2 was second with 82 points, and inside team No. 1 was third with 68 points. Between 600 and 700 people witnessed the exhibition. Following the contests a banquet was held, and President Joseph Jermyn presented the winning team with a large silver loving cup. He congratulated the winners on their excellent work, and also Dr. Edwards, of Taylor, who drilled the teams. Mr. Jermyn promised to send the winners to Pittsburgh next fall to participate in the annual state contests.

Each member of the winning team was also presented with a watch fob, appropriately engraved. The following men made up the winning team: David Davis, captain; William Williams, Lawrence McDermott, Charles Llewellyn, and Lawrence Fallon. The members of the other teams are: Inside No. 1, John B. Price, captain; Walter Tibbs, Patrick Kelly, and Harry Edwards. Inside No. 2, James McGinley, captain, William Riddel, Michael McNulty, Joseph Hart, and James Marino.

DISCUSSION BY READERS

Education in Coal Mining

Letter No. 2—Referring to the discussion on Education in Coal Mining, allow me to make a few remarks on this subject, gained from my observation as inspector of mines during the last decade. I wish to draw attention briefly to the importance of higher education along this line.

It is my opinion that a higher educational standard should be set by our examining boards, in addition to the technical and practical requirements. It is true that many of the workmen in the mines have not had the advantage of a common-school education; but this feature will be less prominent as time goes on, owing to the school law requiring that children attend school until they arrive at a certain age. Those who follow mining will, in the future, have an easier road to travel than did their fathers, who, seeing the advantage of a mining education, have spent much time and burned the midnight oil at their studies. Many have had to start at their A B C's; but, step by step, they have finally mastered the object of their ambition through the assistance of mining books and papers and correspondence schools. By their efforts many such men have risen to high positions in the mining world; and have become successful general managers, superintendents, mine inspectors, mine foremen, etc.

I have noticed that the average man, after receiving a certificate for mine foreman, which was evidently the height of his ambition, has thrown his books aside. He begins to think he is competent to fill that position at any mine. He fails to understand why some foremen can obtain positions at mines where a high salary is paid, while he holds a less important place. But the secret of the matter lies in the fact that the higher positions with good salaries require a man having more thorough and uptodate education on mining problems, and who can make an intelligent report to higher officials on any conditions they may meet in the mine. Such men earn the support of their superiors. By their education they learn to exercise good judgment and are successful in handling the workmen. In other words, education is the means of making a broad-gaged official—one who, while he has all these qualifications, is still pursuing his studies as an ardent student of mining conditions, reading uptodate mining literature and having always the ambition to attain higher honors.

I do not mean by these statements that the successful foreman is compelled to keep in his head all the formulas pertaining to mine ventilation, chemistry and mechanics; but he should be so familiar with the subjects that he could readily refer to his library and know where and how to get the information he desires and how to apply it, just as a mining engineer refers to his field book for the sine, cosine or tangent of a required angle; or a lawyer refers to his library to ascertain the law on a certain case.

This point leads to the use of textbooks at mining examinations, and as I have been a member of examining boards for mine foremen and firebosses for the last ten years, I am firmly of the opinion that we would get some very good men as mine officials were they permitted to refer to their textbooks and work out the questions asked at these examinations; whereas, if they are required to work out such problems by trying to remember the formula in the particular case, they would make a failure. I know of several such cases where the party can sit down and work any ordinary ventilation problem if allowed to refer to his textbook for the formula, but he cannot remember the formula in an examination. I will say that if textbooks are allowed at examinations, the books should contain only formulas, and be so arranged that it would be up to the student or applicant to know just what formula he should use for the question under consideration.

It is the desire of the examining boards to make the examinations for mine foremen and firebosses as nearly practical as possible. Only such technical questions as are absolutely necessary are generally included. But I am of the opinion that there should be more technical questions, in addition to the practical questions asked, in order to ascertain the capabilities of candidates along certain lines. I am also of the opinion that all miners should be urged to read certain mining literature bearing on their duties and explaining the dangers pertaining to certain methods that they persist in following, and describing how they can increase their efficiency.

I believe that every person should serve a certain length of time as assistant mine foreman or fireboss before he is allowed to assume full charge of a mine—especially a gaseous mine; and if he serves under a good foreman, his chances are better for becoming himself a successful foreman. I have seen old practical miners, who had a good education, pass a good examination and yet make a failure as mine foremen and superintendents, because they were unable to manage men; their judgment was bad and they could not apply their mining experience and education to the proper supervision of the mine.

I am of the opinion that a person wishing to attain a mine foreman's certificate should educate himself along the following lines: Reading, spelling, writing, elementary English, arithmetic, to cube root of numbers. A mining course should include mine gases, safety lamps, mine ventilation, blasting, timbering of mine workings, mine haulage, mine mechanics, electricity, practical methods of developing and operating mines, and should teach men how to read and understand mine maps. If one attains a fair education on the above subjects, in connection with the practical experience required by the state mining laws, there should be no question about his being able to pass an examination.

I will say further that the advantages education offers to those wishing to better their condition are as accessible as the air we breath. Institutions, as well as private instructors, have offered their services free to those wishing to avail themselves of the opportunities, and I am glad to say that many have taken advantage of

these golden opportunities; but, on the other hand, there are many who have not availed themselves of these opportunities. Some have started who did not have the will power to give up pleasure and have dropped back in the old rut, spending their spare time in idleness. My advice to the young man connected with mining is: Avail yourself of any opportunity to secure a good mining education. These opportunities, for first-class ambitious men, are increasing daily.

F. W. Cunningham,
Mine Inspector, 21st Bit. Dist.

Charleroi, Penn.

Letter No. 3—I want to say I favor the use of textbooks at mining examinations. There are so many branches of science connected with coal mining and the scope of the questions asked in the examinations is so great, that the average man cannot undertake to memorize a sufficient number of the formulas required to answer the questions, which he must do if he is to pass a satisfactory examination. I believe where the answer to any question involves the use of sines, cosines, tangents, etc., these should be given in the questions. It might be well where a formula is required to work the question, to print the formula with the question, as this would save the candidate much time looking through the textbooks to find the formula he wants to use.

I may say that I have been successful in seven examinations, held in three different states; but I would add that the time spent in these examinations was, for the most part, a season of anxiety for me. My brain was not as clear and I could not collect my thoughts, in the examination, as when going about my daily occupation. Had I been allowed the use of a textbook, as at home, it would have been a wonderful help to me.

I have often thought that many of the questions asked at mining examinations were too far advanced in mathematics for the average miner to answer without a textbook to which he can refer. It is one thing to ask a question and another thing to give the proper answer to the question asked. Anyone can ask a question that will require an educated man to answer. For these reasons, I think textbooks should be allowed in some of the examinations of mine foremen and firebosses.

R. J. Pickett.

Shelburn, Ind.

Letter No. 4—There appears to be a large difference of opinion among mining men as to whether textbooks should or should not be used at mining examinations, by candidates seeking certificates of proficiency that would make them eligible to the position of mine foreman or fireboss. Some men who are opposed to the use of textbooks in examination, claim that the proper formula should be given with each question. Others argue that neither formulas nor textbooks should be provided, but that the candidate should take the examination without helps of any kind.

In my opinion, it would be much better to conduct these examinations without allowing the use of textbooks or giving any formulas. A candidate will often show that he knows nothing of the question by using a wrong formula, and to give the formula with the question would, in this case, be giving the candidate just the information he needs to answer the question correctly. If textbooks were to be allowed in a mining examination, I believe such a practice would tend to lower the standard of the examination. Men would depend too much on the books and grow careless about reading and studying the theory and principles of mining. They would not be so anxious to know the reason "why." Many of them would not be able to transpose the many formulas pertaining to mine ventilation.

I will give here an instance where I believe the use of textbooks in an examination would do the candidate more harm than good. I believe if the following question was asked and textbooks were allowed in the examination, 95 per cent. of the candidates would apply the wrong rule. The question is:

> In a certain mine, a current of 66,000 cu.ft. per min. is passing under a pressure of 5 lb. per sq.ft.; what quantity of air would be circulated in this mine if the pressure was increased to 8 lb. per sq.ft., the power remaining the same?
>
> Ans.—41,250 cu.ft.

Looking in the book the candidate would find a rule reading somewhat as follows: "The quantity of air in circulation in a mine or airway varies as the square root of the pressure." Applying this rule, he would get about double the right quantity of air for his answer. When the "*power remains the same,*" as stated in this question, the quantity of air in circulation varies inversely as the pressure.

Another reason why textbooks should not be allowed in examination is that the man who has a good school education, but who knows nothing at all about mining, would be more likely to pass the examination for mine foreman than the man with only a fair education, but who has worked all his life in the mines. I think that to encourage such a practice would be doing an injustice to those who, by hard study, have reached their present standard.

Joseph Northover.

Seanor, Penn.

Sudden Collapse of Working Places

In reading Mr. Lane's letter regarding the sudden collapse of mine roof, Coal Age, Mar. 29, p. 500, it occurred to me that the trouble, in the instance he describes, was due to leaving too small a rib when driving up the center of the pillar. It seems evident, from his description of the occurrence, that the side pressure probably shoved the legs of the timbers in at the bottom. Mr. Lane states that the bottom was hard, and probably the timbers stood erect, without any batter or other provision against side pressure.

I would not consider two 12-ft. ribs, in this high coal, a sufficient thickness to support a roof pressure due to 500 ft. of cover. Under these conditions, we might expect a creep or squeeze to start; and, in my experience, no timbering of this sort was ever effectual in stopping a squeeze. The most that could be expected of the 5-in. timber frames, mentioned in Mr. Lane's letter, in a 9-ft. seam of coal overlaid with 500 ft. of cover, would be to steady the immediate roof strata and possibly give warning when the pressure came on or the "weighting" of the roof occurred.

When an undue weight is thrown on the pillars, it is not always shown by "nipping" of the top coal, or the "heaving" of the bottom; but when the pillars or ribs are narrow and the weight comes on, the coal begins to spall off at the middle of the seam, just as a post under great

pressure bows out and breaks in the middle. However, assuming that the "bearing in" or mining, in this seam, is near the bottom, the bottom coal would be broken when the squeeze first came on; and the great pressure would then be apt to kick out the timbers at the bottom if they did not break.

Permit me to say that I think this accident would not have occured if, instead of splitting the pillars, which were already weak, they had cut across near the face, each time, in lifts of about 15 ft. I have always thought that splitting should be avoided unless the pillar is about twice as strong as necessary; because by so doing the rib is weakened at the very time it most needs its strength. Ample pillars and a regular breaking line will do much to guard against the loss of coal and timber and avoid the sacrifice of many lives. It seems to me there is no reason why large pillars should not always be left, except where a maximum of mach ne coal must be obtained. In most cases, after the room centers exceed about 35 ft., the wider the pillars between the rooms the fewer times does the track turn have to be laid, for a given tonnage. If the centers are wide enough to require a turn anyway, they might as well be sufficiently wide to give ample support to the roof pressure.

E. C. TAYLOR, Supt.,
Keystone Coal & Coke Co.

New Alexandria, Penn.

Another Letter

In reading of the sudden collapse of a working place, as described in COAL AGE, Mar. 29, 1913, p. 500, it seems to me that there are two good reasons that may be given as causing the sudden collapse of the roof in that ease.

Mr. Lane does not state the time the miner quit work the day before the accident; but we will say it was 4 o'clock, and from that time until 3 o'clock the next morning when the fireboss made his first round, the roof had been working continuously. In this condition, it was about ready to fall when the fireboss made his examination, but was held in place by the frail timbers, which were 9 ft. long and only 5 in. in diameter. When the mine started again in the morning, the roof began to work the second time, and the breaking of the light post at the face started a heavy fall of roof that kicked out the timbers in order, back from the face, as it fell.

The second reason that may be given is that the timber was altogether too light for use in a seam of coal 9 ft. thick, under the heavy roof cover. It is impossible to wedge a 9-ft. post 5 in. in diameter very tight, without first bracing the legs from one timber frame to the other, with a plank spiked between them. I would say that heavier timbers should have been used in the working face.

Scranton, Penn. THOMAS R. PIERCE.

Study Course in Coal Mining

BY J. T. BEARD

The Coal Age Pocket Book

MINE AIRWAYS

Definition of Terms—The term "airway," in mining, generally relates to a passageway for the circulation of the air current, in distinction from a haulage road or travelingway, although these entries may serve also as airways. The entry by which the air current enters the mine is called the "intake," and that by which it is carried out of the mine, the "return." In like manner, the two shaft or slope openings in a mine are called, respectively, the "downcast" and the "upcast."

The "perimeter" of an airway is the distance measured around the circumference of its cross-section. The "area" or "sectional area" of an airway is the area of its cross-section.

The "rubbing surface" of an airway is the entire inner surface of the same; and is found by multiplying the perimeter o by the length l, of the airway; thus,

$$s = lo$$

Essential Features of Mine Airways—Airways in mines should be as straight as possible and void of sharp bends and other obstructions that increase the resistance of the airway to the flow of air. The shape of the airway is important as affecting the pressure required to pass a given quantity of air.

Shape of Airways—The cross-section of an airway may be a circle, square, rectangle, ellipse, or any combination of these that best meets the needs or conditions. For the purposes of ventilation, that form of airway is best that has the shortest length of perimeter, for the same area of section.

In this respect, the circular airway is first; the ellipsoidal airway next, until the major axis exceeds 2.73 times the minor axis when, for the same area, the perimeter is equal to that of a square airway. The square airway is then third in the series and the rectangular and trapezoidal forms last.

There are, however, other requirements than those of ventilation. Haulage requires a level bottom for the roadway. Roof conditions or economy of driving entries may make an arched roof out of the question, making it necessary to adopt the square, rectangular, or trapezoidal shape. Again, a weak coal and heavy side pressure may demand an ellipsoidal shape of section or a special type of timbering approaching the same. It is not uncommon to arch the roof of airways for a distance, using either a semicircle or a semiellipse to form the arch, the latter being called a "flat arch."

The closer the ellipse approaches the circle or the nearer a rectangle comes to being a square, the less is the perimeter of the airway, for the same area of section. For the same length of airway, the perimeter is proportional to the rubbing surface of the airway.

Calculation of Airways—In order to facilitate the calculation of the perimeter and sectional area of the different shapes of airways, we give the diagram shown on the following page, which explains these calculations for each case.

The Coal Age Pocket Book

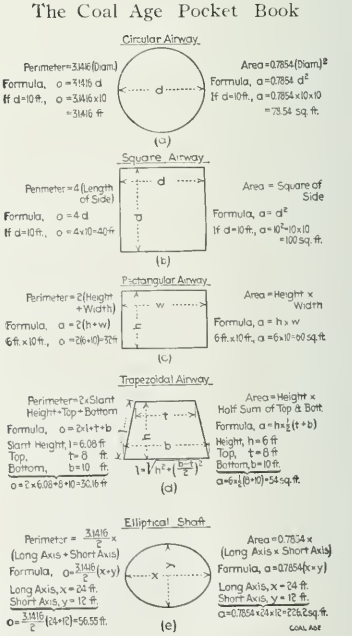


DIAGRAM SHOWING METHOD OF CALCULATION OF PERIMETER AND AREA OF AIRWAYS OF DIFFERENT SECTION

INQUIRIES OF GENERAL INTEREST

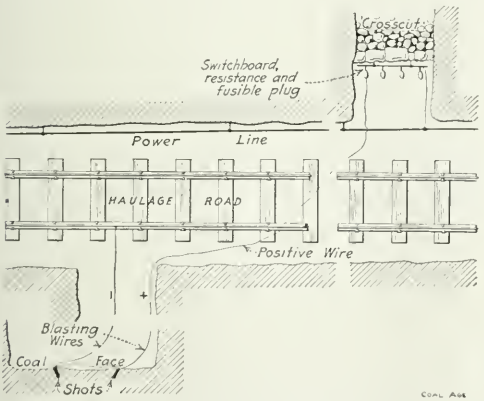
Firing Blasts by Trolley Connection

I want to ask if it is a dangerous practice to fire a heavy charge of, say eight or more holes together, by connecting the blasting wires with the trolley wire on the main haulage road, or with any other live wire conducting current into the mine. Will such a connection for that purpose affect, in any way, the dynamo at the power plant?

RICHARD EVANS.

Olyphant, Penn.

The usual practice in electric firing, in mines, is to employ a magneto machine for generating the electric current, although it is not an uncommon practice to use the power lines for the purpose of firing. In such cases, however, a special arrangement is generally preferred, similar to that shown in the accompanying figure, which consists in introducing a safety or fusible plug into the positive wire conveying the current from the power line to the coal face. There should also be introduced into



SHOWING ARRANGEMENT FOR FIRING BLASTS BY POWER-LINE CONNECTION

this wire a sufficient resistance consisting of several incandescent lamps, to reduce the current. While this is not absolutely necessary, it is generally considered safer practice. The negative, or return wire, may be connected with the rail.

A switch is also introduced into the positive line to enable the current to be turned on after all connections have been made. To insure greater safety, the fusible plug in the positive wire should always be removed and only introduced after everything is in readiness for firing. This forms an extra safeguard against the current being suddenly turned on at the switch before everything is ready.

It is possible to fire shots in mines, without taking the precautions named; but there is more liability of accidents occurring and the blasting wires may be fused by the strong current flowing in the power line. This, however, would not prevent the explosion of the blast. In presence of gas, there is always the danger of the sparking of the wires at the switch igniting a possible explosive mixture.

The firing of the charge, in any case, could not affect the dynamo at the power plant, any more than does the change of load due to turning on or shutting off the current of the motors used in haulage or coal cutting and drilling. A little experimenting may be required to ascertain the number of lamps that should be introduced as a resistance to reduce the current sufficiently for the purpose of firing.

Percentage of Fuel Consumed

There are two boilers in operation at a certain plant. No. 1 boiler burns 1168 tons of coal in the same time that No. 2 boiler burns 652 tons. I want to ask what per cent. of fuel does No. 1 boiler burn more than No. 2?

G. S. T.

Harrisburg, Ill.

No. 1 boiler burns $1168 - 652 = 516$ tons more coal than No. 2 boiler consumes. This quantity of coal is

$$\frac{516 \times 100}{652} = 79.1 \text{ } \textit{per cent.}$$

of the coal consumed in No. 2 boiler. Therefore, No. 1 boiler consumes 79.1 per cent. more coal than No. 2 requires.

Barometric Pressure

Since warm air is lighter than cold air, why does the barometer record the same pressure in summer as in winter, at the same elevation above sea level? I should think that the warm air in summer would cause a less pressure and the reading of the barometer be lower than in winter.

N. M. RIGSBY.

Sale Creek, Tenn.

The change of seasons does not affect the temperature of the air surrounding the earth, for a great distance above the earth's surface. Very little of the heat of the sun is absorbed in its passage through the atmosphere; but the heat absorbed by the ground is radiated back into the atmosphere and warms the lower atmosphere in contact with the earth, making this air lighter. The effect, however, is not sufficient to cause a great change in barometric pressure.

It is true, nevertheless, that the average barometric pressure is greater, in the northern hemisphere, in the winter months than in the summer season, reaching a maximum about January and a minimum about July. This is explained under "The Barometer," Study Course in Coal Mining, Mar. 29, p. 501. The daily variations of barometric pressure and the variations due to atmospheric changes are so much greater, however, as to wholly absorb the effect of the change of seasons.

EXAMINATION QUESTIONS

Surveying

(Answered by Request)

Ques.—Calculate by sines and cosines the bearing and length of the closing line of the following traverse of a survey:

Station	Bearing	Distance (feet)
1	N 43° 18′ E	145
2	S 62° 25′ E	122
3	S 72° 43′ W	93
4	S 69° 55′ E	232
5	S 8° 15′ W	173
6	N 81° 10′ W	141
7	S 3° 05′ W	128
8	S 43° 18′ W	136
9	N 9° 08′ E	285

British Columbia Exam.

Ans.—The plat of this survey is shown in Fig. 1. The first step is to calculate the latitude and departure of

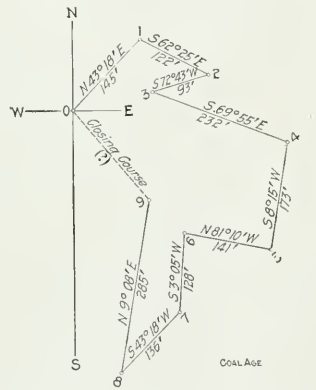


Fig. 1.

each course. The latitude is either a "northing" or a "southing," and the departure either an "easting" or a "westing," as indicated by the bearing of the course.

The latitude and departure of each course is found by multiplying the length of the course by the cosine and sine, respectively. Thus, the latitude of the first course being a northing (N) and the departure an easting (E), they are found as follows:

$$N = 145 \cos 43° 18' = 115 \times 0.72777 = 105.53 \text{ ft.}$$

$$E = 145 \sin 43° 18' = 115 \times 0.68582 = 99.44 \text{ ft.}$$

In this manner, the northing or southing and the easting or westing of each course is calculated and written in the proper column as follows:

Course	Bearing	Distance	N	S	E	W
1	N 43° 18′ E	145	105.53		99 44	
2	S 62° 25′ E...	122		56.49	108 13	
3	S 72° 43′ W	93		27 63		88 80
4	S 69° 55′ E....	232		79 67	217.89	
5	S 8° 15′ W....	173		171 21		24 82
6	N 81° 10′ W....	141	21 65			139 33
7	S 3° 05′ W....	128		127 82		6 89
8	S 43° 18′ W	136		98.98		93 27
9	N 9° 08′ E..	285	281.39		45 24	
			408 57	561.80	470.70	353 11
Closing course			153 23			117 59
			561 80			470.70

The next step is to calculate the angle of bearing of the closing course, which must have a northing of 153.23 ft. and a westing of 117.59 ft., in order to make the sum of the northings equal to that of the southings and likewise the sum of the eastings equal to that of the westings, in the completed survey. Referring now to Fig. 2, the angle of bearing a is found as follows:

$$\tan a = \frac{departure}{latitude} = \frac{117.59}{153.23} = 0.7674$$

and $a = 37° 30'$.

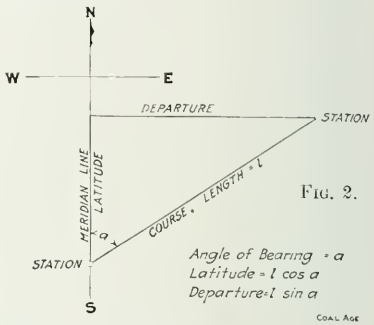


Fig. 2.

The length of this course is then calculated by dividing either its latitude by the cosine of the angle of bearing, or its departure by the sine of the same angle. For example, the length of the closing course 9-0, in this case, is

$$l = \frac{latitude}{\cos a} = \frac{153.23}{\cos 37° 30'} = \frac{153.23}{0.79335} = 193.1 \text{ ft.}$$

or

$$l = \frac{departure}{\sin a} = \frac{117.59}{\sin 37°30'} = \frac{117.59}{0.60876} = 193.1 \text{ ft.}$$

The closing course of the survey is, therefore, N 37° 30′ W, 193.1 ft.

Correction

(See p. 575, last issue)

Ans.—The weight of the loaded trip is $25 \times 4600 = 115{,}000$ lb.; the weight of the rope, $6000 \times 1.2 = 7200$ lb., which makes the total load hoisted, when the trip is at the bottom of the incline, $115{,}000 + 7200 = 122{,}200$ lb.

The tension or pull on the rope is equal to the sum of the gravity pull and the friction pull. In this case, the inclination being small, the gravity and friction pulls are calculated as follows, taking the coefficient of friction as 0.025:

Gravity pull $= 122{,}200 \times 0.05 = 6110$ lb.
Friction pull $= 122{,}200 \times 0.025 = 3055$ lb.

Total pull on rope..... 9165 lb.

A speed of 13 miles per hour is $13 \times 5280 \div 60 = 1144$ ft. per min. The horsepower of the engine required to draw this load up the incline at a given speed is then

$$H = \frac{9165 \times 1144}{33{,}000} = 317.7 + hp.$$

BOOK REVIEW DEPARTMENT

FIFTEENTH BIENNIAL REPORT OF THE STATE INSPECTOR OF COAL MINES OF COLORADO FOR THE YEAR ENDING DEC. 31, 1912. James Dalrymple, Chief Inspector Denver, Colo. 138 pp.; 6x9; paper.

Besides the usual statistics giving the production of coal and the accidents in mining, the report contains many valuable recommendations. Attention is drawn to the failure of the attempt to obtain new mining legislation in 1910. At that time a commission was appointed to investigate the great loss of life in mines and prepare a new mining bill, which was presented to the 18th General Assembly, but so mutilated in the Senate as to be later vetoed by the governor. The report states that the present mining law is the same as it was nearly 30 years ago, and draws attention to the incompetent class of miners now employed, which, together with the improved machinery, is responsible for the high death rate in the state. It is stated the death rate in Colorado is double that of the United States taken as a whole.

The report gives an account of the Hastings mine explosion, June 18, 1912, when 12 men were killed; also an account of the Piedmont explosion, August 29, 1912, entailing the loss of two lives.

ANNUAL REPORT OF THE MINE INSPECTOR FOR ALLEGANY AND GARRETT COUNTIES, MD., FOR THE YEAR ENDING APRIL 30, 1912. John H. Donahue, Inspector. 36 pp.; 6x9; paper.

The production of coal in Maryland for 1911 was 4,166,736 long tons, being a decrease of 496,792 tons from the production in 1910.

The report gives an account of the drainage of the old Borden shaft, abandoned 21 years ago, and which had recently become dangerous from the accumulation of water, and was a menace to adjoining properties. A brief description is given of each of the mines in operation.

ANNUAL REPORT OF THE STATE INSPECTOR OF NEVADA MINES FOR THE YEAR ENDING NOVEMBER 30, 1912. Edward Ryan, Inspector of Mines. 79 pp.; 6x9; paper.

This report is practically confined to the metal mining industry in Nevada, but is of interest in coal mining as referring, page 24, to "Nevada's only known coal deposits." The report states that the mining of coal in the state is an "infant industry," which may never get out of its "swaddling clothes." The principal coal operation is that of the Nevada Coal & Fuel Co., which recently received its lease from the Nevada Coal Co. and is developing a 16-deg. slope, described in the report as "an inclined shaft." The slope is 725 ft. long and has a vertical fall of 200 feet. The seam of coal varies from 3 to 5 ft. in thickness. The quality of the coal improves as the development progresses. The mine is not as yet productive, although numerous shipments have been made at different times. The property of the Darms Coal Co. lying adjacent is being prospected with core drills.

FIFTEENTH ANNUAL REPORT OF THE BUREAU OF LABOR AND INDUSTRIAL STATISTICS FOR THE STATE OF VIRGINIA. 148 pp.; 6x9 in.; cloth bound.

The report is of great interest to the coal industry of Virginia, including as it does on pp. 98-110, a copy of the new mining law, approved March 13, 1912. This law is Chapter 178 of the Virginia code, entitled: An act concerning coal mines and safety of employees, creating a department and inspector of mines under the Bureau of Labor and Industrial Statistics.

The new law is a vast improvement in coal-mining legislation in Virginia. The law makes numerous specifications, providing for the safety of employees and determining the duties of both miners and operators, providing also suitable penalties for the violation of its provisions. The law specifies a standard cotton-seed oil for use in the mines.

ANNUAL REPORT OF THE STATE COAL MINE INSPECTOR OF WYOMING FOR THE YEAR ENDING SEPT. 30, 1912. 57 pp., 6x9 in.; paper.

The publication includes the report of the two district mine inspectors, George Blacker, state coal mine inspector, District No. 1 Cumberland, Wyo., and W. E. Jones, coal mine inspector, District No. 2, Sheridan, Wyoming.

The report of the first district describes the Susie Mine explosion of the Kemmerer Coal Co., Jan. 20, 1912. Some important recommendations are made in the report of the second district. These include: A standard grade of miner's oil; rock stoppings for cross-entry crosscuts; precautions in the handling of powder and methods of blasting; employment of shotfirers, or electric shotfiring; daily inspection of all working places, instead of every alternate day; prohibiting use of compressed air for brushing out gas in working places; adoption of a Qualification Act, providing apprenticeship for underground employees; adoption of a suitable compensation act to avoid the present difficulties concerning the liability of employers for injuries of workmen.

COAL-MINE STATISTICS OF STATE OF ALABAMA FOR 1911. C. H. Nesbitt, chief mine inspector. Paper, 13 pp., 9⅝x12⅛. Alabama Mineral Map Co., Birmingham, Ala.

This is a somewhat belated publication of mine statistics. It includes a statement showing the output of the largest producers in 1912, which proves that it is barely dry from the press.

The record shows the location of mines, the operating companies, superintendents, mine foremen post-office addresses, coal thickness, seams worked, types of openings, whether the mines are gaseous or non-gaseous, number of employees, mode of ventilation, explosives used, method of mining, production in various sizes, prices paid per ton for mining, number of days worked and railroad connections, output of the different companies and the annual output since 1870.

The report is almost wholly economic and contains only a few references to fatalities. That record, though short, is not very favorable; in 1911 one man was killed, for every 108 employees, the tonnage per fatality being 71,827. The record was even worse the year before when one in every 92 employees was killed.

COAL FIELDS OF GRAND MESA AND THE WEST ELK MOUNTAINS, COLORADO. By Willis T. Lee. 6⅜x9⅛ in.; 219 pp. with 21 full-page plates and a few text illustrations. Pocket with a large map—U. S. Printing Office, Washington, D. C.

Without desiring to exhibit any national complacency but seeking rather to defend in all fairness our national bureaus which are assailed so unmercifully that we sometimes forget that we have abundant reason to be proud of them, we propose to compare this bulletin with the Report of the Committee on the Carboniferous Limestone Formation of the North of England.

The American report is in every respect superior. There is a careful attempt to correlate beds, the illustrations give us a correct idea of the formations, and the descriptions of the strata are much clearer and more specific. The analyses are many (88) in the American work and almost entirely absent in the English. The British report has only one analysis and that unofficial and, whereas the book of the survey has several paleontological plates, the foreign monograph has none. The map is more complete and detailed and has many valuable cross-sections. The English map is, it is true, a beautiful example of the almost unexcelled British cartography with all the clarity of color of the Philip Bartholomew maps. However, some of the clearness and color value is due, of course, to the paucity of detail.

This report of the Geological Survey is no better than the average publication of that bureau. It is not more worthy than any other of our commendation. In fact, W. T. Lee labored under some considerable disadvantages. The territory, he describes, has been only locally operated whereas the English area has been mined since 1736. One would therefore expect the British report to be far superior to the American but it is not. It is creditable to the Survey that it is able to equal and even to surpass the work done in the country where geology had not only its birth but much of its early development.

The coal described is in the Upper Cretaceous series. It is therefore comparatively recent, geologically speaking, having been ripened by the mellowing heat of the bodies of volcanic material which found vent in its midst. The coal found therefore varies from anthracite to sub-bituminous, though the area of the former is restricted. Bodies of natural coke are also found

COAL AND COKE NEWS

Washington, D. C.

In spite of the hostility to many of the rates in the new tariff bill, it seems to be pretty generally conceded that there will be no interference with the determination to keep coal on the free list. It is certain that that policy will be followed throughout the time that the measure is in the House of Representatives, and careful investigation has indicated but little disposition to oppose the item in the Upper Chamber.

In addition to coal of all kinds the free list includes charcoal, coal tar, mineral salts, crude minerals not advanced in value by refining or grinding and "miners' rescue appliances designed for emergency use in mines where artificial breathing is necessary in the presence of poisonous gases, to aid in the saving of human life, and miners' safety lamps." Tar is also included in the free list.

There has been a strong demand for so long for the inclusion of coal as a non-dutiable article that the movement to remove the tariff from it would have strong support in any case. This backing is greatly strengthened, however, by the fact that within the past year there has been so much dissatisfaction regarding the price of coal and the relations between mine owners and railroads.

It is believed that the removal of the tariff, while under ordinary circumstances not very important, may affect the price of the article quite materially at times when there would otherwise be a disposition to advance the price charged the consumer, owing to domestic shortage as was the case during the coal strike of 1902. It is also believed that special benefit will be had by New England and by the Northwest, both of which regions are fairly close to the coal fields of Canada. In this way it is supposed, some portion of the effect of the reductions of duty on the products of those sections may be offset.

Albert C. Frost Has Been Acquitted

Information received here to the effect that Albert C. Frost, who was under prosecution in Chicago for alleged conspiracy to obtain illegal control of a large tract of coal land in the Matanuska Valley in Alaska, has been acquitted, has led to an unofficial statement that the Government has no intention of relaxing its Alaska conservation policy.

Frost and several others were indicted about two years ago for conspiracy to obtain control of 64 coal locations by the use of dummy entrymen. It was claimed that the accused had caused various employees to apply for coal lands with the intention of turning over the whole amount thus obtained to Frost.

It was pointed out here, as soon as news of the verdict was received, that this does not open the way for any further work on the claims, as the coal lands are still withdrawn from entry and will remain so until released by the Department of the Interior. The construction of the proposed road depends upon the opening of the coal lands, and is admittedly at a standstill so long as the country is closed to locators.

Alaskan interests have been eager to secure the relaxation of the Government policy with respect to the opening of the coal lands and it is expected that the verdict in this case will considerably strengthen their activity. They have desired that the subject should be taken up at the special session of Congress with a view to passing some legislation that would pave the way for what they want to do in opening up the country.

It is not believed that anything of the sort will be attempted now, but the adoption of legislation on this old question may be taken to regular session next winter. It is admitted that there should be some change in the present legal situation in regard to the opening of Alaskan lands if it is desired to have the growth of the territory proceed at all rapidly in the future.

While there is a strong conservation sentiment in Alaska there has apparently been some relaxation of feeling in recent years with respect to what are considered the somewhat overdrastic regulations on this subject.

Erdman Act Redrafted

A redraft of the Erdman act, framed with the purpose of extending the provisions of that legislation to mining and other industries, involving the movement of commodities in interstate commerce, but with particular reference to mining has been completed and is understood to have the approval of the Civic Federation of New York.

This is along the lines of the bill proposed about a year ago, but is understood to have been more carefully prepared. It will probably be introduced in Congress at an early date and will be referred to the Committee on Interstate and Foreign Commerce, but it is not expected that anything will be done at the current session. Something may be undertaken next winter.

WILKES-BARRE, PENN.

Work on the tunnel which is to connect the Parrish Colliery of Plymouth with the Buttonwood Colliery in Hanover Township, has begun and will be rushed to completion. Mechanics are at work improving the machinery in the breaker of the latter colliery. Patent pickers, etc., are being placed and the breaker will be enlarged. If the fire in the Red Ash Vein at the Buttonwood, which has been sealed tight for the last few months, is not out by the time the tunnel is finished and breaker repairs made, a landing will be made in the shaft to the end that cars may be caged from the upper as well as from the lower veins.

The coal from the new Inman shaft of the Lehigh & Wilkes-Barre Coal Co. will also be run through the Buttonwood breaker, obviating the necessity of erecting a second structure. Surface tracks will be laid from the Inman to the Buttonwood, and the coal taken to the latter. When this work is completed, the present little Buttonwood will be one of the largest and greatest producing collieries in the anthracite region.

The Pennsylvania Coal Co. is building a new breaker at the Underwood Colliery, and work is progressing so rapidly that the officials hope to have it in operation in the early fall. Reinforced concrete and steel are being used in the construction. The main building will be of steel, and the coal and rock pockets and part of the washery will be of concrete. The washery will be located in the main building. There are many new ideas contained in the plans for the structure, prominent among them being the use of concrete for the coal and rock pockets, and the manner of their arrangement. Coal cars will be loaded directly beneath the pockets, while the box cars will be loaded outside the building, from a chute leading from the center of the bottom slab of the pocket. The width of the pockets varies from 10 ft. 8 in. to 16 ft.. The walls of the pockets are designed as usual to carry that part of the load which comes from the arching of the coal in the pocket, and also to withstand the pressure against them when one pocket is full and another one empty. The pockets will have a capacity of 3500 tons. The breaker will be fed by coal from a new tract that is now being opened by the company in Throop and vicinity. It is being built by contractors Williams & Richardson.

PENNSYLVANIA

Anthracite

Scranton—Every colliery in the anthracite region was idle Apr. 1, while the mine workers celebrated the fifteenth anniversary of the 8-hour working day. This day is a holiday for the miners throughout the country.

Shenandoah—Fifty-two breaker boys at the Maple Hill colliery have struck for higher wages notwithstanding the recent agreement between the miners and operators. The company filled their places, however, and the colliery was not idle.

In a fall of top rock at the Knickerbocker colliery near Shenandoah, one miner was killed and another was fatally injured. The men had fired a shot while robbing pillars and before they could get out of the way the roof came down, completely shutting the mouth of the breast. Another accident, caused by the premature explosion of a blast, occurred at the Packer No. 4 colliery of the Lehigh Valley Coal Co. One miner was killed and another was seriously injured.

Shamokin—A fall of coal at the Cameron colliery, Apr. 5, caused the death of Robert Boyd, a miner. Arthur Neely, who was working with him, had a narrow escape.

Bituminous

Sharon—Two hundred and fifty miners were temporarily thrown out of work when the coal tipple and boiler house at mine No. 3 of the Filer Coal Co., was destroyed by fire.

Apollo—Because their demand for higher wages has been refused the employees at the Paulton plant of the Hicks Coal Co., have struck and the works have been closed.

Charleroi—About 1500 dock employees of the Monongahela River Consolidated Coal & Coke Co., who are employed at the marine mines of the company in Allenport, Monongahela and Elizabeth, have struck for an increase of 50c. a day. They have been receiving $3 a day.

Brookville, Penn.—Mine Inspector Thomas Furniss of Punxsutawney is bringing charges of violating the mining law against John Jacob and Martin Mescavick in the Jefferson County Court. Alkinn Sheri of Brockwayville is charged by Andy Lovas with removing car checks from loaded wagons in the West Clarion mine of the Northwestern Mining & Exchange Co.

Washington—The Pittsburgh Coal Co. has started proceedings in the local courts against the Carnegie Natural Gas Co. to restrain the latter from drilling a well on the Gault farm in Nottingham Township.

Connellsville—The H. C. Frick Coke Co. has decided to establish swimming pools and gymnasiums at all its plants in this territory. Instructors will teach the employees. The tanks will be 40x75 ft. Cinder tracks will also be built at plants where track events can be held.

Efforts of a professional diver, employed by the Latrobe-Connellsville Coal & Coke Co., to enter the shaft at Derry No. 2 mine to examine the pumps buried beneath 50 ft. of water have proved unavailing. The company is renewing its efforts to pump out the water which has been flooding the mine for months.

WEST VIRGINIA

Charleston—The department of mines of West Virginia will conduct examinations for mine foremen and firebosses at the following places: May 13 and 14, at Logan; June 3 and 4, at Mt. Hope; June 18 and 19, at Charleston.

About 125 men employed at the Long Branch Coal Co.'s mine, near Mt. Hope, have struck because certain of their number were discharged for trying to induce the men to strike in a body.

Reports are to the effect that the United Mine Workers' leaders have decided to issue a call for a state-wide strike, to become effective in the near future. If this report is true, it will be the most important development in the coal trade for at least a decade. Should the suspension in West Virginia become serious, it is believed coal would advance at least $2 a ton at the mine from Pittsburgh territory.

Hughesston—Part of the tipple and a barge of coal belonging to the Hughes Creek Coal Co. were destroyed by fire, Apr. 7. The blaze is thought to have started from a fire which was built by some careless persons.

St. Clairsville—Two hundred men employed in the Pursglove mine went on strike Apr. 8, compelling the mine to suspend operations. The trouble arose over some difficulty concerning the wage scale.

ALABAMA

Empire—The Maryland Coal Co., the new operation in the Sipsey basin, near Empire, will be shipping coal July 1. An announcement to this effect was made recently by local officials of the company. The improvement of the Maryland Coal Co are the beginning of a development to involve over $2,000,000 when the Panama Coal Co. makes its improvements.

Birmingham—It is reported that the Mine Inspectors Institute of America will hold its annual convention in Birmingham, commencing on June 10. It is expected that 100 mine inspectors of the United States, accompanied by their wives, will attend. The Institute will be welcomed to Alabama by Governor O'Neal and to Birmingham by the president of the city commission.

Montgomery—Former State Mine Inspector Hooper, who was recently appointed to examine into conditions at the Banner and Flat Top mines, has submitted a report commending the conduct of the Banner mine, criticising the water furnished at Flat Top and recommending that a portion of the earnings of the convicts be used for the support of their families. He declares that there is less whipping at the Banner than at any other place where convicts are worked.

In regard to the matter of ventilation used in the Flat Top, however, Mr. Hooper's opinion seriously clashes with the opinion of State Mine Inspector C. H. Nesbitt. Mr. Nesbitt declares that the Banner mine is as safe as it is possible to make a mine.

KENTUCKY

Louisville—A recent decision of the Kentucky Court of Appeals in the case of the Bennett-Jellico Coal Co., of Artemus, Ky., against the East Jellico Coal Co., will operate almost to put the latter company out of business, as far as its present workings are concerned. The land involved consists of 146 acres and is located in the heart of the East Jellico Co.'s holdings of 1000 acres, and contains the entries opened by that company and all of the equipment used by it in the operation of the property. The East Jellico Coal Co. has consequently suspended operations and shut down the mines for an indefinite period. In the meantime it is preparing to open other entries on parts of its property not claimed by anybody else.

Several hundred miners working in the western Kentucky field have brought suit against the Illinois Central R.R. Co. for damages because of its failure to supply cars, thus throwing the men out of employment. The men ask reimbursement from the railroad for the wages which they lost by reason of the car shortage. The individual amounts are small, but the aggregate is in the neighborhood of $100,000.

Spottsville—The Green River flooded the mine of the Pittsburgh Coal Co., located at this place, on Apr. 4, and on Saturday, Apr. 5, at 10 a.m. the water in the mine reached water level outside. The mine is worked by a shaft. The coal crops out above low-water mark and it is proposed that a drift be driven into the mine to drain the water, this waterway being closed in periods of flood.

OHIO

Logan—At the annual convention of Subdistrict 1 of District No. 6 of United Mine Workers, held at Logan, Ohio, recently, steps were taken to prepare for the struggle between the operators and miners on Apr. 1, 1914, when the present wage scale expires. John Moore, president, and Leo Hall, vice-president of the Ohio organization, attended the meeting.

Crooksville—The fan house of the Standard Hocking Coal Co. was destroyed by fire, Apr. 8, with a loss of $650. The origin of the fire is unknown. At the time of the fire 93 men were at work in the mine, but all were brought to the surface in safety. As a result of the fire the mine has been closed down until a new fan house can be erected. One hundred and twenty-five men are idle.

Columbus—The Thomas resolution, providing for the appointment by Governor Cox, of Ohio, of a commission to investigate the question of wages paid to coal miners in Ohio has been finally passed by both houses of the Ohio General Assembly, and is now a law. The resolution was vigorously assailed in the senate after it had been passed by the house of representatives by a vote of 69 to 40.

In the senate the fight against the resolution was made by Democratic Floor Leader William Green, author of the anti-screen bill, which has passed the senate and is pending in the house. The matter of passing the Green bill is now up, but it is believed the bill will be allowed to rest in statu quo, because of the passage of the Thomas resolution.

Elyria—The loading and coal docks of the Lake Shore R.R. were destroyed, Apr. 8, by a fire which was supposed to have been started by spontaneous combustion. The docks were valued at $50,000 and are a total loss together with 600 tons of coal.

INDIANA

Boonville—The transfer of title to 300 acres of land near here and the organization of several coal companies now in progress, means the investment of considerable capital in the coal industry in this part of Indiana. The fields hereabout have many shallow coal beds which, in the past, have been mined with great danger to the workers, from falling slate due to bad roofs and several mines were abandoned on this account. The beds run from five to twenty-five feet in thickness. The new companies will use the stripping process and the huge steam coal shovels used, after the removal of the soil from the top of the coal, are said to mine one thousand tons a day.

Indianapolis—The Chamber of Commerce of this city has filed a protest with the Indiana Railroad Commission against the proposed increase in freight rates for coal shipped from Indiana mines into this city, from 50 to 55c. a ton.

Sullivan—W. E. Woods and M. A. Haddon, of this city, have located a drill for coal on the land of Wilton Howard, Jeffersonville Township and propose to test the entire territory in the south part of Sullivan County. They have options on 16,000 acres. They will also drill test holes on a 6000-acre tract north of here and on a 12,000-acre option in Fairbanks Township.

Evansville—About four hundred miners employed in the Sunnyside, Crescent and Ingle mines have gone on strike because the management at the Sunnyside refused to reinstate a discharged miner. The three mines are controlled by one company.

NEW YORK

Geneva—One hundred employees at the Empire coke plant in Border City struck, Apr. 2, for an increase in wages and a shorter day.

KANSAS

Pittsburg—Mine No. 11 of the Cherokee & Pittsburg Coal & Mining Co., has been closed by the order of Francis Keegan, assistant labor commissioner. This is the largest mine in the district and employs 300 men. Mr. Keegan declared the mine to be in a dangerous condition. Refuge holes for the miners had not been provided along the haulage way, and the ventilation was poor. The officials state that they will put an extra force of men at work to make the necessary alterations and repairs.

PERSONALS

John T. Parry, foreman at the Butler Colliery of the Pennsylvania Coal Co., at Pittston, has been transferred to the Barnum Colliery, taking the place of Thomas Huntley. The latter is transferred to No. 9 breaker, taking the place of William Wertz, who goes to the Butler.

Earl Martin, of Chattanooga, Tenn., has resigned as president of the Continental Coal Corporation, of Tennessee and Wyoming. The cause of the step taken by Mr. Martin is not definitely known. H. L. Cory, of Chattanooga, who has been vice-president and sales manager of the Tennessee branch of the company, will assume the office of president of that company, and White L. Moss, of Pineville, vice-president of the Wyoming side of the corporation, will be acting president of that company until the annual meeting of the stockholders in June.

FORTHCOMING MEETINGS

The annual convention of the Canadian Retail Coal-dealers Association will be held in Toronto, Ont., on June 18 and 19. An especially interesting program is in preparation.

The Southeastern Passenger Association has granted special return rates for the Kentucky Mining Institute meeting to be held in Lexington, Ky., on May 16 and 17, 1913. The special return fare will be one first-class one-way fare plus 25c. Tickets will be on sale May 15, 16 and 17, and void after May 19, 1913. Fares will apply from and tickets will be on sale at all agency stations in Kentucky on the Cincinnati, New Orleans & Texas Pacific Ry., Louisville & Nashville R.R. and the Lexington & Eastern Ry., and also at various other stations in Kentucky and Tennessee.

TRADE CATALOGS

Stephens-Adamson Mfg. Co., Aurora, Ill. "The Labor Saver." Mar., 1913. 24 pp., 6x9 in.

Williams Patent Crusher & Pulverizer Co., St. Louis, Mo. Catalog. Coal crushers. Ill., 46 pp., 10x12½ in.

Ingersoll-Rand Co., 11 Broadway, New York. Form No. 3312. Imperial "XB" duplex power driven air compressors. Ill., 20 pp., 6x9 in.

CONSTRUCTION NEWS

Birmingham, Ala.—The Mountain Valley Coal & Iron Co. is reopening its mines at Mountain Valley. The company will spend about $20,000 in new developments, with equipment for a 400-ton capacity.

Topeka, Kan.—Work has been started on the new Union Pacific coal chute, west of the city. The new chute will have a 250-ton capacity, 150 more tons than could be held by the old chute, and will cost $15,000.

Fairpoint, Ohio—The large coal tipple and trestle of the Provident Coal Co. has been completed and put in operation. The structural-steel work was furnished and erected by Wm. B. Scaife & Sons Co., Pittsburgh, Penn.

Greensburg, Penn.—Byrne Brothers, who recently purchased the Mathias, Miller and Keller tracts of coal in Sewickley Township, have begun operations on the Miller tract. A force of men is at work driving the main entry for the mine.

Evans Station, Penn.—The Evans Coal & Coke Co. has awarded contracts for extensive improvements to cost about $40,000. A new tipple and a 60-oven coke plant will be built and a coke crusher installed. The company has 1050 acres of coal still unmined.

DuQuoin, Ill.—Preliminary work on a new shaft of the Bell & Zoller Coal Co., at Zeigler, was begun Apr. 10. The new mine will be sunk near the famous Leiter colliery and will be equipped with modern machinery throughout. The colliery will have a daily capacity of 3000 tons.

Punxsutawney, Penn.—The Maderia Hill Coal Mining Co. has purchased 5000 acres of coal land in the Clover Run district. A tipple will be erected at once. Surveys have been completed for a two-mile spur from the Bellwood division of the Pennsylvania R.R. to the new operation.

Birmingham, Ala.—The Montgomery Coal Washing & Mfg. Co. has been awarded the contract to construct a Montgomery coal washery, for the Black Mountain Coal Land Corporation, whose main offices are in Bristol, Va. The plant to be erected by the Birmingham concern will be at Pockett, Va., on the Virginia & Southwestern R.R., and will cost approximately $25,000.

Pittsburgh, Penn.—A deal has just been consummated whereby the American Metal Co. has purchased 2500 acres of Pittsburgh coal and 350 acres of surface land on the line of the Pan Handle R.R., in Washington County. The American Zinc & Chemical Co., a subsidiary of the American Metal Co., is being organized under a Pennsylvania state charter to operate a new $2,000,000 zinc smelter which will be erected at Burgettstown.

Connellsville, Penn.—The Connellsville Coal Co. is contemplating the erection of a modern coal-storage and sales plant at its property on South Arch St. The project calls for the erection of six 50-ton bins, a 200-ton drop open storage, a large bin for anthracite coal and a bin for coke. A switch is to be run from the tracks of the Baltimore & Ohio to the company's property. The proposed plant will have a capacity of over 500 tons.

Stewartsville, Ohio—The mine of the Franklin Coal Co. will be shut down for a period of five weeks. This suspension is necessitated as a result of the fire which occurred there recently, when the entire power plant was practically destroyed by flames. Plans for the new structure are now being drawn up and it is understood that the new building will be much more substantial than the old one. Officials of the company estimate that it will cost $15,000 to replace the damage.

NEW INCORPORATIONS

St. Louis, Mo.—The Imperial Coal Co.; capital stock, $8000. Incorporators: D. G. Jackson, F. S. Suerer and B. E. Hefter.

Punxsutawney, Penn.—The Lorenze Mining Co.; capital stock, $25,000. Incorporators: F. A. Lorenze, J. W. Wingert and J. G. Adams.

Pueblo, Colo.—The Smith-Tanner Coal & Mining Co.; capital stock, $50,000. Incorporators: G. T. Ortner, L. F. Schumm and V. G. Garnett.

St. Louis, Mo.—The Universal Smokeless Fuel Co.; capital stock, $50,000. Incorporators, Jas. M. Moran, A. A. Loudon and Alfred Mueller.

New York, N. Y.—The Mineral Lands Co.; to acquire, own, use, develop, sell and deal in lands containing ores, minerals and stone; capital stock, $100,000.

Boton, Mass.—A firm has been incorporated under Massachusetts laws as the Staples Coal Co., of Boston, with an authorized capital of $1,000,000.

New York, N. Y.—The R. J. Buchholz Coal Co., Inc.; to deal in coal and fuel; capital stock, $25,000. Incorporators: R. J. Buchholz, C. E. Buchholz, J. V. Koch, Jr.

Mt. Sterling, Ohio—The Barner Coal Co.; capital stock, $32,000. Incorporators: Lewis Apperson, W. C. Taylor, J. W. Clay, M. C. Clay, R. T. Judy and J. A. Judy.

Mingo Junction, Ohio—The Brettelle Bros. Co., of Mingo Junction, Ohio, has been incorporated, with a capital stock of $25,000, to mine and deal in coal. The incorporators are Thomas Brettelle, Sr., W. M. Brettelle, M. Brettelle, George L. Thompson and James Brettelle.

INDUSTRIAL NEWS

Dorchester, Va.—The Wise Coal & Coke Co. recently ordered two five-ton, 44-in. gage electric mining locomotives from the General Electric Co.

Fairmont, W. Va.—The Consolidation Coal Co. will add to its equipment two 10-ton electric mining locomotives recently ordered from the General Electric Co.

Pottsville, Penn.—A Massachusetts manufacturing firm has purchased the only loose tract of coal land lying untouched in Kline Township. The consideration was $45,000.

Huntington, W. Va.—The local plant of the American Car & Foundry Co. has received an order from the Baltimore & Ohio R.R. for the construction of 500 all-steel hopper coal cars.

Elders Ridge, Penn.—The Iselin mines of the Rochester & Pittsburgh Coal & Iron Co., recently loaded 2058 two-ton mine cars in one day. This coal-loading feat was accomplished in ten hours.

DuQuoin, Ill.—A large block of coal weighing 4000 lb. was recently taken from the Paradise mine and shipped to Cairo. It was 6 ft. 9 in. high, 42 in. square at the base and 21 in. square at the top.

Chicago, Ill.—The By-Products Coke Corp. will install one 70-hp. and three 135-hp. motors in connection with new belt conveying systems. The motors will be furnished by the General Electric Co.

Johnstown, Penn.—The Black Lick Mining Co., for 20 years operating at Big Bend, has gone into the hands of a receiver, a Philadelphia man having been named to settle the firm's financial affairs.

Big Stone Gap, Va.—The Stonega Coal & Coke Co. will place in operation in its mines four new four-ton, 250-volt, 44-in. gage electric mining locomotives recently ordered from the General Electric Co.

Roswell, Penn.—At a meeting of the stockholders of the Standard Quemahoning Coal Co. the old directors and officers were reëlected. Plans for future development of the company's fields near here were discussed.

Hoonville, Ind.—W. T. Blair has recently bought 400 acres of coal and expects soon to start operations at surface mining. Mr. Blair is said to represent Chicago and Indianapolis capitalists. The price paid for the land was $40,000.

Johnstown, Penn.—Options for 1700 acres of coal land in Indiana County, between Vintondale and Strongstown, which were taken by Dr. Charles E. Altemus, may result in the development of this large territory within the next year.

Lorain, Ohio—The United States Steel Corporation's new freighter "James A. Farrell," built at the Lorain yards of the American Ship Building Co., was given its trial trip recently and will be used in coal trade after the lake season opens.

Greensburg, Penn.—John G. Felger, of Greensburg, has been inspecting property which he owns in Sewickley Township. Tests are being made of the underlying seam of Pittsburgh coal, preparatory to sinking shafts for the mining of the coal.

Morgantown, W. Va.—J. A. Martin, owner of the Terra Alta electric-lighting plant, has sold that property to W. F. Patterson, of Waynesburgh, Penn., in exchange for 1000 acres of coal in Monroe County, Ohio. The deal involves approximately $50,000.

Pittsburgh, Penn.—The Belmont Coal Mining Co. will add to the electrical equipment in its power plant 200-kw. and 300-kw. two-unit, three-bearing motor-generator sets and switchboard. The machines have been ordered from the General Electric Co.

Mt. Pleasant, Penn.—M. F. Byers has sold his farm, which is underlaid with valuable coal, about a mile from Central, to Isaac Brownfield, of Unlontown. Mr. Brownfield tendered in payment 2050 acres of coal land in Marshall County, West Va., and $74,000 in cash.

Logan, Ohio—According to a decision recently made by the public service commission, the Hocking Valley Ry. Co. must pay the Colonial Coal & Supply Co., of Columbus, the value of 11,020 lb. of coal alleged to have been lost in a shipment from Pomeroy to Lima.

Scottdale, Penn.—A tract of 2500 acres of coal in the Ohio valley, near Wellsburg, W. Va., has been sold for $600,000. The tract was being operated by Messrs. Stauffer, Braddock & Hough under the name of the Beech Bottom Coal Co. The sale included the plant with a daily output of 1000 tons.

Pottsville, Penn.—Excavating for cellars for new dwellings on the property of S. A. Hogan, workmen discovered the outcrop of a vein of fine coal. The vein is 15 ft. thick, but being so near the surface and directly underlying Pottsville's new residential section, it will be impossible to mine it.

Dorchester, Va.—The N. Y. Mining & Mfg. Co. will increase its power-plant capacity by the addition of a 1250-kv.a. Curtis turbo-alternator with 15-kw. turbo-exciter, three 150-kv.a. transformers and switchboard. The apparatus will be supplied by the General Electric Co., which corporation will also install the plant.

Pond Creek, Ky.—The Pond Creek Coal Co., which controls a large acreage in Pike County, Ky., is reported to be arranging for a bond issue of $2,000,000 for the purpose of providing funds for the development of its properties. The company already has seven mines in operation and plans three additional openings.

Johnstown, Penn.—John Lochrie, of Windber, has taken over a lease of the 400 acres of rich coal near Dunlo, owned by Matthew Calvin and Eliza C. Smith, of Hollidaysburg. Mr. Lochrie is to mine a minimum of 2000 tons a month for one year after beginning operations and a minimum of 4000 tons after the first year of mining.

Des Moines, Iowa—Supervisors James B. Uhl, C. W. Keller and Harry Barquist have been appointed to enter into a contract with the Bloomfield Coal Co. for the leasing of the coal under the Polk County farm. A royalty of 10c. per ton has been agreed upon with the stipulation that, if the third vein is directly under the shaft of the mine, the board expects an income of $40,000 from the deal.

Earlington, Ky.—The St. Bernard Mining Co. has arranged for equipping its power station and mines with new electrical apparatus consisting of a 500-kw. Curtis turbo-alternator, a 200-kw. Curtis turbo-generator set, a 14-kw. induction motor-generator exciter set, 100-kw., 150-kw. and 200-kw. synchronous motor-generator sets, and switchboard. All the apparatus will be built by the General Electric Co., which will make the installation.

Louisville, Ky.—After recovering rapidly from the slight setback caused by high water, the coal mines on the Lexington & Eastern in eastern Kentucky and in the Letcher County field, recently opened by the Consolidation Coal Co., are increasing their output daily, and expect soon to be operating at the maximum. The Consolidation company is shipping nearly all of its Letcher County coal to Gary, Ind., for the use of the U. S. Steel Corporation's plant at that place.

Joliet, Ill.—The Laclede Gas Light Co. has awarded to the Koppers Co., of Joliet, the contract for the installation of a new $5,000,000 byproduct coke-oven plant, to be located in South St. Louis at the junction of the River Des Peres and the Mississippi. Work will start in the course of the next three weeks. The coal to be used will be brought from West Virginia fields by water in barges via the Ohio and Mississippi Rivers, and a special dock for unloading barges will be built.

Camden, Ark.—Considerable activity in the development of the lignite deposits in this vicinity would indicate that in the course of the next two years large investments will be made in mines west of this place. Local parties are planning the organization of a $1,000,000 corporation, to develop coal and clay properties in Ouachita County.

A party of Little Rock people is organizing a similar company for the development of lignite and clay properties in Ouachita and Nevada Counties.

Jenkins, Ky.—The Chesapeake & Ohio Ry. has let the contract for the construction of its 22-mile Beaver Creek extension, reaching from the mouth of Beaver Creek to Steele's Branch, Jackson County, Ky. The branch will tap a rich coal and timber section, and its completion will be followed by an industrial development similar to that which has been seen in Harlan County in the past two or three years. The cost of the line will be about $10,000 a mile, but the amount of grading and trestle work necessary is expected to run the total cost to nearly $300,000. The firm of Ballard, Herring & Severer, of Jenkins, Ky., received the contract.

Moundsville, W. Va.—The big river tipple at the Fort Pitt coal mine in Belmont County, Ohio, which was carried away by high water three weeks ago, will not be rebuilt. The company has been making but few shipments by water during the last few months and it has been decided that all will be discontinued from now on, owing to the fact that it is not considered profitable to build a new tipple in consideration of the small returns. All shipments will be made by the Cleveland & Pittsburgh division of the Pennsylvania line, which runs by the mine. It is likely that improvements will be made on the railroad tipple in order that the full production may be handled through this source without delays.

COAL TRADE REVIEWS

GENERAL REVIEW

The hard-coal companies appear to have all the business they can possibly handle as is usually the case in April when the minimum anthracite prices are in effect. There is a general shortage on all the domestic grades, with broken probably in the greatest demand; pea is the shortest of the steam sizes. The difficulty in obtaining supplies last fall has tended to stimulate an early buying this season.

Some of the Coastwise soft-coal agencies are still apprehensive over the labor situation in West Virginia, but this has not effected any tangible improvement in the market so far. Buyers generally are not responsive and usually more than small concessions are necessary to interest them. There is quite an amount of coal on hand, inland, although this is slowly moving off, but probably at low quotations; many prices are being asked and predictions into the future are confusing. The heavy consumption has undoubtedly been the controlling feature in maintaining prices, and operators continue to hold firm; it is not believed that the discounts of the smaller companies are having any material effect upon the market.

Shipments out of the Pittsburgh district into Ohio and beyond are still considerably restricted, but the Lake service is probably up to full requirements. Prices are holding well, except on small business, which is a trifle irregular and production is greater than at any time since the Lakes closed, fully 75 per cent. of full rated capacity. Order is being gradually restored out of the chaos in Ohio, and conditions are again slowly becoming normal. The movement continues uncertain, but embargoes are being lifted rapidly, and it is now possible to get rail connections to all Ohio points. Operations have been severely restricted because of the lack of transportation facilities, conditions in the Hocking Valley having been generally better in this respect than at other points.

In the Southern market there is a temporary rush of orders for steam sizes, consumers fearing that the floods may cut them off from supplies as has been the case on other occasions. The movement into Chicago is far below normal, only a few of the Illinois mines being able to ship; the main supplies for the time being are coming from the Hocking Valley district. The Terre Haute, Ind., mines, which were closed for two weeks, are again working, but many other operations are still unable to get cars; fortunately, the demand, especially for manufacturing, is also restricted.

BOSTON, MASS.

Bituminous—Reports on the labor troubles in the New River district are received here with much interest. The union seems to be gaining in membership from day to day and several of the important mines are affected. The practice of the mine-workers buying land to camp on has put a new face on the situation. Some of the agencies appear to be apprehensive of trouble but so far there have been no signs that the market has in any way improved. A good volume of coal is being sold off-shore but there is no slackening up of effort to place coal here. Buyers are not responsive and with the present state of trade it will take more than small concessions to interest them. The call for Pocahontas and New River for spring shipment will depend very largely on the outcome of the negotiations in West Virginia.

Georges Creek mines are in good shape with an ample business and a large output. There has been some hesitation on the part of the regular buyers of this grade on account of the differential asked this year over Pocahontas and New River, but it remains a popular coal.

There is only a small movement of Pennsylvania coals at tidewater this month. A good tonnage is usually moved in conjunction with anthracite, particularly from Philadelphia, but retailers are apparently confining themselves to the latter for the present. All-rail there is fair business for coals from the Cambria districts and from the better known operations in Clearfield, but otherwise there is only a light demand.

Anthracite—April is not turning out such a disappointment as was feared. The companies appear to have all the business they can handle and there are even notable shortages in sizes like broken and pea. Dock screenings are also hard to get and distributors at this end are getting more interested in hard coal as the weeks go on. Inland, there are so many that were in difficulty last year that with the spring price in their favor they are trying to get their coal forward this year as early as possible. A decided improvement can be reported in that respect over a week ago. At least one of the originating companies that stayed out of New England last year is planning to do the same in 1913, on account of a largely increased demand from the West. That situation helps keep the other shippers well supplied with orders. Dealers here have become so accustomed to entering requisitions to be filled on short notice that already some of them find themselves out of certain sizes.

Current wholesale quotations are about as follows:

Clearfields, f.o.b. mine	$1 00@1 35
Clearfields, f.o.b. Philadelphia	2.25@2 60
Clearfields, f.o.b. New York	2.55@2 90
Cambrias, Somersets, f.o.b. mines	1.25@1.55
Georges Creeks, f.o.b. mine	1.67@1.77
Georges Creeks, f.o.b. Philadelphia	2.92@3.02
Pocahontas, New River, f.o.b Hampton Roads	2 75@2.85
Pocahontas, New River, on cars Boston	3.70@3.85
Pocahontas, New River, on cars Providence	3.40@3.70

PHILADELPHIA, PENN.

Dealers here are reporting a slight improvement in the demand for anthracite, but the difference is trifling, and is undoubtedly due to the damp and unpleasant weather prevailing here for almost a week. The companies, however, still continue mining at full time, and it is understood that most of the prepared sizes are being readily taken up, but all that is moved to the retailer is not sold, by any means. Quite a number of the dealers, whose demand for a certain size, say egg, is not great, will possibly get a supply in April that will about carry them over until fall of next year, and the same is sometimes true of the other sizes, particularly buckwheat and rice. The market, from a wholesale point of view, is good, although still lacking the snap that usually characterizes April business. While some new business is reported, orders are not coming in as rapidly as they would like to see them, but they all claim to see business ahead for at least the next three or four weeks.

The bituminous situation shows little or no improvement. Cheap coals are almost a drug in the market, and the better grades are selling, in some cases, at prices that probably net the operators less than the cost of production. Many contractors are still holding out for better figures, and with the prospects fair that they will secure them, if conditions do not change.

NEW YORK

Bituminous—While there is no tangible evidence of any material improvement in the local soft-coal market, there is undoubtedly an optimistic undertone that is having a steadying and beneficial effect on the trade. This is particularly true on contract business. Consumers are showing a greater willingness to close and there has been much business signed up during the past week; in fact, the companies generally report that nearly all contracts which expired the first of the current month have been renewed, and that they are not interested in further contract business unless same presents some unusually desirable features. Prices for the new contract year showed a general increase without exception, varying from 5@15c. above last year's figures.

In the prompt market there is no pressure to sell and inquiries seem to be on the increase. Supplies at tide are rather below normal. Mines are reported to be working about two-thirds capacity, some curtailment still being evident; the railroad movement is good, and plenty of cars are available. Prices have not undergone any change, although they are probably somewhat firmer on the same basis as last week as follows: West Virginia steam, $2.55@2.60; fair grades, Pennsylvanias, $2.65@2.70; good grades of Pennsylvanias, $2.75@2.80; best Miller, Pennsylvania, $3.05@3.15; Georges Creek, $3.25@3.30.

Anthracite—There are no indications of any letup in the demand for hard coal, and it is probable that this will continue in excess of the production throughout the balance of the month, as is usually the case in April. Production is up to full rated capacity and all the tonnages are going immediately into the consumers' storage bins. The car supply is a trifle short but not sufficiently so as yet to materially affect production. The heaviest demand is centering on stove, although all the domestic sizes are about equally active; the

steam grades are also quite strong, particularly rice, and the companies are, in some instances, drawing upon their storage supplies for these grades.

Interest in the Eastern markets is being shown in the situation in the Northwest, where the supplies on the docks are almost entirely depleted. This means that Lake shipments, and those to the West generally, will be unusually heavy during the coming season, while consignments to the Eastern points will be correspondingly lighter; in fact, one company has withdrawn entirely from the New England trade, in order to concentrate its entire attention upon the Western market. We quote the nominal New York market fairly strong and active on the following basis:

	Circular	Individual—Lehigh	Individual—Scranton
Broken	$4 50	$4 45	$4 50
Egg	4.75	4.70	4 75
Stove	4.75	4 70	4.75
Chestnut	5.00	4 95	5.00
Pea	3.50	3 35@3 45	3 50
Buckwheat	2.75	2 25@2.45	2 50@2.75
Rice	2 25	1 95@2.05	2 25@2 35
Barley	1 75	1 50@1.70	1.60@1.75

PITTSBURGH, PENN.

Bituminous—Coal shippers have been securing almost full service from railroads for lake coal, but shipments to various points in Ohio and beyond are still considerably hampered. Production in the Pittsburgh district is greater than at any time since Lake shipments closed last season, and probably exceeds 75 per cent. of capacity. Prices are well maintained by leading shippers, with occasional irregularities among the small ones. Slack rarely commands a premium, now that the Lake trade has begun. We continue to quote: Slack, 90c.; nut and slack, $1.05; nut, $1.25; mine-run, $1.30; ¾-in., $1.40; 1¼-in., $1.55, per ton at mine, Pittsburgh district.

Connellsville Coke—The coke market shows more stiffness than might be expected, after so serious an interruption to shipments as was caused by the floods. The regular quoting basis on prompt furnace is $2.25, this being shaded only occasionally on small lots, while on contract the operators speak confidently of obtaining $2.50. There is, however, no contract market, there being practically no inquiry even, and an actual inquiry would probably develop weak spots, as was the case in the last contract placed, some three weeks ago, when $2.25 was done for shipment to July 1. Furnaces uncovered for second-half are quite indifferent, and naturally so, as they see a constantly falling pig-iron market, and scarcely any demand. We quote: Prompt furnace, $2.25; contract furnace (nominal) $2.25@2.50; prompt foundry, $3@3.50, and contract foundry, $3@3.50, per ton at ovens. Indifferent grades of foundry coke could possibly be picked up at slightly lower figures.

BALTIMORE, MD.

The continued movement of traffic westward to await the opening of Lake business was the only feature of interest during the week. Local operators depend largely on this Western business to tide them over the dull period in the East, and the Lake trade promises to show a substantial increase this year. The Eastern situation has undergone but little change. The demand for coal is still light, the supply has not been large and the report is current that some of the smaller mines were shutting down.

More consumers renewed their contracts during the week, but there are still many who are holding out, preferring to take their chances in the spot market. In the face of the quiet market at this time optomistic predictions for future business are heard.

Spot business here is certainly not booming, due to the large supplies purchased by consumers during January and February, when it was thought that severe weather would be experienced. These consumers are still drawing on their supply, and consequently have no occasion to enter the market. The coke market is quiet, the supply being gradually reduced to meet light demand.

BUFFALO, N. Y.

There are a good many prices asked for bituminous coal and predictions as to the future of the trade differ widely. The seller who has held his prices firm and expects to continue doing so does not believe that the low prices here and there are likely to have any influence on the general trade. If a few operators want to give their coal away they certainly cannot be prevented. For all that the consumer is buying sparingly, he is not going to pay 15c. or 20c. more for coal than he has to. It is not denied that a good part of the cheap coal is low in quality, but there is enough of it that is good to keep the consumer uncertain as to the future.

There is nothing but the heavy consumption all along the line that keeps prices at all firm. There is really enough being used to enable the sellers to maintain prices, but dealers hear rumors that competitors are cutting and start doing likewise themselves, when it is quite likely they are the only ones cutting. Some time ago there was quite an amount of coal on track here, but it is now said to be sold at pretty low prices, it is believed.

Reports from the Canadian trade are favorable to a heavy movement in that direction. The industries there are well kept up and there is plenty of money available. Collections in Canada are said to be satisfactory. The Eastern trade is not so strong, but it would be good if the cheap salesman would stay away.

Pittsburgh is holding prices firmest. A big Lake trade is opening and rumors are current that some of the heavy operators refuse to make quotations to new inquirers. With such possible competitors out of the way it ought to be rather easy to keep the market firm. Quotations remain at $2.80 for Pittsburgh lump, $2.65 for three-quarter, $2.55 for mine-run, and $2.15 for slack. Coke is still rather quiet at $5 for best Connellsville 72-hr. foundry. Allegheny Valley coal is about 25c. below Pittsburgh. Side coals, such as smithing and cannels, are not much affected by other fluctuations and prices have not changed lately.

The demand for anthracite is light. March and April have not made much inroad on the supplies, so that consumers have quite an amount on hand and do not care to buy now, even at the reduced prices.

COLUMBUS, OHIO

After several weeks of demoralization, the coal trade is again showing signs of becoming normal. One of the results of the flood was a rush of small orders for domestic grades and this is having a good effect on the trade generally. There is also a fair demand for steam sizes and taking it all in all the outlook for the future is considered excellent.

Prices have strengthened materially although there has not been any special advance excepting in the small sizes; other grades are sold at the circular figures. Concessions off of the list are infrequent and most of the operators and jobbers are inclined to maintain the circular figures.

Railroad traffic is still somewhat uncertain but officials are making every effort to remedy the situation. Embargoes have been the rule and the work of shipping required calculation. But toward the latter part of the week the embargoes were gradually removed and it is now possible to reach practically every point in Ohio through some railroad or other. Springfield, O., was about the only large town where there was any great shortage of coal and this situation is now relieved. The shortage at no time amounted to a coal famine.

Operations have of course been much restricted by the lack of transportation facilities. The greatest activity is shown in the Hocking Valley because the roads were best able to handle the output from that district. Lake trade is close at hand. A number of bottoms have been loaded and will leave the ports of the lower Lakes just as soon as navigation is formally opened which will be shortly after Apr. 15. Word received from the upper Lakes shows considerable ice in the Soo, although efforts are now being made to break the ice by means of tugs. There is an extraordinary Lake demand in prospect for the summer.

Quotations in the Ohio fields are as follows:

	Hocking	Pittsburgh	Pomeroy	Kanawh
Domestic lump	$1 50	..	$1 50	$1 50
¾-inch	1.35	$1 35	1 35	1 30
Nut	1.20	....	1 25	
Mine-run	1 15	1.10	1 15	1 10
Nut, pea and slack	1 00	..	1 00	1 00
Coarse slack	0 90	0 85	0 90	0 85

BIRMINGHAM, ALA.

One interesting feature of the local coal market is the rush of orders for steam coal by some of the railroads west of the Mississippi who have contracts for Alabama coal. It is feared that the floods of last year will be repeated; at that time some of the roads were caught short of fuel on account of their inability to get coal across the flooded territory.

There is no apparent change in the domestic market since our last report. We give below schedule of prices covering Carbon Hill domestic coal for the coming season:

Month	Fancy Lump	Nut
April	$1 75	$1 45
May	1 85	1 55
June	1 90	1 60
July	1 95	1 65
August	2 00	1 70
September	2 15	1 75
October to February, inclusive	2 25	1 90

The market for both foundry and furnace coke is active and high prices are maintained. All of the producers are sold up for several months ahead and an inquiry for 100 cars for nearby shipment found no bidders although it was stated they were willing to pay $4 f.o.b. local ovens.

LOUISVILLE, KY.

The coal business in this vicinity was virtually brought to a standstill by the flood, but the railroads are slowing resuming operations again, altheugh the road beds are in a precarious condition.

The Louisville, Henderson & St. Louis which handles the large proportion of the Western Kentucky production is once more getting under operation, but the movement is still uncertain. In the same field the Illinois Central is in somewhat better condition and its movement East is fairly prompt but the service for the South is badly crippled by the floods in the Mississippi Valley. In the Eastern Kentucky fields the situation is much better. The roads generally are not so accessible to flood waters and little trouble was experienced in rapidly repairing what little damage was done.

The damage to the mines was comparatively insignificant and there will be few if any protracted shut-downs due to loss of equipment or water in the workings. The great congestion of traffic at all the important junction points appears to have been the most serious result of the flood. The service is still badly demoralized at a number of points and the work of getting cars moving again is going forward slowly. The congestion of coal is particularly accute. While the physical condition of the roads is such that there seems to be no reason for further delays there is a paralyzing confusion that seems to make the efforts of the operating departments ineffective.

Because of the large number of cars tied up and not available for use an actual shortage of equipment has developed. The Kentucky product is being called upon to supply markets which usually belong to the West Virginia operators. A prominent Kentucky operator recently shipped 30 box-cars of the best block coal to Seattle, Wash., the freight rate on which was between $10 and $11 a ton.

The heavy demand and short supply of nut and steam grades has resulted in an advance on these to as high as $1.10. Western Kentucky lump can be had from $1.10 to $1.25, domestic nut from $1 to $1.10, with nut and slack strong at 75 to 85c. and not much available.

KNOXVILLE, TENN.

Business in this district is considered fairly good for this period of the year. While the advance in prices, as compared with other states, and even with adjoining competing districts is somewhat less, still most steam contracts are being closed on an average of about 10c. higher than last year's figures and operators appear satisfied. The domestic consumption has been comparatively light due to the persistently warm weather over the past two or three months, but the steam grades are in strong demand and the surplus domestic is being diverted into the steam market.

The excessive domestic production which always occurs through May and June appears to be pretty well covered; contracts have been rather harder to close. Local operators are taking considerable pains with their preparation and this, together with a rather extensive campaign for business, and the high grade of the coal, has created a very strong and consistent demand for these fuels.

INDIANAPOLIS, IND.

Many of the mines of the state are still shut down because of inability to get cars and the movement to Indianapolis and to some of the other large cities is small. Railroads are repairing flood damage as fast as possible, but scores of bridges were carried away and the work of rebuilding will be slow. Where parts of them only were damaged, repairs will soon be made and some have already been fixed.

On account of the high water and restricted railroad service, hundreds of factories were shut down or are now working part time and this relieves the pressure for coal. The weather has not been severe and the domestic demand has not yet cleaned up stocks in retail yards, the mild winter leaving these still of ample proportions.

In the Terre Haute district, mines that were closed for two weeks during the worst of the flood and its aftermath are in operation again, as some cars are being furnished. While here and there a premium is offered, no advantage is being taken by operators or retailers of the shortage condition in particular places and summer prices prevail at the mines.

DETROIT, MICH.

There is a reverse condition existing here from last week; the consumers of steam coal seem to be all over stocked by the abundance of fuel that is arriving daily, some of the railroads being forced to auction several cars off for demurrage. They are now requiring the shippers to stop all shipments so that they can work their stocks down and clean up for the spring.

It is thought by the operators that this will give them an excellent advantage on prices for contracts in the future. Pocahontas is the only coal that is showing any strength just now, however, as retailers are very slow in the matter of stocking up on domestic soft coal.

The market is dull at present, and only those who are forced are buying coal. The following quotations for today are as follows, f.o.b. mines:

	W. Va. Splint	Gas	Hocking	Cambridge	No. 8	Pocahontas	Jackson Hill
Domestic lump.	$1.40	..	..	....	....	$2 25	$1 75
Egg.....	1.40	..	..	....	..	2 25	1 75
Nut.....	1.30	..	$1 30	....	..	..	..
1½-in. lump.....	1 15	..	..	....	..	..	..
¾-in. lump.....	1 05	$1.05	1 05	$1.05	$1 05	1 25	....
Mine-run.....	0 95	0 95	0 95	0 95	0 95	....	
Slack.....	0.75	0.75	0 75	0 75	0 75	1 00	

The coke situation here has fallen off quite materially in the last few days because of the slight demand. Connelsville is being quoted at $2.80 Semet Solvay $3, and Gas House $2.75, f.o.b. the ovens.

CHICAGO

The amount of coal available for Chicago delivery is far below normal, due to the recent floods in Ohio, Indiana and Illinois. The main source of supply at the moment is the Hocking district of Ohio, that part of Indiana north of the Wabash River and from a comparatively few mines in Illinois. Chicago dealers report a temporary rise of prices for spot coal and dimirished storage piles.

Domestic coal is being sold largely for steam-making purposes and commands mine-run prices; mine-run is bringing from $1.10 to $1.25. Retail dealers are paying $1.25 for central Illinois coal and $1.35 for the southern product. Eastern coals coming into this market include Hocking, Pennsylvania smokeless and anthracite. The coke market temporarily is strong and byproduct coke has been fairly active during the past few days at $5@5.25. A few shipments of Connellsville coke have been made and the price is firm at about $6 delivered.

Prevailing prices in Chicago are:

	Sullivan Co.	Springfield	Clinton	W. Va.
Domestic lump.	$2.47	$2.07	$2.27	....
Egg.....	2.47	....	....	$3.95
Steam lump....	$2.12 @ 2.37	1.92 @ 1.97	2.17	....
Mine-run.....	....	1 87 @ 1.92	1.97	3.30
Screenings.....	1.77 @ 1.82	1.77 @ 1.82	1 77	....

Prevailing prices for coke are: Connellsville and Wise County, $6@6.25; byproduct, egg, stove and nut, $4.45; gas house, $4.75@4.85.

ST. LOUIS, MO.

There is no change in the local situation, with the possible exception that a few of the operators are beginning to realize that they are losing money, and are asking a trifle more for coal. Franklin County coal is being sold on the local market at perhaps the lowest price of any high-grade coal.

The Standard market is still struggling along against odds. The past week has seen the price of screenings jump from 60 to 90c. on account of the poor demand for the screened sizes. With this exception there has been no change in prices.

The circular is:

	Carterville and Franklin Co.	Big Muddy	Mt. Olive	Standard
2-in. lump.....	....	....	....	$0.90
3-in. lump.....	....	....	$1.25	....
6-in. lump.....	$1.20 @ 1 25	....	1 35	1.10
Lump and egg..	1 25	$2.25	..	....
No. 1 nut.....	1.10 @ 1 15	..	..	....
Screenings.....	0 95 @ 1 00	..	..	$0.85@0.90
Mine-run.....	1.05 @ 1.15	..	..	0.85
No. 1 washed nut	1.35			....
No. 2 washed nut..	1.35			....
No. 3 washed nut	1.35			....
No. 4 washed nut	1.35			....
No. 5 washed nut	1 00 @ 1.05			..

OGDEN, UTAH

March finished with all the mines working every day This increased demand for coal during the latter part of the month resulted in a production that was not expected. The first 20 days were very discouraging and had it not been for the storms that visited the West, March would have been a poor month. April is starting out well as there is not much coal in storage and also because of the reduction in quotations for shipments to Nebraska. No doubt the demand for Rock Springs coal will steadily increase until this market will again become normal. This will be a great relief to the Wyoming operators as Kansas and Nebraska have been a source of annoyance.

Prices remain unchanged as follows, with nut and slack selling below circular prices: Lump, $2.25; nut, $1.75; mine-run, $1.75; slack, $1 for Nebraska and Kansas. Lump, $2.75; nut, $2.25; mine-run, $1.85, and slack, $1, with Utah slack $1.25 for shipments to the Northwest.

PRODUCTION AND TRANSPORTATION STATISTICS

ANTHRACITE SHIPMENTS

The following is comparative statement of the anthracite shipments for March and the first three months, of the years 1912-13, in long tons:

	March		3 Months	
	1913	1912	1913	1912
Phila. & Reading	976,712	1,472,696	3,399,293	3,861,766
Lehigh Valley	829,502	1,225,019	3,066,782	3,329,391
Cent. R.R. N. J.	665,856	848,110	2,240,293	2,393,145
Del. Lack. & West.	532,247	916,824	2,217,917	2,491,221
Del. & Hudson	562,440	578,983	1,782,988	1,718,283
Pennsylvania	429,211	537,179	1,496,825	1,663,828
Erie	700,383	761,742	2,073,342	2,154,850
Ont. & Western	212,932	228,843	642,236	656,867
Total	4,909,288	6,569,687	16,919,876	18,209,351

Stocks at Tidewater at the close of March were 772,115 tons as compared with 484,270 tons on Feb. 28.

CHESAPEAKE & OHIO RY.

The following is a comparative statement of the coal and coke traffic over the lines of the C. & O. Ry., for February, and the eight months ending Feb. 28, 1912-13, in short tons:

	February		Eight Months			
Destination	1913	1921	1913	%	1912	%
Tidewater	323,469	299,459	2,391,580	22	2,605,213	22
East	220,991	190,655	1,739,089	16	1,472,804	13
West	671,742	971,416	6,109,197	57	7,456,874	63
Total	1,216,202	1,461,530	10,240,466		11,534,891	
Coke	29,643	91,579	195,343		147,616	
From connections						
Bituminous	88,546	17,650	423, 11	4	153,890	1
Anthracite	1,480	4,742	8,829	1	26,646	1
Grand total	1,335,871	1,503,501	10,867,749	100	11,863,043	100

THE CAR SITUATION

The net surplus of idle coal cars shows an increase of about 40% over the two previous statements. American Ry. Association reports surpluses and shortages of coal equipment for two weeks ended Apr. 1, as follows:

	Surplus	Shortage	Net*
New England Lines	321	0	**321**
N. Y., New Jersey, Del.; Maryland; Eastern Penn.	4,303	182	**4,121**
Ohio; Indiana; Michigan; Western Pennsylvania	1,215	554	**661**
West Virginia, Virginia, North & South Carolina	1,574	400	**1,741**
Kentucky, Tenn.; Miss.; Alabama, Georgia, Florida	1,412	150	**1,262**
Iowa, Illinois, Wis., Minn.; North & South Dakota	3,368	55	**3,313**
Montana, Wyoming, Nebraska	1,453	15	**1,438**
Kansas, Colorado, Missouri, Arkansas, Oklahoma	2,792	0	**2,792**
Texas, Louisiana, New Mexico	635	33	**602**
Oregon, Idaho, California, Arizona	3,008	0	**3,008**
Canadian Lines	127	11	**116**
Totals	20,209	1,400	**18,809**
Greatest surplus in 1912 (Apr. 25)	94,692	2,144	**92,548**
Greatest shortage in 1912 (Oct. 10)	6,491	14,897	8,406

*Bold face type indicate a surplus

FOREIGN MARKETS

GREAT BRITAIN

Apr. 4—A great improvement has taken place in the demand for all descriptions of coal. Prompt supplies are very scarce and dear, while for forward shipment values are stiffening further all round.

Quotations are approximately as follows:

Best Welsh steam	$4.80@4.92	Best Monmouthshires	$4.44
Best seconds	4.68@4.80	Seconds	4.32
Seconds	4.56@4.68	Best Cardiff smalls	3.78
Best dry coals	4.56	Seconds	3.60

The prices for Cardiff coals are f.o.b. Cardiff, Penarth or Barry, while those for Monmouthshire descriptions are f.o.b. Newport; both exclusive of warfage, and for cash in 30 days —less 2½%.

FINANCIAL DEPARTMENT

Pittsburgh Coal Co.

Chairman M. H. Taylor reports under date of March 11, as follows:

Results—The total tonnage produced and handled, including coke purchased and exclusive of coal purchased by the subsidiary companies, was 18,363,417 net tons, an increase of about 14%. The gross earnings from all sources increased $382,558, or 9.46%, and the net earnings after interest charges and full depreciation were $2,025,483 (an increase of $633,545, or 45.52% on the preferred stock.

Demand caused by favorable weather conditions and the uncertainty attending the biennial miners' wage-sclae settlement materially improved tonnage and earnings for the first quarter of the year. Then followed idleness for three weeks in April, pending scale adjustment. When the mines resumed, contracting was done under sharp competition from all districts at prices at which the bulk of the production for the year was moved. This, with floods, shortage in labor and car supply, limited the advantage that otherwise would have been received under the better trade conditions of the last half of the year.

The increase in net earnings is partly due to a small increase in the average selling price of the product f.o.b. mines, and from better dock and agency returns. Labor mine costs were increased under the wage scale adjustment of Apr. 1. Practically all of the betterments on the mines for the year have been charged to operation, as has also full depreciation. Floods during the spring and summer caused severe losses in property.

The undivided earnings account now stands at $9,153,131.

Finances—The working capital Dec. 31, 1912, was $4,573,679, a net increase of $267,275. There are no outstanding obligations for borrowed money, either by this company or any of its subsidiaries, and the floating debt is chiefly for accounts payable not yet due and for paper issued by subsidiary companies for sold undelivered dock stock coal.

Mining Plants—Disposition of 77 mining plants owned at the beginning of the year is as follows: In commission either the whole or part of the year, 51; available but idle for the year, 6; operated under leases, 7; exhausted and dismantled, 5; assigned to other mines, 8; total, 77. The possible tonnage capacity of the mines in commission for the year as against the actual output shows an efficiency percentage of only 65.36%.

Pittsburgh Coal Dock & Wharf Co.—Guaranteed Bonds—To secure funds to repay the Pittsburgh Coal Co. of Wisconsin for its advances on account of Dock No. 7 construction, to enlarge dock No. 5 at Superior, Wis., and to construct a dock at Lime Island, Mich., it became necessary to transfer the dock properties at the head of Lake Superior to the Pittsburgh Coal-Dock & Wharf Co. and to retire the $1,852,000 outstanding bonds upon them as follows: Northwestern Coal Ry. Co., $794,000; Ohio Coal Co., $200,000; Pittsburgh Coal-Dock & Wharf Co., $858,000. [Of these old bonds there remained outstanding on Dec. 31, 1912, $121,000, $85,000 and $250,000, respectively.]

To do these things, an issue of bonds by the Pittsburgh Coal-Dock & Wharf Co. of Minnesota, guaranteed as to principal and interest by the Pittsburgh Coal Co. of Pennsylvania, was duly authorized in the sum of $3,500,000, dated Apr. 1, 1912, bearing 5.4% interest payable semi-annually, with sinking fund provision for their retirement at or before maturity, Apr. 1, 1938, but redeemable all or any part on any interest date at 102½. Trustee, Union Trust Co. of Pittsburgh.

The large expenditures authorized will provide modern dock facilities sufficient for storing and handling an increase over present tonnage requirements, and for some time to come, at the head of Lake Superior. Decrease in handling costs, maintenance and rentals, heretofore paid, will exceed the increase in fixed charges created based upon the same tonnage.

Midland Purchase Bonds—The Midland Coal Co. lease of Jan. 1, 1903, upon 4736 acres of coal rights and of three mining plants taken over at that time was terminated by

sinking fund bonds of Pittsburgh Coal Co. of Pennsylvania, known as Midland purchase bonds, dated May 15, 1912, $1,006,000 of which have been issued on the conveyance of the property, and the balance retained for the retirement of a prior-lien mortgage of the Midland Coal Co.

Monongahela River Consolidated Coal & Coke Co.—While practically all of the preferred and about 94% of the common shares are held, this controlled company has been independently conducted, although, for economic reasons, a portion of the operating staff of both companies is joint and it had relatively an equal year in net gain with this company. Of the issue of debenture bonds exchanged for the preferred shares, $57,500 have been acquired and canceled during the year, and we plan to retire annually hereafter such a percentage as will cancel the entire issue prior to maturity.

Montour R.R. Extension—Bonds—To insure maintenance of the present tonnage of the company, and to provide for its increase, it has become a present necessity to extend the Montour R.R. from its treminus at North Star, Penn., to the Mifflin Yards of the Bessemer & Lake Erie R.R. Co. by an extension of about 34 miles, to furnish an outlet for proposed new mine developments. A contract has been entered into between the Montour R.R. Co. and the Bessemer & Lake Erie R.R. Co., dated July 11, 1912, for a traffic exchange between the two railroad companies and a division of the rates upon it.

It is expected that the road will be in operation by July 1, 1914. To finance its cost, $2,750,000 first morgtage 50-year 5% cupon bonds have been issued, free of deductible tax, and having an annual sinking fund provision sufficient to retire all before maturity on Feb. 1, 1962. Contracts have been let for the work. Current progress will also be made in the opening up of mines along the line of the projected road, with which all the railroads of the district can be connected. While the tonnage of this company will furnish a sufficient revenue to meet all charges, there are assurances of other traffic which would add greatly to the value of the new line.

RESULTS YEAR ENDING DEC. 31, INCLUDING SUBSIDIARY CO'S

*Production in short tons:	1912	1911	1909	1909
Pittsburgh district coal	16,948,775	14,739,158	16,213,912	14,560,331
Hocking district coal	1,414,642	1,281,517	1,267,914	1,005,437
Pittsburgh district coke		567,350	535,338	484,903
Profits, after all expenses	$4,427,036	$4,044,504	$4,699,863	$3,448,394
Depletion of coal lands	714,306	696,181	777,285	697,968
Deprec. plant and equipment	811,251	867,595	901,089	927,870
Net profits	$2,901,506	$2,480,728	$3,021,489	$1,822,556
Interest on bonds	876,024	1,088,791	1,056,039	1,012,458
Preferred div (5%)	1,353,590	1,353,590	1,353,590	.....
Undivided profits	$671,892	$38,347	$611,860	$810,098
Surplus brought forward	8,841,541	8,443,194	7,831,333	7,021,235
Total suprlus Dec. 31	$9,153,434	$8,481,541	$8,443,193	7,831,333

* Production includes sundry purchases from other producers and coal used in manufacture of coke.

CONSOLIDATED BALANCE SHEET DECEMBER 31

(*Pittsburgh Coal Co. and Subsidiary companies.*)

Assets—	1912	1911
Properties *x*	$69,464,237	$ 69,579,705
Treasury stock—pref. stock	4,928,200	4,928,200
Investment in stocks and bonds	16,525,240	13,877,627
Cash with trustees	1,206,350	32,142
Pension fund investments	86,243	86,243
Merchandise	3, 92,186	3, 80,930
Accounts and bills receivable	6,266,386	5,147,243
Cash	2,023,869	1,464,910
Total	103,992,712	103,992,712
Liabilities—	1912	1911
Preferred stock	$32,000,000	$32,000,000
Common stock	32,000,000	32,000,000
First mortgage bonds	9,205,000	10,084,000
Shaw. coal purchase bonds	1,335,000	1,395,000
Debenture bonds	5,931,000	9,526,120
Subsidiary bonds	4,111,000	2,067,900
Maryland Coal Co. purchase bonds	1,006,000	.....
Maryland Coal Co. bonds	137,000	.....
Mortgages payable	315,498	178, 39
Car trust notes	260,000	364,000
Pension fund	108,026	92,529
Bills payable	2,675,255	4,465,414
Accounts payable	3,533,508	2,221,274
Stock purchase surplus	1,021,992	1,021,992
Insurance funds	175,000	175,000
Sales contingent fund	25,000	25,000
Undivided earnings	9,153,434	8,841,541
Total	103,992,712	100,497,000

x Properties owned Dec 31, 1912, consisting of coal loands, mine plants and equipment, railways, railway cars, docks on Great Lakes, etc., were: Coal lands and real estate, less allownnce for depletion of coal lands, $56,086,905; plant and equipments, $12,595,942; advanced royalties, $7,388.

Outlook—The outlook for the present year is for a material increase in net earnings, against the adverse factors of an unusually light winter use and a reduced general business demand. Since 1907, due to special conditions, all costs have steadily advanced, and the margin of gain has as steadily declined, until it is reasonable to expect an advance in the selling price of 1912, which did not represent the cost risk and value of the product.

The Central Coal & Coke Co.

According to the recent statement of this company (of Kansas City, Mo.), it has over 30 coal shafts operating in Kansas, Missouri, Arkansas, Indian Territory and Wyoming, with timber mills in Texas and Louisiana. Gross income for 1912 shows a better proportion than for the 19 months ended Jan. 1, 1912, being $1,265,279 to $1,581,164 for the earlier period. Expense, interest and depreciation have decreased from $1,086,577 for the 19 months before 1912 to $633,770 for 1912. Net earnings for 1312 are $631,508, against $494,587 for preceding 19 months. The payments of 5% dividends upon the $1,875,000 of preferred stock and of 6% upon the $5,125,000 of common stock left a balance of $230,259, compared with the balance of $93,337 for the previous 19 months.

Out of assets of $13,014,267, quick assets are $2,431,730. Current liabilities are $2,125,132, leaving a working capital of $306,598. This compared with assets for the 19 months before of $1,996,494 and liabilities of $1,260,115, making a working capital of $736,379. Decrease has been due largely to bills payable, which are $547,500 larger for the shorter period.

COAL SECURITIES

The following table gives the range of various active coal securities and dividends paid during the week ending Apr. 12:

Stocks	Week's Range—High	Week's Range—Low	Week's Range—Last	Year's Range—High	Year's Range—Low
American Coal Products	87	87	87	87	87
American Coal Products Pref.	109½	109¼	109½	109½	109½
Colorado Fuel & Iron	35½	33½	34	41½	31
Colorado Fuel & Iron Pref.			155	155	150
Consolidation Coal of Maryland	102¼	102¼	102½	102½	102¼
Island Creek Coal Pref.	86	85	85	....	....
Lehigh Valley Coal Sales	225	210	210	....	....
Pittsburgh Coal	20½	20½	20½	24½	19
Pittsburgh Coal Pref.	85½	83	83	95	80½
Pond Creek	23½	22	23¾	28½	22
Reading	168½	164½	166½	168½	152½
Reading 1st Pref.	92½	92	92	92½	89½
Reading 2nd Pref.	95	93½	93½	95	87½
Virginia Iron, Coal & Coke	50	50	50	54	44½

Bonds	Closing Bid	Closing Asked	Week's Range or Last Sale		Year's Range	
Colo. F. & I. gen. s.f.g 5s	97½	98½	98½	Apr. '13	98	99¼
Colo. F. & I. gen. 6s	....	....	107½	June '12	....	....
Col. Ind. 1st & coll. 5s. gu.	79½	81	80	Mar. '13	78½	85
Cons. Ind. Coal Me. 1st 5s	75	80	85	June '11	....	....
Cons. Coal 1st and ref. 5s	....	94	93	Oct. '12	....	....
Gr. Riv. Coal & C. 1st g 6s	....	100	102½	Apr. '06	....	....
K. & H. C. & C. 1st s f g 5s	....	....	98	Jan. '13	98	98
Pocah. Con. Coll. 1st s f 5s	....	87	87½	Mar. '13	87½	87½
St. L. Rky. Mt. & Pac. 1st 5s	77	79	76	Mar. '13	76	80
Tenn. Coal gen. 5s	101½	102½	100½	Mar. '13	100½	103
Birm. Div. 1st consol. 6s	101½	103½	101	Apr. '13	101	103
Tenn. Div. 1st g 6s	....	103½	102	Feb. '13	102	102
Cah. C. M. Co. 1st g 6s	....	104	110	Jan. '09	....	....
Utah Fuel 1st g 5s	....	....	....	....	....	....
Victor Fuel 1st s f 5s	....	83½	70½	Feb. '13	70½	70½
Va. I Coal & Coke 1st g 5s	95	97	94½	Mar. '13	94½	98

Consolidation Coal Co.—Regular quarterly dividend of 1½% payable Apr. 30 to holders of record Apr. 15.

Pacific Coast Co.—Regular quarterly of 1¼% on the common and second preferred and 1¼% on the first preferred payable May 1 to holders of record Apr. 18.

Metropolitan Coal Co. (Boston)—This company, controlled by the Consolidation Coal Co., has recently issued $200,000 first mortgage 4½ per cent. bonds, dated Dec. 1, 1911. The issue is due Dec. 1, 1939, but callable at $105 with interest for sinking fund beginning Oct. 1, 1913. The total authorized issue is $250,000. The mortgage was made in connection with the purchase and development of the large coal plant of Geo. B. Emery, on the waterfront in Chelsea, it being proposed to build a 300-ft. pier and provide facilities for handling and storing 1,000,000 tons a year.

Hocking Valley Products Co.—This company was incorporated in West Virginia, February, 1911, as successors to the Columbus & Hocking Coal & Iron Co. and the Columbus & Hocking Clay & Brick Manufacturing Co., both of which were sold in foreclosure July, 1911. The authorized capital stock is $4,600,000, having a par value of $100. The annual sinking fund on bonds is at least 5c. per ton on coal, 15c. per barrel on oil and 25c. per 1000 on brick, and a further sum equal to the excess in dividends above 6 per cent.

COAL AGE

Vol. 3 NEW YORK, APRIL 26, 1913 No. 17

ARE you feeling rather tired and out of sorts just now? Sure! You're suffering from "Spring Fever"!

There is only one class of human beings who escape the tired feeling incident to Springtime—the poets: For them this is a season of undue activity.

If you assume that every one regrets the advent of Spring, just shadow the trail that leads to the fishing pool, and you'll go home convinced that your wits have been woolgathering. It doesn't take the boys long to discover that the outside boss isn't keeping close tab on them, while the fever keeps hold of him, and they slip off satisfied that they won't be missed.

Isn't it just barely possible that these same boys are the only ones around the camp who have found a sensible remedy for the annual tired feeling—sneak away and commune with nature while she is at her best and you are at your worst?

We wonder what would happen if every mining company should set apart one day each Spring and allow the entire camp to shut up shop and take to the woods—women, men, children, babies, dogs, mules, etc.,—that they might enjoy together a genuine old-fashioned picnic.

Think of the ideal picnic grounds that are within easy riding distance of most camps: Water, flowers, moss, trees, birds; with such a combination you can stage any kind of outdoor fun from baseball to "spooning."

Mining folk in this country display little imagination when it comes to planning amusements and recreation for themselves and their families, which explains, no doubt, their lack of community interest.

Can you picture to yourself anything better calculated to develop a community spirit than an entire camp's population being hauled to a picnic in company wagons, drawn by company mules, under the personal direction of the local superintendent, at a time when the Spring fever is first making itself felt?

Such a picnic holds out many possibilities. If all the women folk are required to furnish eatables for a general feast, good-natured discussions as to culinary usage will spring up and the rivalry promoted will have its effect on many a future bill of fare—if you consider all miners' wives ideal cooks, your digestive organs must resemble those of the proverbial can-eating billygoat.

Furthermore, think of the misunderstandings that might be cleared up during a general gathering of this kind. Isn't it reasonable to suppose that many a strike could have been avoided if opportunity had been presented to talk things over in a friendly way, spontaneously?

"All work and no play—"

Honest now! has the miners' play been given proper consideration?

A Brief Account of the Matanuska Field

By W. R. Crane*

SYNOPSIS—The Matanuska field has been exposed to less violence and volcanic heat than the Bering River field. Some of the coal is almost lignitic, but 75 per cent. is bituminous fuel. The best coal chemically is in the worst physical condition and would have to be briquetted or coked to make it acceptable to the market. A portion of the field has good coal, which could be mined at reasonable expense.

The Matanuska coal region, as commonly defined, occupies an area some 80 miles long by 5 to 10 miles wide, lying principally along the valley of the Matanuska River and extending to the eastward from a point slightly to the northeast of Knik, on Knik Arm.

The coal-bearing area is being rapidly extended until at present a considerably larger area is included in the field than was at first anticipated. Coal is now known to occur in beds of workable size to the northward along the Susitna and the Little Susitna rivers and on Willow, Caribou and Billy creeks, while to the southward similar

Fig. 1. Looking up Matanuska River, Chugach Mountains in Background

beds have been located at various points, covering considerable areas in the Chugach Mountains.

The Topography of the Field

The wide valley of the Matanuska River lies between the Talkeetna Mountains on the north and the Chugach Mountains on the south, both of which ranges are steep and rugged, having elevations ranging from 3000 to 6000 ft. See Fig. 1.

The country to the north of Knik Arm consists of lowlands, which gradually increase in elevation as the valley of the Matanuska River is approached and change into a comparatively narrow strip of rolling country with hills seldom exceeding 1500 ft., but increasing rather abruptly in height as the main ranges of the mountains are approached.

Unlike the Bering River coal field, this region is not isolated from the interior by mountains and glaciers, although to the northeast and eastward, except for a few passes, the passage to and from the region is rather difficult. However, to the northwest and westward, a continuous stretch of practically level country extends along Knik Arm and thence into a similar country adjacent to Cook Inlet. The accompanying map gives the location of the rivers and creeks in the coal field with respect to Knik Arm. See Fig. 3.

Not an Icy Wilderness but a Productive Valley

Few parts of Alaska excel the valley of the Matanuska River in favorable climatic conditions. The rainfall is abundant but not excessive, and the amount of sunshine

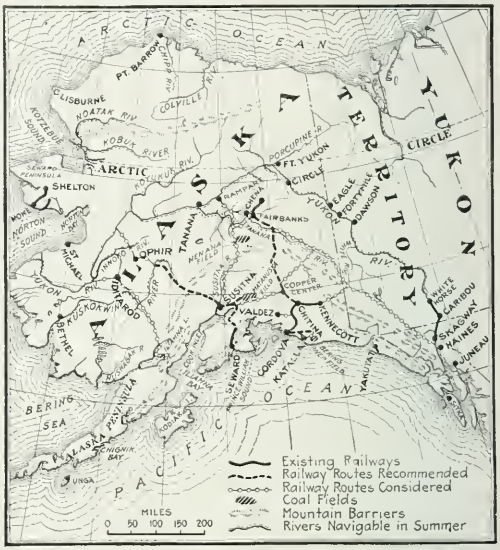


Fig. 2. The Alaska Coal Fields and the Railroads Built and Proposed

is sufficient to insure the growth and maturity of vegetation, as the luxuriant growths on the flats bordering on Knik Arm and the valley of the Matanuska attest.

Excellent pasturage for animals and a soil suitable for raising a great variety of vegetables and cereals is to be found in this locality. In the valley of the Matanuska, timber grows in great variety. The most common trees, naming them in order of their frequency, are the following: Cottonwood, birch, spruce, quaking aspen, white willow and alder; current bushes are also abundant.

The width of the bed of the Matnuska River probably averages one-half mile, although it measures a mile or more in some places. The stream gorges with precipitous walls at other points. It often consists of extensive flats of gravel and sand, through which swift mountain torrents and glacial streams are constantly cutting new channels. See Fig. 1.

No Lack of Rivers and Creeks

The principal streams tributary to the Matanuska River and entering it on the north are: Moose, Eska, Granite, Kings, Chickaloon, Hicks and Caribou, while on the south and proceeding up the river in the same order as before are: Carbon and Coal and numerous others of minor importance. These tributary streams are usually of con-

*Professor of Mining, the Pennsylvania State College, State College, Penn.

siderable volume and are, particularly in certain seasons, difficult to ford.

While the Matanuska River can be forded in a number of places, crossing it is usually a hazardous undertaking. Owing to the difficulties encountered in towing and poling river boats up the river, most of the supplies required in the field are either carried in by pack animals or are sledded in during the winter, the trail following the course of the river.

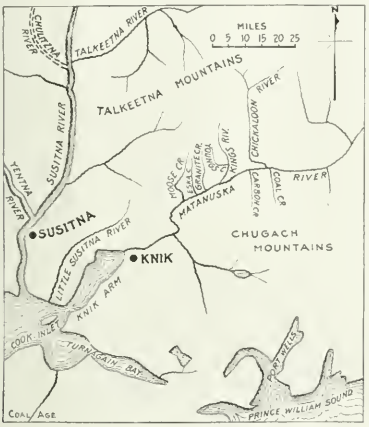


Fig. 3. The Immediate Surroundings of the Matanuska Field

is estimated that some 70 square miles are underlaid with coal. Of this area fully three-quarters, or approximately 50 square miles, contain coal of a bituminous character.

The coal areas of this field are naturally named after the various streams where coal has been found to outcrop. These streams are all tributary to the Matanuska River. The only exception is the anthracite ridge, which lies between two streams. For convenience in discussion the coals of the bituminous area can, therefore, be separated into districts according to the arrangement indicated above, namely, those along Chickaloon, Kings, Young, Eska, Moose, Carbon and Coal creeks, respectively. The last two mentioned, the combined Carbon and Coal Creeks district, lies to the south of the Matanuska and on the opposite side of the river to the Chickaloon Creek district.

The Northeastern and Southwestern Groups

This subdivision of the bituminous area by districts does not take into consideration the character of the coal, which, if followed, would require a wholly different arrangement of the districts in the field. Were the bituminous areas to be subdivided according to character of coals, the coals on Chickaloon, Carbon, Coal and Kings creeks would be placed in one group and called true bituminous coal, while the coals of Young, Eska and Moose creeks would be designated as low-grade bituminous fuels, as they are in some places considered lignitic in character.

The general physical appearance of the coals of Chickaloon and Kings creeks, when compared with those in the southwestern portion of the Matanuska coal field, would seem to indicate that there should be a greater difference in chemical properties than there actually is.

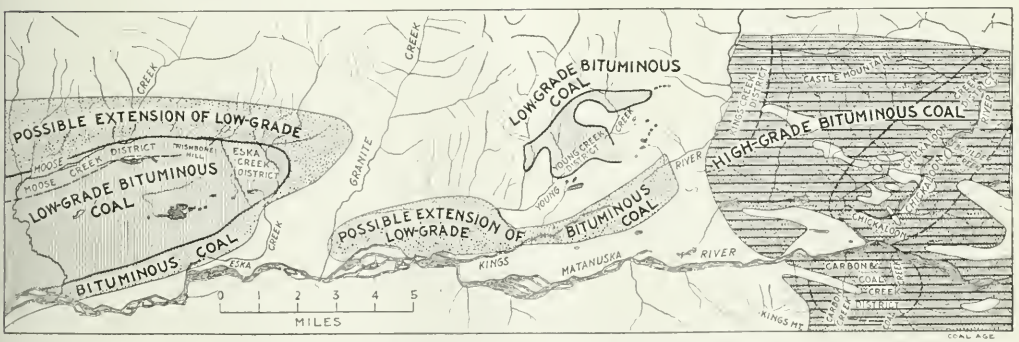


Fig. 4. Map Showing the Various Coal Districts

It is claimed that George Jammé discovered the coal in this field at a comparatively early date, although it was not until 1894 that it became generally known that coal occurred in workable quantities. While considerable work has been done in certain localities, it has been confined to exploratory work and since the withdrawal of the coal lands from entry the field has been practically abandoned.

Coal Is of Varied Grades

The area in which the various grades of bituminous coals occur, extends up the river as far as Chickaloon Creek, including particularly the region lying between and including Moose and Chickaloon creeks. Of the 300 square miles of coal-bearing formations in this field, it

Further, the rock movements evidenced by the folds, faults and igneous intrusions apparent in the upper coal field, gave every opportunity to the coals of both Chickaloon and Kings creeks and possibly to less extent Carbon and Coal creeks to assume a radically different character from those of Young, Eska and Moose creeks, where the rock movements appear to have been slight compared with those in the districts above mentioned.

The Characters of the Coals

The physical condition of the coals of the bituminous area of the Matanuska field is, as a whole, good. The coals of Chickaloon Creek and Kings Creek districts are exceptions. These are badly broken and fractured and much fine coal will be produced in their mining and hand-

ling. The rock movements responsible for the broken condition of the coals on Chickaloon and Kings creeks were much less severe in the western portion of the field, for aside from a moderate degree of folding and faulting the coal remains practically undisturbed.

The U. S. Geological Survey has made extensive tests, both chemically and physically, on the coals of this field. The results of some of these tests are given in the following table[1]:

ANALYSES OF MATANUSKA COALS

District	Total Moisture	Volatile Matter	Fixed Carbon	Ash	Sulphur	Calories	Btu.	Fuel Ratio
Chickaloon Creek	1 98	17.20	66 08	14 56	0 67	8260	14,868	3 77
Carbon and Coal Creeks	4.20	19 72	65.26	10 82	0 42	6649	11,968	3.32
Kings Creek	1 45	22.77	66.40	9 38	0.67	7419	13,354	2 91
Youngs Creek	2.50	28 32	58 82	10.36	0 58			2 08
Eska Creek	6 08	35 41	49 78	8 23	0 42	6299	11,338	1 41
Moose Creek	7 04	35 45	49 10	8 41	0 32			1 39

The chemical properties of coals determine their value and utilization while the physical properties indicate the possibility of their production and are limiting factors in their utilization. It is not, therefore, easy to say which may be the most important from the commercial standpoint, except that the first consideration is fuel value.

The Relative Availabilities of the Coals

The coals of Chickaloon Creek, Carbon and Coal Creeks, and Kings Creek districts, being in bad condition for use commercially, and readily making a coke of good quality, are naturally best suited for the production of coke. But, like the Bering River coals, they might be briquetted to advantage.

The coals of the remaining districts being hard and firm, could be mined with the production of a moderate amount of small coal, thus permitting them to be placed on the market in competition with coals of other fields. Further, the conditions under which these coals occur are no more severe nor extreme than the conditions existing in other localities, where mining is carried on both extensively and economically.

Much depends upon means of transportation both by rail and by water, if these coals are to be placed on the market in competition with other coals. However, Alaska needs fuel for local consumption, and with the assurance that a reasonably cheap fuel can be obtained, the consumption will steadily increase to the vast benefit and growth of her various industries.

[1] U. S. G. S., Bull. No. 289, pp. 27 and 28.

How Electricity May Make Mines Safer

H. H. Clark, electrical engineer of the Bureau of Mines, in his paper on "Safeguarding the Use of Electricity in Mines" read before the Pittsburgh meeting of the American Institute of Electrical Engineers which met Apr. 18 and 19, made the following remarks relative to the hope that mines will be safer when certain electrical developments become more general and are modified to meet the needs of the situation.

"There are, however, some ways in which it seems possible for electricity to decrease the risks now attendant upon mining work. There is one piece of electrical equipment which may almost be considered as a safety device and there are three others which, by substitution for more dangerous equipment and methods, promote the safety of underground workers.

"First may be mentioned the telephone, which is of use in spreading the news of trouble, in calling aid to the injured, and in assisting in mine-rescue work after disasters. Next may be mentioned portable-electric lamps for use of miners. The development of such lamps is just beginning in the United States. At the date of this writing no device has been fully developed and standardized for insuring absolute freedom from gas ignition by lamps of this sort.

There can be no doubt, however, that in the near future some such device will be developed and then the electric lamp will become safer than the locked safety lamp, although it has not the latter's ability to detect the presence of explosive gas. The statement that the electric lamp may be made safer than the safety lamp is based upon the fact that the parts of a safety lamp may be improperly arranged and ignition of gas occur as the result. The records show that this has happened on more than one occasion.

"The greatest benefits to be derived from the electric lamp as a safety device will be in those mines where the electric lamp supplants the open-flame lamp and thereby eliminates a real fire hazard.

"Next may be mentioned the firing of shots by electrical means. There can be no doubt that the firing of shots by properly designed and operated electrical shot-firing devices and equipment is safer than firing them by fuses or other devices which ignite explosives by means of sparks or flames.

Use of Storage-Battery Locomotives

"Finally, it may be suggested that electrical development may partially remove some of the greatest dangers now confronted, by displacing trolley locomotives for those actuated by storage batteries. Main-line haulage by such locomotives can hardly be advocated at present but the gathering of coal by these motors seems to be a feasible proposition, in many cases.

"The use of storage-battery locomotives would entirely do away with the trolley wire from a large part of the mine entries which are now provided with this dangerous equipment. In addition to the greater degree of safety assured, storage-battery locomotives would be more flexible to operate than are cable-reel motors. The load factor on the generating station would be materially improved, satisfactory voltage regulation of the distributing system could be obtained with less copper, and the expense of installing and maintaining trolley wire and rail bonding would be eliminated in the entries worked by storage-battery locomotives."

He also made the following observations regarding the premature ignition of shots:

"It is not the best practice to shoot electrically under conditions that require one side of the detonating circuit to be connected to the earth, because wherever grounded systems of distribution are used unexpected differences of potential exist in the earth in the vicinity of such circuits. If, therefore, one side of the detonator be purposely grounded, an accidental ground on the other side of the detonator may enable an igniting current to traverse the detonator. Premature ignitions have been reported which seemingly have been caused by the conditions just described."

Parallel Operation of Alternators

By C. A. Tupper*

SYNOPSIS—Conditions are here enumerated, which must be complied with before two alternators may be placed at work in parallel upon a common load.

With the rapidly increasing use of electric power for coal mining, its generation and distribution as alternating current has become general; hence the matter of operating various units of a large system or systems in parallel has assumed an importance, at many plants, formerly unknown.

This is particularly true where all of the alternators are not in the same power house, serving a single mine or group of mines, but are installed in stations located at different points in an extensive area and connected by a common net-work of transmission cables.

Such interconnected systems have heretofore been more common in Europe than in America; but within a few years that condition is likely to be reversed. A discussion of the various factors to be considered in operating such units may, therefore, be of value.

When alternating-current generators are run in parallel, there are certain conditions that must be met in order to secure satisfactory operation. These are:

(a) The machines must be in synchronism. That is, the frequency of alternation must be the same for each, and the points of maximum potential of the different units must be in phase.

(b) The voltages must be approximately equal.

(c) In order to secure proper division of the load under changes in load conditions the speed regulation of the prime movers must be alike.

(d) To prevent periodic cross-currents between machines the variations in angular velocity during different parts of the revolution of the prime movers must be kept within certain limits. In waterwheel or steam-turbine-driven units the angular velocity is uniform, but with reciprocating-engine-driven generators there may be trouble, due to periodic variations in angular velocity, if the engine flywheels are not sufficiently heavy.

With belted alternators it is important that the pulleys be proportioned so as to make the speeds of the generators such that they will give exactly the same frequency; if all the machines have the same number of poles their speeds must be exactly alike. If the pulleys are not of the proper size there will be excessive belt slippage or exchange of cross-currents between the various units, thus causing fluctuations in voltage.

With engine- or steam-turbine-driven alternators the speed can be varied by adjusting the governor, and there will be no trouble from cross-currents provided the angular velocity of the engines does not vary too much, and the engine governors act properly.

When alternators are running in parallel their output (actual power) depends on the amount of power supplied by their prime movers. For example, suppose two engine- or steam-turbine-driven machines are running in parallel and that each is taking half of the total load. When the load increases there is a tendency for the speed to drop slightly, and in order for the engine governors to act and admit more steam there must be such a speed decrease.

Now the two alternators must always run in synchronism, or at the same rate, assuming the number of poles to be alike, and if the drop in speed does not result in an equal increase in the steam admission of each engine, one alternator will be supplied with more power than the other and the load will become unequally divided.

Changing the field excitation of the lightly loaded machine will not remedy matters (as with direct-current generators where the machines do not have to run in synchronism and have independent speeds). The only effect of changing the field excitation is to make a wattless current circulate between the two alternators, the actual amount of power supplied by each remaining the same.

The only way to increase the steam admission is by adjusting the engine governor, and to secure equal division of load under all conditions, the change in speed for a given change in load must be alike for each engine. When two or more alternators are run in parallel it is advisable to have an indicating wattmeter on each machine, so that the actual load will be indicated.

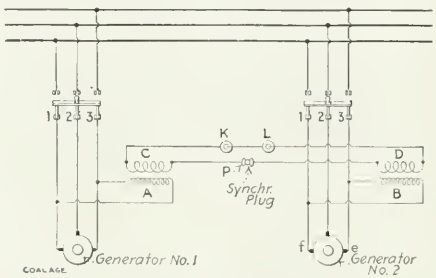


FIG. 1. DIAGRAM FOR SYNCHRONIZING TWO ALTERNATORS

In case wattmeters are not provided the load on each should be adjusted so that the sum of the currents as indicated by the machine ammeters will be a minimum for a given total current supplied to the line. If the sum of the machine currents is much in excess of the line current it shows that a wattless current is circulating between the machines.

TESTING FOR SYNCHRONIZING

The condition of synchronism is usually indicated either by incandescent lamps, which is the simplest method, or by a synchronism indicator or synchroscope, the latter now being used in most large installations. A synchroscope gives more accurate indications than lamps and has the additional advantages of showing whether the incoming machine is approaching or receding from phase and how much this variation actually is.

Fig. 1 is a diagram of the connection for synchronizing lamps. Two small transformers *A* and *B* have their primaries connected to the same phase of each generator. The secondaries *C* and *D* are connected in series through plug or switch *p*, to the lamps *K* and *L*. Assuming that cor-

*Milwaukee, Wis.

responding terminals of the primaries are connected to corresponding lines on each machine and that the two transformers are alike in every particular, corresponding secondary terminals will, at any given instant, have the same polarity when the two machines are in phase. When plug p is inserted, secondary terminals of opposite polarity are connected together; hence the two secondary voltages are in series and aid each other in forcing current through the lamps K and L, which are, therefore, bright at synchronism.

It may happen that the transformers are not wound exactly alike or that the connections have become confused; it is always advisable, therefore, to test them out to make sure that the lamps are light or dark at synchronism. To test the connections in Fig. 1, disconnect B from generator No. 2 and transfer the connections, without changing their relative position, to lines 1 and 3 of generator No. 1; A and B will then be connected to the same lines and if the lamps are bright, they will also

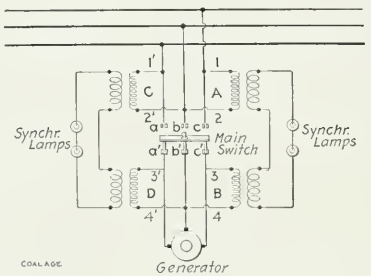


FIG. 2. TEST FOR PROPER CONNECTION TO BUSBARS

be bright at synchronism when B is connected to generator No. 2, as shown. If dark lamps are preferred, either the primary or secondary connections of one transformer must be reversed.

Another method of testing is to leave the transformer connections as they are and disconnect the main leads at e and f on generator No. 2. Both main generator switches are then closed, thus connecting both transformers A and B to generator No. 1. In synchronizing, bright lamps are to be preferred to dark.

When a polyphase alternator is first connected up it is highly important to see that all of its phases correspond with those of the busbars; if one phase only of a three-phase machine is correct, it does not follow that the other two are correct also. Two of the phases should be tested at the same time by using a pair of auxiliary transformers in addition to the regular synchronizing transformers A and B, Fig. 2. Transformer A is connected to the busbars and B to the generator. A second pair of transformers C and D is connected to one of the other phases, the connections in each case being such that the lamps are bright at synchronism.

The connections should be tested as described above to make sure that the polarity of the transformers is correct. With the main switch open and with the generator running at full voltage, both sets of synchronizing lamps should pulsate together. If they do not do so the generator leads are incorrectly connected to the machine terminals and should be interchanged so as to make the lamps pulsate together. After this test has been made, to insure that terminals a, b, c connected to the busbars correspond to a', b', c', connected to the generator, the temporary transformers C and D can be removed.

Bring each alternator and exciter up to speed and make sure that the oil rings are revolving freely. See that all resistance in both exciter- and alternator-field rheostats is out and that both field and main switches are open. Cut out resistance in exciter field and bring the exciter pressure up to normal. Close the field switch of the alternator and have all resistance in so that full voltage will not be generated in the windings.

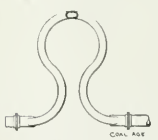
In case the machine is being started for the first time, allow it to run for an hour or two at low voltage and then gradually increase the voltage until it reaches normal; the load can then be thrown on. As the load increases it will be necessary to cut out some resistance in the field circuit in order that full voltage may be maintained, and if the load on the alternator is inductive a larger amount of resistance must be thus removed than with noninductive load.

On light loads comparatively small field excitation is required and it is advisable to run the exciter at rather low voltage and avoid wasting so much power in the field rheostat, provided the exciter voltage is not made low enough to render the operation unstable or cause sparking at the brushes, and that the exciter is not supplying current to other alternators.

A New Expansion Bend

The proper provision for expansion and contraction of steam pipelines is a subject which should receive the most careful attention in any piping layout. This is particularly true, however, when high pressure and superheat are to be dealt with. At 175 lb. pressure a superheat of 375 deg. F., causes an expansion of the pipe 2.2 times greater than is the case when saturated steam is used at the same pressure.

One of the most satisfactory expansion bends which has heretofore been produced is what is frequently termed "the lyre shape" which is equivalent to a double-offset U-bend combined with two 90° bends. The principal objection to this shape is, however, the great space which it requires, particularly in the larger sizes of pipe.



THE NEW BEND; NOTE SECTION

In order to obviate its great size and lessen the strain due to excessive expansion and contraction, a German firm has recently brought out a flat "lyre" shaped bend, the cross-section of which is somewhat elliptical in form and resembles, to a considerable extent, the ordinary Borden tube as used in the steam gage. The manufacturers of this new expansion bend claim that its compensating capacity is four times as great as that of the ordinary bend.

According to the U. S. Geological Survey, more recovery coke plants were constructed in 1909 and 1910 than at any time since 1903. In 1909, 649 such ovens were being built and 800 more were contracted for. Of the 649 ovens in process of construction in 1909, 99 were finished and working in 1910. The amount of coke produced by byproduct ovens in 1910 was 7,138,734 short tons, against 6,254,644 tons in 1909, an increase of 14.13 per cent. The output of byproduct coke ovens in 1910 was 17.12 per cent. of the total coke production. The average cost of coal used in the byproduct ovens in 1910, $2.18 per ton; the cost of that used in beehive ovens was $1.01.

The Car Hauls for a Modern Tipple

By F. R. Bogart*

SYNOPSIS—A system of six hauls which disintegrates a trip at the foot of the tipple incline, elevates one car at a time, five cars per minute, lowers the cars at the same speed and makes them up into trips of empties again.

In order to rapidly handle the output of the No. 2 colliery of the Provident Coal Co., at Fairpoint, Ohio, a system of chain car hauls was recently installed. At this plant the mine cars weigh 6000 lb. when loaded and 2000 lb. empty. These are hauled up an incline at the rate of five per minute. The incline is approximately 200 ft. long and the difference in elevation between the ground level and the tipple floor is about 47 ft. The angle of inclination is thus slightly over 14°.

There are three headings into the mine, one for the exit of loaded mine cars, and the other two for the entry of empties. The latter lie upon either side of the former, and the tipple floor is provided with four tracks.

The system consists of a feeder-haul 20 ft. long, center to center of shafts, for loaded cars at the foot of the incline; an up-haul for loaded cars 225 ft., center to center; two down-hauls for empties, each 205 ft., center to center; and two trip-maker hauls, each 20 ft., centers at the foot of the down-hauls.

A mine locomotive brings a trip of, say, 50 loaded cars, and drops them where the first car can be picked up by the hooks of the loaded car feeder. This feeder is controlled by an attendant who operates the friction clutch, starting or stopping the haul. Starting the haul, advances the trip till the second car in the train is engaged by a hook of the feeder. The chain is then stopped long enough to pull the coupling pin between the first and the second cars, whereupon it is restarted, the following car pushing the uncoupled one upon the foot of the up-haul, where it is caught by the haul hooks and drawn up the incline.

After passing over the tipple dumps, the empty cars are delivered by gravity from kickbacks to the head of the down-haul. Here they encounter a slight incline upward, just before they reach the top of which they are caught and held by one of a series of dogs until they are automatically picked up by the hooks of the down-hauls, which pull them up and over a hump, and then lower them down the incline, to be released automatically at the foot, ready for assembling into trips by the trip-maker haul.

The two trip-makers and the feeder-haul are driven from one lineshaft operated by a 35-hp. motor, and each can be operated independently of the others by friction clutches. Driven from the head of the feeder-haul, and arranged to be thrown in by a clutch, is installed a car puller, to bring up a trip of cars which may have been dropped by the locomotive some distance from the feeder.

The driving machinery of the trip-makers is arranged with a breaking-pin device to give way and protect the machinery in case a "wild" locomotive bumps into the trip while it is being pushed by these trip-makers. The two down-hauls and the up-haul are connected by shafting and gearing, and are operated by one 75-hp. motor.

Tipple and Incline up Which Cars Travel

Clutches are also employed to allow either of the down-hauls to be thrown out.

Upon one of the countershafts of the up-haul there is arranged an automatic band brake, which prevents the chain from running backward in case the current should be cut off while there are cars upon the incline.

The chain for the up-haul is composed of 18-in. pitch upset-end links with wrought-steel rigid hooks every 18 ft. upon four-roller trucks, and two-roller trucks placed midway between hooks to better support the chain. The rollers are flanged, 6 in. in diameter, and of the inclosed-oiling type.

The chains on the down-hauls are of 12-in. pitch with flat links, and with double-tumbling hooks of cast steel every 18 ft. These are also provided with four-roller trucks, and with two-roller trucks placed between. The rollers are identical with those above mentioned.

The chains for the feeders and trip-makers are 12-in. pitch links with cast-steel one-way tumbling hooks every 10 ft., provided with four-roller trucks. The rollers in this case are, however, 4 in. in diameter, but are inclosed oiling, similar to the others.

George A. Baton Co., of Pittsburgh, were the engineers for the tipple, which was erected by William B. Scaife & Sons' Co., of Pittsburgh. The car-hauls were designed and installed by the Link Belt Co., of Philadelphia.

*Engineer, Link-Belt Co., Philadelphia.

Guideless Mine Accumulator Locomotives

By J. Rechtenwald

SYNOPSIS—Description of a novel haulage system which dispenses with the services of the motorman. Comparatively low speed is used and provision is made for automatically stopping the motor when obstructions are encountered, and also for throwing the required switches. The method certainly has its limitations, and there appear to be many possibilities for failure, but there are undoubtedly numerous cases where it might be economically applied.

In the von der Heydt mine, some time ago, a hauling system with accumulator locomotives and without motormen, was installed. The construction of the locomotives in general is not greatly different from the usual accumulator locomotive, only the motorman is replaced by a device which, on meeting an obstacle, automatically disconnects the electric current, pulls the brakes electromagnetically and stops the train at once; the same device releases the brake, and switches on the current as soon as the obstacle is removed and the road again clear.

The construction and action of the arrangement is shown in Figs. 1 and 2. The feeler-like wooden frame, which protrudes over the fore part of the engine, is attached in sled-like fashion to the body of the locomotive so that when meeting an obstacle it can retreat until behind the bumper of the engine. When the wooden frame is thus pushed back, the electric current is disconnected by a switch and at the same time a short circuit is produced which sets a powerful brake on the wheels. This action occurs even if the loop is pushed back a little distance only.

The slow speed of one meter per second is used so a short application of the brake is sufficient to avoid any collision; it has been found that the motor, with a full load behind, stops readily after one meter of travel. By pushing back the protruding frame, a spring is pressed together which advances again as soon as the pressure is relieved; this at the same time switches on the current. The action of the spring is regulated by an oil buffer, so that the switching on of the motor occurs gradually; the disconnecting, however, occurs suddenly. The hoop, in its sled-like guide, is arranged so that it can be swung over the top of the battery to the other side of the

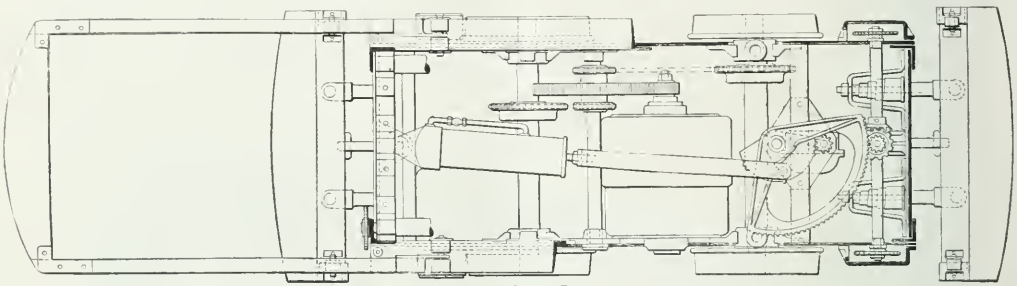


FIG.1 PLAN

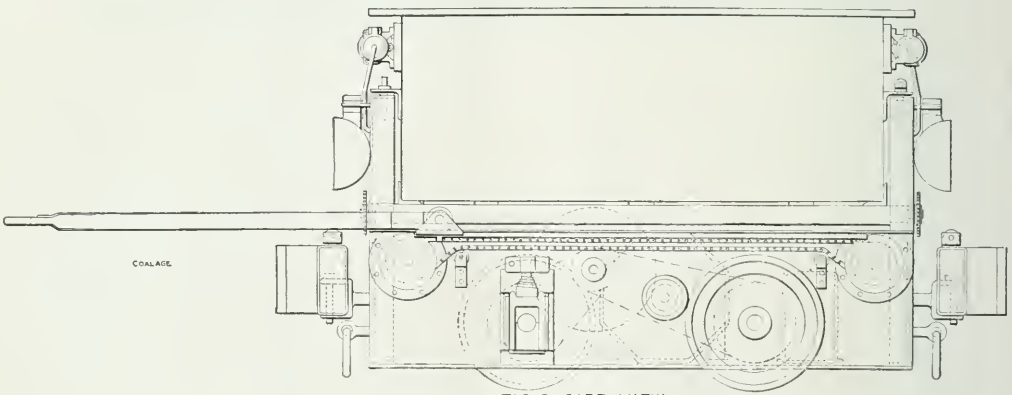


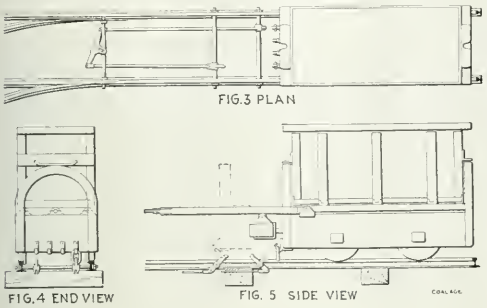
FIG. 2 SIDE VIEW

Figs. 1 and 2. Plan and Elevation of Guideless Mine Motor

Note—Translated from "Glückauf."

locomotive, and thus give it another direction of travel, if so desired.

The device is so sensitively constructed that a minimum pressure against the frame, for instance, running against a miner, brings the train to a sudden stop. Also if the obstacle should exert a pressure in a slanting direc-



FIGS. 3 TO 5. AUTOMATIC SWITCHING ARRANGEMENT

tion, as for instance, when crossing switches or curves, the frame is easily pushed back by a parallel guide running in a chain and rolls. (See Fig. 1.) Thus any laborer, without special knowledge, can stop the locomotive immediately or give it another direction of travel. If it is to be stopped altogether, the frame has only to be pushed back and held in this position by a bolt.

The power is furnished by a side-circuit motor of two horsepower, which acts upon the axles through a double gear. (See Fig. 2.) Going down inclines this kind of motor keeps up the same number of revolutions and when miners are carried to their places or back to the foot of the shaft, a higher speed can be used; these advantages could not be obtained with a main-circuit motor.

5 in., without frame; breadth, 2 ft. 11 in.; height, 4 ft. These dimensions were selected so that the locomotive could be used wherever horses were working.

SWITCHING ARRANGEMENT

The switches, which ordinarily have to be thrown by hand, are so arranged that the locomotive changes them automatically. The front end of the locomotive shows various hooks (see Fig. 4), on which rings are hung that engage levers, laying between the tracks which, in turn throw the switches; the different hooks are so arranged that they are exactly above the levers of the corresponding switches. Before starting the train, rings are placed on the front which will throw the switches for the track it desired the trip shall take. The switch tongues themselves are retained in the final position by springs, and when leaving the switch, are pushed into the right position by the wheels of the locomotive. The mine doors are opened in both directions, automatically by the locomotive itself, without the frame touching the door (see Fig. 6). At both sides of the door, next to the rail, are swinging posts, at bumper heights, and so fastened that when the door is closed they are directly across the rails. As soon as the bumper of the locomotive pushes the post sideways (see dotted line) the door is either pulled or pushed open by a rigid-lever transmission. After the train has passed and the door shuts itself.

There are also block stations, which prevents trains at the junction of two lines or at a crossing from running into each other. To stop one of the trains a post is fastened at the height of the frame; this is held by a blocking device with a rope and spring transmission. As soon as another train passes the switch, the post is pushed aside, and when it has left the switch, the blocking device is released, the frame of the locomotive then advancing and thus switching on the current. The various locomotives succeed each other at suitable distances, thus

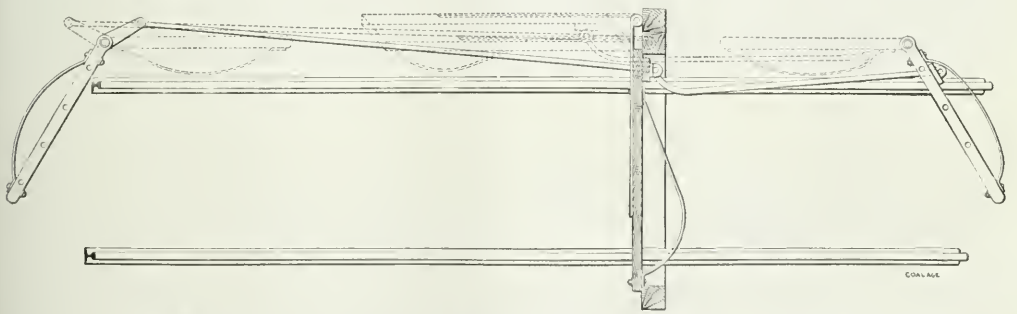


FIG. 6. PLAN VIEW, SHOWING METHOD OF OPERATING AUTOMATIC DOOR

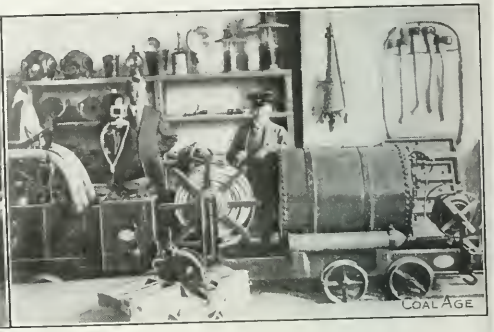
The batteries are charged by a current of 220 volts, which is developed outside the shaft. Each battery consists of 30 cells, of 2-volt discharge tension, with a capacity of 72-amp.-hr. and a radius of action of 10 km. The discharge tension of the battery is 60 volts and it is charged with a current of 30 amp. by connecting the battery to a plug with direct current. The time required for charging is three hours and the exchange of the batteries can be made by one man in two to three minutes. The weight of the locomotive, ready for use, is 2.5 gross tons. The measurements are as follows: Length, 8 ft.

furnishing a continual supply of coal. The locomotive following is always stopped by the last car of the leading train and advances automatically as soon as the latter releases the frame of the second locomotive. Each of the two locomotives, in eight-hour shifts, does about 65-ton-km. of work, with a current consumption of 0.167 kw.-hr. to 1 ton-kilometer.

The coal supply of Oklahoma is estimated to be ten billion tons. The state contains more than six million acres of coal-bearing land. Some of the land is estimated to be capable of yielding 7000 tons per acre.

VIEWS AT EUROPEAN COAL MINES

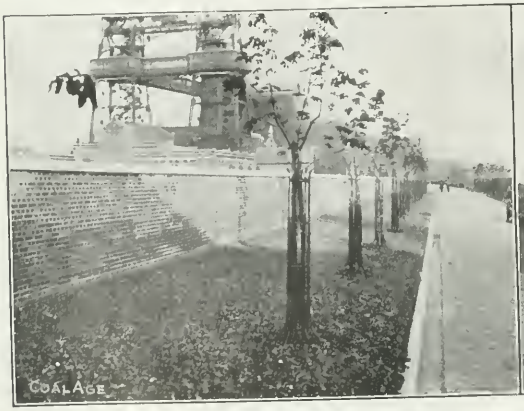
GEO. RICE, ERSKINE RAMSAY, HARRY WARREN, ALBERT JESSUP AND OTHER MEMBERS OF AMERICAN INSPECTION PARTY VISITING NO. 1 PIT AT FERNDALE, WALES



INTERIOR OF BUTHEM RESCUE STATION IN UPPER SILESIA, SHOWING MR. JESSUP AND DIRECTOR OF THE STATION IN BACKGROUND

TOP WORKS, HATTON MINE, SOUTH SHIELDS, DURHAM COUNTY, ENGLAND

VIEW OF AN INTERESTING STEEL HEADFRAME AND HOISTING-ENGINE HOUSE

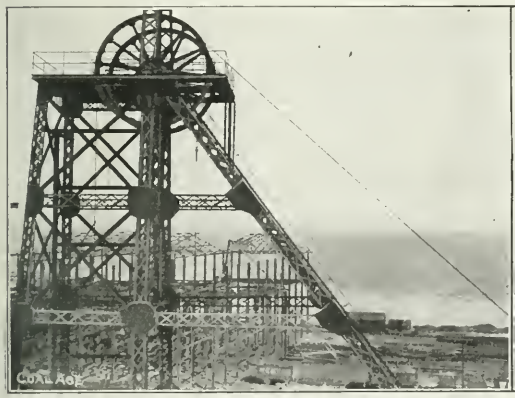


SHOWING HEADFRAME OF SHAFT NO. 15 AT MINE DE LENS, PAS-DE-CALAIS, FRANCE. THIS HEADFRAME IS 80 METERS HIGH

TOP WORKS OF MYSLOVITZ MINES IN UPPER SILESI NOTE THE SUBSTANTIAL CHARACTER OF ENTIRE SURFACE PLANT

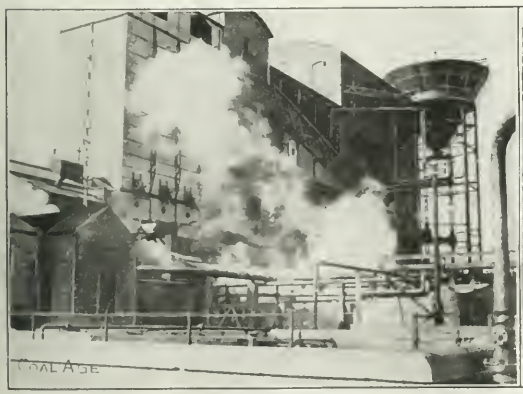
Top Works at Williams Pit, Looking Toward the Sea. White Haven, England

Surface Plant, Showing Steel Headframe at Bonifatius Mine, Westphalia, Germany

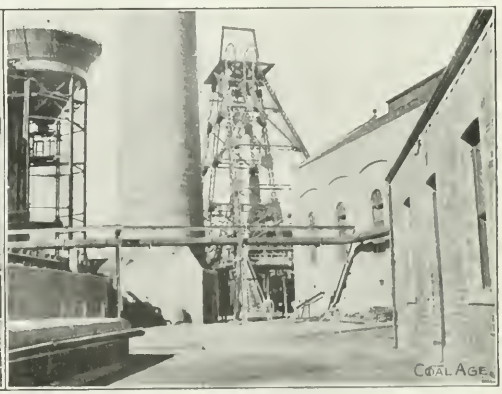


Headframe and Screening Plant under Construction at Wellesley Pit, Weymss Coal Co., Denbeath, Scotland

Office Building and Miners' Hall at the Left in Background, Delbruck Shaft in Upper Silesia



Outside View of Baum Washery at the Wellesley Pit, Weymss Coal Co., in Scotland



Another View of a Steel Headframe and Power House at Wellesley Mine of Weymss Coal Co.

(Above photographs published through the courtesy of John G. Bart, Russellton, Penn.)

What Dynamite Grade Markings Express

By F. H. Gunsolus*

SYNOPSIS—The grading of dynamite is actually based on its strength and not on its percentage of nitroglycerin. That chemical when absorbed by a body which does not aid explosion is not as powerful as when saturating bodies which are able to take part in the detonating action, such as wood pulp and nitrate of soda. Substances having much explosive force are sometimes added, guncotton for instance.

The meaning of the grade distinctions or "per cent. strength" mark on dynamite is somewhat of a puzzle to many consumers, and often a source of misunderstanding between manufacturer and customer.

Originally a 40 per cent. dynamite meant that the dynamite contained 40 per cent. of actual nitroglycerin by weight, but as modern dynamites do not always contain this proportion as marked, a short description of the modern practice in grading may be of interest. A slight knowledge of the history of the manufacture of high explosives may also help to explain the situation.

The Kiesel-Guhr Dynamite

The first dynamite manufactured by Alfred Nobel on a large scale was called "No. 1 dynamite" and consisted of 75 parts by weight of nitroglycerin and 25 parts of "kiesel-guhr," an inert infusorial earth, which is full of microscopic tubes and shells, and which has the property of absorbing three or four times its weight of nitroglycerin. This was truly a 75 per cent. nitroglycerin dynamite but it was not as strong as the 40 per cent. strength dynamites made today, which contain even less than 40 parts in a 100 by weight of actual nitroglycerin.

The kiesel-guhr acts only as an absorbent. It does not assist at all in the explosion and with it we can make only one grade of dynamite, that in which the kiesel-guhr holds nearly all the nitroglycerin it can absorb. If more nitroglycerin is added, it leaks from the dynamite to a dangerous extent, and if less than 75 per cent. is used the dynamite becomes insensitive, so much so that a mixture of 40 per cent. of nitroglycerin and 60 per cent. of kiesel-guhr cannot possibly be detonated at all. Advantage is taken of this property in the transportation of nitroglycerin for medicinal purposes. Kiesel-guhr is chemically inert. A pound of 75 per cent. kiesel-guhr dynamite will do just as much work and no more than 75/100 of a pound of pure nitroglycerin.

Active-Base Dynamites

The dynamites which are in use at present in the United States were originally known as "active-base" dynamites in contra-distinction to the kiesel-guhr dynamites which had an inert base.

At first to form active-base dynamites a crude gunpowder was substituted for the kiesel-guhr, but as the gunpowder was not a good absorbent, it was not possible to make a dynamite containing more than 30 per cent. or 40 per cent. of nitroglycerin; so a mixture of wood meal and nitrate of soda was used instead of the crude gunpowder. With these two ingredients, dynamites could be made with different proportions of absorbent to nitroglycerin, so that explosives containing as much as 75 per cent. or as little as 20 per cent. of nitroglycerin could be made, worked, packed and exploded.

A 40 per Cent. Wood Meal and Nitrate Dynamite Equal to a 75 per Cent. Kiesel-Guhr Dynamite

It was also found that with an active base like wood meal and nitrate of soda, a dynamite having only 40 per cent. nitroglycerin would develop as much power or more than a 75 per cent. kiesel-guhr dynamite. A reasonably definite proportion of wood meal to nitrate of soda existed at which an explosive was not so wet that it would leak nor yet so dry that it could not be "punched" into the paper shells.

The proportions of wood meal and nitrate were changed to accord with any change in percentage of nitroglycerin. More wood meal and less nitrate were used when the absorbent was to retain a large percentage of nitroglycerin. More nitrate and less wood meal or wood meal of less capacity for absorption, like fine-grained sawdust, were used when making a dynamite with a lower percentage of nitroglycerin.

Using these three ingredients with minute proportions of other nonexplosive substances required to stabilize the dynamite, a type of high explosive known as "straight dynamite" is made which when thoroughly incorporated out of well dried and pulverized ingredients, constitutes the standard of strength against which all other dynamites are graded.

Dynamite Containing Added Explosives

When other explosive substances are incorporated into dynamites they increase the power over the straight dynamite and it is then necessary to reduce the amount of nitroglycerin and otherwise modify the formula so that the new compound will develop the same power in actual work as the standard dynamite.

For instance, when guncotton is dissolved in nitroglycerin it makes a sticky jelly-like substance which when added to the wood meal and nitrate of soda makes an explosive much more powerful than one in which nitroglycerin alone is used.

If such an explosive were graded according to its actual content of nitroglycerin, it would be so much more powerful than the standard grade of dynamite that it would not be safe to use in work where the blasters were accustomed to using that standard grade, as it would break the material too fine and throw it too far and do much damage.

When other active ingredients in the absorbent were employed, it was found necessary to reduce the amount of nitroglycerin until the mixture developed the same strength as the straight dynamite nitroglycerin by which it was graded.

There are now many explosives in the market which contain no nitroglycerin at all, some of them being equal to a 40 per cent. straight nitroglycerin dynamite, and these are graded against the straight nitroglycerin dyna-

*Manager technical division E. I. Du Pont de Nemours Powder Co. Wilmington Del.

mite as described above. There are other powerful explosives widely used which contain only small amounts of nitroglycerin, sometimes from 5 per cent. to 10 per cent.—which, nevertheless, develop as much power, weight for weight, as 50 per cent. and 60 per cent. straight nitroglycerin dynamites. It is readily seen, therefore, that a customer should not feel that he has been injured when he finds that the dynamite he has been buying as 40 per cent. strength has actually less than 40 per cent. nitroglycerin in it.

Straight Dynamites Are Rapid in Action and Susceptible to Shock

While the straight nitroglycerin dynamites are still on the market, they alone actually contain the same percentage of nitroglycerin as the per cent. strength marked. In many ways they are distinctly inferior to later explosives containing less nitroglycerin, but having more of the other active ingredients in the absorbent. The straight nitroglycerins are too quick for much of the work to be performed and are much more sensitive to rough handling than explosives which have been developed more recently.

When a dynamite contains less nitroglycerin than the per cent. strength as marked on it, that difference is made up by other explosive substances so that a given weight of the dynamite is equal in strength, as developed in the ballistic pendulum and in active field trials, to a straight dynamite which contains that percentage of actual nitroglycerin.

Central-Station Power for Coal Mines

By C. W. Beers

SYNOPSIS—The author presents the coal-corporation view of central-station power for coal mines and declares himself in favor of its further introduction where a reasonable contract can be secured. This the central-station management opposes, not understanding the nature of mine demands, which are highly favorable for power generation. He regards 0.8c. per kilowatt-hour delivered at the substation a fair figure for 50 per cent. load factor. The power-plant officials decided that the average maximum colliery demand was half the rated power in kilowatts of all the connected consuming units, not including transformers, converters and motor-generator sets. Their bid was based on this consideration.

The purchase of central-station power by coal operators for use in and about the coal mines, appears paradoxical owing to the apparent cheapness of fuel at the mines, yet some companies have found it economical to do so, and up to the present time these companies do not regret making contracts for the purchase of power. One large coal company in the anthracite field has closed a contract with a large central station for a long term of years, and with considerable advantage to itself.

Inefficiency in the Boiler Room

A great source of loss in the present colliery steam plants today is in the boilers themselves. This is due to the fact that the firemen employed are not very intelligent and their wages are not particularly high. The result is that while fuel is comparatively cheap, little effort is made to use it economically; oftentimes the grates are ill adapted for the kind of fuel used and this is due to the fact that the fuel varies largely in quality from time to time. Draft arrangements are not always suitable, with the result that much energy goes up the stack. The boiler units are usually small in size, working at large overloads, and no arrangements are made to have them operate at their highest efficiency.

As far as the boiler losses are concerned they are subject to easy control, and one large operating company has made great strides in this direction by expending intelligent effort on the type of boiler used, the grates employed, and the quality of fuel burned.

Long steam lines poorly designed are responsible for much waste of steam. Leaks are seldom repaired, and, owing to exposed locations, the pipe covering is usually in bad condition.

From the above rough sketch of average conditions it is seen that large steam consumptions are invited, and it is a conservative statement to say that for every effective horsepower-hour used in and about the coal mines, 25 to 30 lb. (11.3 to 13.6 kg.) of fuel are burned under the boilers.

A Continual Rise in the Cost of Steam

During the last eight years, the average value of the fuel used under colliery boilers has increased in value from 35c. to 75c. per ton and it is still advancing.

Today, an ordinary boiler plant of 700 to 1000 hp. rated capacity has a steam cost of approximately 15c. per 1000 lb. (453.5 kg.) of steam generated. This figure drops to about 12c. per 1000 lb. in plants of 2000 to 3000 boiler horsepower capacity.

The correct design of a modern central-station plant for colliery operations is a rather difficult task, and it requires that the future of the mining operations be clearly forecast. This is an exceedingly difficult thing to do, and, as a result, the tendency is to curtail the initial expense as much as possible, owing to the uncertainty of future developments. Hence the plant is started on a more or less limited basis with the idea of expansion.

Variant Power Factor as Mine and Plant Grow

This is good practice, and the engineer, being eager to show good economy, installs apparatus that permits of a good load factor on the plant, and as a result shows low cost of power at the switchboard. As soon as the plant is loaded, additional apparatus must be installed. The station then will operate at a reduced load factor for some time, although there has been no reduction in the steaming expense; hence the cost per kilowatt-hour delivered to the switchboard has naturally increased.

This method produces a variation in the kilowatt-hour cost from time to time and may result in the ultimate installation of five or six machines in the plant. Idle-

Note—Paper presented at the Pittsburgh meeting of the American Institute of Electrical Engineers, Pittsburgh, Penn., Apr. 18, 1913.

time periods and idle hours during the working day require that some machines work at underload and this with full steam capacity on the boilers, hence the load factor naturally decreases, and as a result the average kilowatt-hour cost is fairly high. This condition must be so, since the boiler plant does not show a proportionate decrease in cost of steam as the load falls off. The continued acquisition of generating capacity along these lines ultimately results in a high cost per kilowatt installed.

The cost per kilowatt installed varies somewhat for each particular case and for a mining central station of two 500-kv.-a. turbo-generator units the cost per kilowatt installed was found to be $110.07. This included a 100-deg. superheater for each boiler unit (1200 boiler horsepower was divided into three 400-hp. units). Stokers were also included. The plant operation was based on a 50 per cent. load factor. The following is an estimated tabular statement of the fixed charges per kilowatt installed:

FIXED CHARGES PER KILOWATT

Item	Installation Cost per Kw.	Fixed Charges per Yr. per Kw. Installed
5 per cent. interest on station cost	110 07	5.50
10 per cent. depreciation and repairs on machinery	37.70	3.77
5 per cent. depreciation and repairs on switchboard	3.00	0.15
10 per cent. depreciation and repairs on light-arrester	0.30	0.03
10 per cent. depreciation and repairs on superheater	4.80	0.48
5 per cent. depreciation and repairs on buildings	6 00	0.30
10 per cent. depreciation and repairs on coal- and ash-handling devices	5.00	0.50
5 per cent. depreciation on boilers	42.00	2.10
Boiler repairs (800 hp. at $2.25 per year)		1.80
50 per cent. depreciation and repairs on condenser (mine water)	3.20	1.60
5 per cent. depreciation and repairs on steam piping	2 00	0.10
10 per cent. depreciation and repairs on feed-water heater	1.50	0.15
2 per cent. taxes and insurance on plant cost	110.07	2 20
Superintendence, etc.	....	0.32
Total		$19.00

On a basis of 50 per cent. load factor we would have the following operating cost per year per kilowatt:

OPERATING COST PER YEAR PER KILOWATT

Fuel at 75c. per ton	7.62
Boiler-room attendants	3.42
Power-house attendants	2 00
One general electrician, one-half time	0.75
Oil, waste, etc.	0.20
Water	2 12
	$16.11

From these figures it will be observed that there is a fixed charge of $19 per kilowatt installed, which is a constant, regardless of the load on the plant. On a basis of 50 per cent. load factor there is a yearly charge estimated at $16.11.

At this point in the argument it is well to consider these values. Under the item of fixed cost the values of depreciation and repairs may be considered high. This is not the case. It must be remembered that the plant is installed as a mining plant to suit mining conditions, and not a main central station in some city. The care exercised in preserving efficiency, etc., is in proportion to the intelligence of the help employed, hence the plant may be considered to depreciate rapidly for two reasons:

First, variations in the proposed life of the plant or additions may be required from time to time, with the result that present capacities may be hardly operated before the necessary additions are made, thus bringing about a condition of hard usage; second, obsolescence of equipment. The first reason naturally carries with it large repairs. For these reasons the above values, from which the fixed charge of $19 per kilowatt is obtained, are considered fair.

The operating costs for coal, water, labor, etc., are the real bones of contention, and at best, their estimate is simply a guess, and the nearer the load factor approaches unity the better the guess. It is at this really crucial point in the estimation of the kilowatt-hour cost, that many fail, simply because of the high value of the load factor assumed.

Load Either below or above Maximum Efficiency

The investigation of a mine load shows that on account of hoisting, locomotive, and other variable power service, the load naturally varies largely in a plant of the above rating, the variable load being such as to cause the generators to be temporarily overloaded many times during the day. Also, for many intervals in any 12-hr. period they are run at underloads, and neither condition tends toward the best economy, although the load factor based on the kilowatt-hours generated may be fairly high.

The result is that a large portion of the kilowatt-hours developed is on ascending parts of the water-rate curves of the prime movers, and, hence, we approach a condition of good load factor on a reduced steam economy. It is such conditions as these that cause the ordinary mine central station to differ from the regular city central station in which the load varies at uniform rates.

The Annual Load Factor

Another condition that tends to destroy the calculated load factor is the idle-day periods, and, when pumping must be taken care of, the absence of large quantities of water. It is estimated that 105 days per year are idle days, and naturally on these days the load factor is not nearly so good as on the regular working day, and particularly is this true if pumping is not required during a part of this time.

The fixed charge of $19 still keeps on working silently and so does a large portion of the $16.11, due to operating expenses. The only items of this charge that show any real decrease are the coal and water. Therefore, we see that while it is possible to estimate the average kilowatt cost per year at a total of $35 or $0.008 per kilowatt-hour on a basis of 50 per cent. load factor, there are conditions which are apt to change this figure considerably.

It will be observed in the original estimate of $110.07 per kilowatt installed that no reserve or emergency equipment has been included. If such had been the case, then the fixed charge of $19 would have to be considerably increased, with a resulting increase in the estimated kilowatt-hour cost.

A number of calculations on mine power plants up to and including 1500 kw. capacity resulted in a close agreement of all the figures, which may be expressed in concrete form as follows:

AVERAGE FIGURES ON POWER COSTS

Cost per kilowatt installed	$110.07
Fixed charges per kilowatt per year	19.00
Operating charges per kilowatt per year	16.11
Net cost per kilowatt-hour at switchboard	0.008
Load factor	50%

A careful study of these statements by the engineer will bring to mind the following questions: "Why must I be saddled with a fixed charge of $19 per kilowatt?" and "How can I improve the load factor within safe station limits and reduce the kilowatt-hour cost?"

Some years ago a large central station of 40,000 kw. ultimate capacity, located in a mining region, endeavored

to interest the company by which I am employed, in central-station power, but lack of understanding of mining conditions on the part of the central station always interfered.

Price 8 Mills per Kw.-Hr., 50 per Cent. Load Factor

Finally it became apparent if the power company could be induced to sell to the mining company at a rate not exceeding eight mills per kw.-hr. on a 50 per cent. load factor basis, that the proposition would be a fine solution to the above perplexing questions, and it was with this idea in view that the mining company ultimately took up the consideration of central-station power in earnest.

A close study of colliery conditions, such as the expected load factor, periods of high and light loads, peak loads, etc., indicated that if a complete understanding of conditions could be made clear to the power company a contract advantageous to all parties concerned would be considered.

Later a contract was executed to the satisfaction of all concerned in which the charge per kilowatt-hour was based on load factor only.

Before the contract was signed the following points were taken up and thoroughly discussed:

(1) On what basis current would be paid for. (2) Territory to be covered by the contract. (3) Location of meters for registering the power consumed. (4) Delivered voltage, power and point of delivery. (5) Maximum demand charges. (6) What apparatus should be considered as "connected" load and the methods of rating the same? (7) The included rating of apparatus used intermittently. (8) The method of determining load factor. (9) Pole-line charges—co-party lines. (10) Power factor. (11) Explanation of terms used. (12) What constitutes a substation.

The discussion of each of the above topics brought out the following arguments for their adoption, and at the same time illustrates the items which should be considered in any contract between a central station and a mine operator.

Power Cost Varied with Power Factor

(1) Current could be paid for, either on the "straight maximum demand basis plus cost per kilowatt-hour," or on a varying rate depending on the load factor. The latter plan was argued and adopted, because it is a simpler method of handling all charges. It eliminates errors due to wrong reading of graphic meters, and hence prevents argument as to the demand.

To the ordinary mind, it presents the idea of cheaper rates in a clearer manner than rates based on the demand system, as the only point to be observed is that the greater the load factor the less the rate; whereas the straight demand system has a tendency to curtail consumption, due to the fact that the demand power may at times be cumulative, and hence the operator may feel worried as he sees the increase on his demand chart, although his kilowatt-hours may not increase.

(2) The contract to be of benefit should be made to cover all territory that a private mining plant could ultimately cover in order that maximum results in load factor would be obtained.

Current Measured on Secondary Side of Transformers at Substation

(3) The preferred location for meters should be on the secondary side of transformers. This is not absolutely necessary if the central station installed the meters. In any event they should always be located in the customers' substation.

(4) In this case the power company agreed to deliver direct into the customer's substation, consequently it seemed fair and equitable to permit the power company to deliver the power and voltage from its nearest available lines. This particular power delivery should always be specified by letter for any particular substation; experience has proved this to be satisfactory.

If the customer was required to build his line into his own substation then he should have the privilege of determining his own voltage in order to suit his delivery requirements. This would eliminate the cost of probable transformers on the part of the customer in lieu of the investment required by the pole line.

Maximum Colliery Demand One-Half the Total "Connected" Load as Rated

(5) Under (1) it was decided to use a sliding rate per kilowatt-hour rather than a charge based on maximum demand. On what would the maximum demand be based? Certainly not on the momentary maximum starting loads of motors, as the starting peaks would scarcely be noticed on the load curve of a station of 40,000 kv.-a.; neither could a two- or three-minute peak be used on account of the difficulty of properly analyzing curves for such a time limit, as errors would naturally be introduced by the thickness of the line; neither could a five-minute peak be used, because this would tend to eliminate hoisting and this would be unfair to the central station, as much hoisting is done on a one-, two- or three-minute basis.

To settle this question the central power-plant officials visited many plants in the mining regions, and found from actual observation that the rating of the "connected" load was just about twice the average maximum demand that occurs on the plant. Experience proved this to be fairly close, hence for the term "maximum demand" a figure was used that was equal to one-half of the total "connected" load, rated in kilowatts.

(6) Since the basis of cost was load factor and since the "maximum demand" as outlined above is used in lieu of station capacity it is necessary to correctly define the "connected load."

This to consist of all direct power-consuming devices (no transformers, converters, motor-generator sets, etc.), and is equal to the sum of the nameplate ratings of all motors, or lamps, or heating devices, etc.

Exceptions. Direct-current hoists and direct-current locomotives to be rated on one hour nominal rated basis. Alternating-current hoists to be rated on their continuous basis, and where transformers are used for lighting only, then the full kilowatt rating of the transformers is used.

Reserve Equipment Reckoned as Part of "Connected Load" in Month Used

(7) Suppose reserve equipment should be installed, such as pumps, to give protection in time of floods. This equipment would be in service only a few weeks total time per year. It was considered equitable to include this apparatus only for the month during which it was used. It is reasonable to state that in a private mining plant emergency conditions are given preference, and, there-

fore, other apparatus would not be worked; for this reason it was considered that such reserve equipment should not be carried from month to month as connected load.

(8) The method of determining load factors was intimated in (6) and is as follows: Let the total manufacturers' nameplate rating of apparatus used during the month equal 500 kw. and let the total kilowatt-hours used during the month of 30 days equal 72,000; then the maximum demand is equal to 500 divided by 2, equals 250, and the average demand is equal to 72,000 divided by 30 days times 24, equals 100; therefore, 100 divided by 250 equals 40 per cent., which is the load factor. Reference to the cost curve shows the rate to be approximately $0.009; therefore, the charge for that particular month would be 72,000 kw.-hr. times $0.009 equals $648.

Power Company Builds Transmission Lines

(9) If the coal company should require the power company to build a line expressly to reach a substation, then it seems fair and equitable that the power company should be paid a rate that will represent the total investment charge on the line. However, if the coal company uses power of a value in excess of this investment charge, then no pole-line cost shall be included in the monthly bill, but if no power is used then the full investment charge is to be paid. This service was fixed at 15 per cent. of the pole-line cost.

Exceptions. If the power company should place extra customers on this line, then this 15 per cent. line charge should be prorated among the various customers in proportion to their respective "demands."

Inadvisable To Use Induction Motors

(10) At all times it is to the interest of the coal company to have the proper voltage. The installation of considerable amounts of induction machinery tends to destroy this feature, and may cause trouble to pumps, fans and hoists, hence to protect itself it is good policy on the part of the coal company to use power-factor correcting devices judiciously.

(11) In order that no errors in calculations in load factors, etc., could arise through ignorance, the power company considered it advisable to make use of definitions that clearly explain the following terms: Maximum demand. Manufacturers' nameplate rating. Load factor. Day.

(12) To suitably define the word "substation" it was determined that all operations which could be conveniently grouped under one colliery lease should be known as a substation.

Day Load Occurs Opportunely; Night Load Is Constant

From the above discussion of the elements of a power contract it is seen how essential it is that the central-station management should be made to understand colliery operations thoroughly and the conditions relating to connected loads, and in addition they should be made to appreciate the fact that the day load is highly desirable as it reduces their station losses and increases their load factor to a very high degree, and when the night loads occur that they are usually of the constant-duty kind.

Failures on the part of others to obtain satisfactory rates could, no doubt, be charged directly to this lack of knowledge on the part of the central station which is due to the failure of the mining company to coöperate properly with the central-station management.

The company with which I am connected has been operating on central-station power for about one year, and up to the present we have about 1000 kw. connected load consisting of fans, pumps, hoists, locomotives, and heaters, and provisions are being made to increase this amount in the near future by about 2500 kw. Plans are now under way to remove the present boiler plant from one of our collieries and operate entirely by power from the central station.

Observed Advantages

Since operating on central-station power, a number of features have presented themselves that make it appear a satisfactory arrangement. They are as follows:

1. Our average kilowatt cost is lower than the estimated kilowatt charges in the ratio of about 7½ to 8, and this kilowatt charge is based on delivery at our substation meters, and not at the main power-house switchboard as per the original data.

2. The company is more ready to consider additions to its power equipment, due to the fact that main power-plant costs have been entirely eliminated and do not appear in the estimate.

3. There is always a "readiness to serve" on the part of the central station and this is seldom true of the mining power plant.

4. There is absolutely no worry due to power-plant operation.

5. In case of holidays, etc., the monthly rate per kilowatt-hour will only slightly increase, which would not be the case in those plants operated by the mining company, for, in such plants, labor and fuel decrease but little.

6. As electric operations are increased, less demands are made on the colliery boiler plant with the result that coal will be sent to a ready market which otherwise would be burned under the boilers, and ultimately this will be to small amount of fuel.

7. The use of central-station power affords a remarkably cheap method of reaching isolated banks, and isolated pumping problems. Operations, such as small washeries are more or less temporary in character, and can be advantageously worked without causing the distress that might be occasioned when operated from a mine central station.

8. The service is reliable. Our service up to the present time does not total more than 15 min. delay, due to failure of supply, and these failures were directly due to lightning.

9. The effect of efficiency is not particularly noticeable, hence air gaps can be made larger, which is highly desirable in mining apparatus, as it reduces the danger of breakdown.

In the above discussion I have presented the case of mine central station vs. public-service corporation supply as it appears to me. My experience has been somewhat limited, but the longer the service is continued the more I am convinced that the purchase of power from public-service corporations offers advantages that should not be overlooked by mining corporations.

The Pittsburgh Meeting of the A. I. of E. E.

By R. Dawson Hall

SYNOPSIS—Many papers of pertinent interest to the coal industry were presented at this meeting. Some of the more important of these were published in our issues of this week and last week. This article is a complete summary of the discussion of these different articles.

The American Institute of Electrical Engineers met Apr. 18, in the English Room of the Fort Pitt Hotel in Pittsburgh, at 10 a. m., with about 150 members and guests present.

R. D Mershon, the president, made the opening address and called the attention of those present to the formation of a new technical committee on the Use of Electricity in Mines, presided over by George R. Wood of the Arcade Building, Philadelphia, Penn.

Banquet of the A. I. of E. E., Held at the Fort Pitt Hotel, Pittsburgh, Penn., on the Evening of Apr. 18

To speed up the presentation of papers the addresses of H. C. Eddy entitled "Purchased Power in Coal Mines," published in our last issue, and that of C. W. Beers, published in the present issue on "Central Station Power for Coal Mines," were read consecutively without intermediate discussion. Whatever the nature of the presentation, the parties most ready to discuss the papers were those in sympathy with the public central station. There was a disposition to regard the uptodate central station plants of the mine operators as quite small.

Thus one speaker said that the usual needs of a colliery were from 100 to 300 hp.; that as the coal used was worth $1 a ton and the load factor only about 20 per cent., he thought Mr. Beers had been too conservative in stating his case because the average mine purchasing power was expending not 8 mills per kilowatt-hour but as much as 2c. This is very true. Such small plants certainly do well to buy such power where an 8-mill rate is available.

Is an 8-Mill Rate Reasonable?

The speaker brought Mr. Eddy to his feet and he stated in reply that his company was willing to sell power for 8 mills per kilowatt-hour under reasonable conditions and Mr. Beers remarked that his company was purchasing much of its power at 5.3 mills per kilowatt-hour.

Mr. Eddy declared that many power companies would readily sell power to coal companies at less than the average year round cost at the switchboard so as to reduce the dead losses of the off-peak period. The chairman stated that most of the mines demanded today at least 300 kw. and that there were 12 or 15 alternating-current central-station plants in the field of which Mr. Beers spoke. One speaker stated there were 200 companies already using central-station power.

Shall the Coal Operator Buy or Sell Power?

Obviously if central-station power were furnished by the coal operator with up-to-date equipment and if the plant were located at an ideal spot for domestic distribution, he should be able to make as much profit in entering the business as any one. There is nothing of a magical nature in the manufacture of power, that he could not combine this with the production of coal. Every argument in favor of the central-station supplying power to the operator is of equal force and value in favor of the coal producer supplying the power consumer with electric current.

It is a certainty that the average operator today disregards the ratio of power actually used to power on the rate-plate of his apparatus; in his estimate he coolly divides the rating of his equipment in kilowatts into his daily expense, divides this by his working hours and thinks he is getting his true kilowatt-hour cost. But as

he is not using so much power for any length of time as the rate plates of his machinery indicates, he should realize that the figure he places as the cost of his hourly requirements is low. He must realize that because his generators are rated at 500 kw. he is not necessarily using that amount of power every moment of the day.

Safety in Mines

The next paper read was that by H. H. Clarke on "Safeguarding the Use of Electricity in Mines." The most interesting remarks in this paper are not for immediate publication as the institute withholds it till it can be entered in the proceedings. The greater part of the paper was of a character hardly new, (except in the manner of expression) to those who have followed the bulletins of the bureau and modern safety literature. It was designed mainly for electrical engineers whose experience was not so definitely subterranean.

Mr. Clark gave an interesting description of an explosion caused by the ignition of a canister, containing 5 lb. of powder. The explosion seriously burned several men who were in a mine car seven cars removed from a mine locomotive.

In the discussion attention was called to the dangers and lack of economy in light equipment. The use of much sand to obtain adhesion made accidents likely from the imperfect grounding of the motor, increased the resistance of the cars to traction and reduced the available voltage for the propulsion of the motor.

Mr. Clark instanced a case where three shots were connected in series to be fired by attachment to the trolley wire. The miner withdrew to fire them by electricity. He had barely left the room when one went off. He reconnected the other shots and without passing a current through the leads, another explosion took place almost as soon as his back was turned. An engineer present recalled a case in West Virginia where a miner tried to fire a shot with a battery but failed. He went back on the shot and was met by the blast which was exploded by some unknown means.

Mr. Clark did not believe that induction could be the cause of these premature explosions. He explained that the sensitiveness of detonators varied, and consequently one would be fired before the other and break the connection. He could possibly have reasonably added that the resistance might vary and the igniting effect differ.

The Portable Electric Mine Lamp

And here may be mentioned another matter which further exemplifies the injustice done electricity. Mr. Clark declared probably without ulterior meaning, that the electric lamp should be perfectly safe, because it could ultimately be made 100 per cent. efficient. We do not demand this ideal of its predecessor, the oil safety lamps; why demand it therefore of the new light unless indeed 100 per cent. efficiency is now to be considered achievable?

The British government has approved two lamps, one oil and one using electricity. The first is for general use and the second is only for the use in rescue work. The electric lamp has adaquate protection and if I mistake not is the safest but the British Home Office does not regard it with as much favor. This is largely due to prejudice.

The Bureau of Mines officials have always contended that no lamp burning oil gave a perfect assurance of safety and have regretted that the word "safety" was ever appended to the oil lamp, while a better word like "permissible" was already in the dictionaries.

When the gauze of a lamp is broken or dirty, the glass fractured or improperly sealed and the air is traveling rapidly and is explosive, when extremely gaseous atmospheres are encountered or when the lamp is held out of the perpendicular, the oil safety lamp is not reliable. Hence, when we show that a blow which breaks the bulb without immediately severing the filament, will cause a minature electric lamp to ignite gas, especially if the battery is overcharged, we do not show concurrently that the lamp is as unsafe as a safety lamp burning oil, provided the risk of breakage of the bulb and of the oil lamp glasses are equal. There are also many other ways beside breakage, whereby an oil safety lamp can explode gas, and in which it shows itself to be undesirable.

When an electric bulb is further strengthened by a heavy glass cover and arranged to go out as soon as the glass is broken, it becomes much more reliable than the oil safety lamp, however well shrouded by gauzes and glasses the latter may be. Let us remember that a suddenly exposed tungsten filament of one candlepower "frequently" ignites gas and one of a half a candlepower *may* fire it, but is "unlikely" so to do.*

The Prone Method of Resuscitation

Dr. C. A. Lauffer gave a demonstration of the prone or Shaffer method of resuscitation, and he remarked that the importance of such methods for aid in emergencies will never cease till oxygen resuscitating apparatus can be rolled up and snugly packed away in a vest pocket. There will always be accidents where pulmotors will not be immediately available. Doctor Lauffer has instructed 2000 men in the prone method and he cited the fact that the system of resuscitation had the indorsement of the National Electric Light Association. In this method, the unconscious person is rolled over till his face is downward. His head is then turned to one side, so that his mouth does not lie in the dirt or in such a manner as to prohibit breathing; the head must, however, be given a sufficiently downward inclination, so that the tongue falls naturally forward, giving freedom for respiration as soon as that function is restored. Water will naturally fall out of the victim's mouth, thus aiding in the clearing of the air passages. The arms of the patient should either be spread out or placed above his head.

Location and Duration of Shaffer Compression—The attendant then preferably straddles the patient, dropping down onto his knees. He grasps the victim with his hands, placing one on each side of the patient over the eleventh or twelfth rib. The location of this hold is all-important; made too high or too low, no good result can be obtained. Perhaps the place where the pressure should be imposed is better defined as about 6 in. above the upper line of the victim's trousers, though Doctor Lauffer is not responsible for that statement.

A gentle but firm pressure is placed on these parts of the man's body for 3 sec. The time is important and should be regulated, either by a watch, by counting three or by the attendant judging by the working or his own breathing. Rapid breathing is a strain on the normal

*The words in quotation marks are from Mr. Clark's recent report on "Ignition of Mine Gases by the Filaments of Incandescent Lamps," page 30.

human being and cannot long be sustained. It is likewise impossible to induce the frequency of respiration of a panting victim, who by drowning or shock has an even smaller ability to breathe than a normal human.

How Much Force Should Be Used

The pressure should be imposed and removed every 3 sec. till the patient recovers or is adjudged utterly beyond hope of recovery. The number of compressions and dilations thus secured should each total 12 per minute. The pumping action induced tends to discharge water from the air passages and thus aid in keeping those channels cleared for respiration.

The attendant can use his weight to effect the required action, so that a strong man is not needed, nor does it demand much energy. Unless the one injured was affected with cancer or tuberculosis before asphyxiation, there is no risk of injuring his ribs by excessive pressure. But such "living museums of pathologic ills" are not usually found among miners or linemen. Continue to press harder till you feel the ribs give way under your hands. Some victims resist the pressure unconsciously and sufficient force must be applied.

Stimulants—Doctor Lauffer did not advocate the putting of hypodermic syringes in the hands of linemen for use in cases of suspended respiration. Aromatic spirits of ammonia, applied to the nose, are helpful. So also is domestic ammonia, if the other cannot be obtained, but as the strength varies with the honesty of the manufacturer, and its age, it is well for the attendant to first try it himself and see how much it has been diluted by solution and evaporation.

As for heart stimulants, atropine is the best with strychnine the second favorite; either one or both can be given, but care must be exercised, as heart stimulation can be overdone. Digitalin, cactin and camphor in oil are all good stimulants, but present greater possibilities for harm than help if administered by amateurs.

How Long to Persevere—Doctor Lauffer stated that his students had restored six men who were injured by electrification, drowning and other forms of asphyxiation. In reply to J. S. Jenks, who remarked that he had seen men brought back to life after 1¾ hr., Doctor Lauffer stated that results had been obtained after as much as 2¾ hr. of work, but that most men revived after 20 min. One man of 57 years of age, who fell 9 ft. onto a concrete pavement, came around in one hour, sufficiently to cause him to vomit. Yet, even with the aid of a stethoscope, his breathing could not be detected when resuscitation was commenced.

Doctor Lauffer's remarks ended the morning session and the meeting, after a short recess, reassembled nominally at 2 p.m., but actually much later.

Variable-Speed Mine Fans

F. B. Crosby then read the most severely technical paper of all those presented, entitled "Alternating-Current Motors for the Economic Operation of Mine Fans." The discussion took two divergent paths: Whether Mr. Crosby's system covered all and the most desirable forms of speed-variation provisions, and whether, after all, the operator was wise in demanding variable speeds or at least whether a choice of two would not suffice for ordinary operating conditions.

Mr. Beers objected that the paper was restricted in application to large fans. It did not meet the needs of the anthracite region where the fan used is rarely more than 100 hp. and sometimes only 50. He regarded constant speed as highly desirable for regulation, but a variable speed involved, in his opinion, a variable pressure and excessive water gages were undesirable, because they are so uneconomical. He preferred to let the fan run at any even number of revolutions per minute and make up for the increased length of the headings to be driven, by increased cross-section or by additional splits. He regarded the simplicity of the squirrel-cage motor as a great element in its favor and urged its continued use in mine ventilation.

Another speaker stated that many other methods of speed regulation were available, some of which are more simple than that Mr. Crosby had outlined. All evidence to the contrary, he said that the Americans always demanded heavier machines than the foreigners. I had always supposed that all foreign machinery was proof against fire, flood, earthquake and the suffragettes, but there are apparently people of a different opinion. The foreign apparatus described was not only light, but complicated and would require expert supervision, such as was given machinery in Germany.

A speaker who appeared to have a most complete knowledge of German conditions, countered with the statement that variable-speed fan motors were being run in Germany by superannuated miners and not by trained men. Some of the stations were kept locked and were tended by a man only once a day. The German experts and operators regarded the regulating set as a great advantage, since it saved so much power, that the purchase price of the apparatus was soon returned in reduced operating costs.

Is a Variable-Speed Motor Wanted?

One speaker advocated either a two-speed motor or a variation in speed by changing pulleys. He pointed out that the variability needed was not diurnal or monthly or even yearly. There came a time when the initial speed failed to meet the requirements of the enlarged mine and then a change in pulley ratios could be made without much trouble. The "delay" could not be called "annoying" or the "method" a "make-shift," since the change had only to be made once. A belt was necessary in any event as the motor and fan could not be run at one and the same speed.

As Mr. Wood explained, the need for a variable-speed motor is more marked with a new mine than an old one, and he did not see why, when full speed was needed, the regulating set with its complications could not be entirely discarded.

But the advocates of variable speed, found a supporter who believed in a reduction of speed at night, because less air was needed when few men were in the mine. That is true, though where much gas is generated, practical men in this country are not much interested in speed reduction, though it is considered important in Germany. Strange to say, no one instanced the difference in barometric pressure as a reason for the use of variable-speed motors. This speaker further advocated arranging for a belt reduction to make up the difference between the requirements of a new and old mine; also a two-speed system to make the change in revolution from the day air current to the lesser night ventilation.

H. L. Beach had his own solution. He purchased two squirrel-cage motors made by the same firm and having exactly the same characteristics. One he installed on temporary work, and one was set up for the driving of the fan. So far the increase of speed needed to take care of the extension of the workings has been obtained by a change in the pulley ratio, but the time is arriving when the second motor will be needed and it will be used to assist in driving the fan.

Mr. Crosby declared that in his paper he did not intend to discuss ventilation. The problem of variable speed was given to him for solution and his paper was a reply to the question, "how to vary," and not to the one of, "why vary."

Low-Load Factors

J. S. Jenks then read his paper on "Central-Station Power for Mines," prefacing it with a few remarks on the impossibility of fixing (without consideration of local conditions), the proper number of mills per kilowatt-hour which the consumer should pay to the public central station. He made the statement that the load factor was often as low as 20 per cent. and might even run as low as 6 per cent. In an average of over 200 installations, it had fallen under 40 per cent. He did not, however, define "load factor."

H. M. Warren then read the paper, of which he and A. S. Biesecker were joint authors, entitled "Characteristics of Substation Loads at the Anthracite Collieries of the Lackawanna R.R. Co." The discussion turned: (1) On his definition of "load factor," which expression he chose to use to express the ratio of the average load to the rated connected loads; (2) on the fact that his "one- and five-minute peaks were measured as block peaks," and did not give the integrated kilowatts.

In the discussion there was no lack of speakers and everyone seemed to have his own way of calculating load factor, some figuring in four or more ways, according to the classification of the customer. Not one adhered to the definition which was placed upon the word for the sole purposes of the paper. Nor did the more general version of load factor meet with approval, viz., ratio of average load on the station to the rating of its included machinery.

Mills per Ton Mined or Mills per Kilowatt-Hour

The definitions given by the public central-station experts varied so much that it was no wonder Mr. Wood declared that the operator would hesitate to commit himself to a bargain with any of them except on the basis of so many mills per ton of coal mined.

Some compared the minute peak with the average monthly demand. Some took the 5-min. or 15-min. or 30-min. or the 1-hr. peak and found its relation to the average power used in determining the load factor. Again it was said that all the peaks should be integrated and further some thought that a single peak towering above all others should not be given such a prominence in figuring, so that they took the three highest peaks in the year and divided by 3 instead of a single isolated peak.

Induction vs. Synchronous Motors

The question of the induction and synchronous motors was then brought up and one speaker declared that the current supplied was the crux of the whole question. When induction motors started there was a watt-less current, and therefore even if pure current considerations did not enter into the question, the load-factor should, in any event, have a bearing on the price paid for power.

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The Explosion at Finleyville

Shortly after 1 o'clock, on the afternoon of Wednesday, Apr. 23, the most disastrous explosion that has happened in this country for more than a year, occurred at the Cincinnati Mine of the Monongahela River Consolidated Coal & Coke Co. Present indications show that about 100 men have been killed.

This mine is located near the Town of Monongahela, about 15 miles in a straight line south of Pittsburgh. It is one of the oldest mines in the Monongahela River Valley. The Monongahela River Consolidated Coal & Coke Co. is a subsidiary of the Pittsburg Coal Co., the latter owning practically all of the preferred and 94 per cent. of the common stock of the former. The Monongahela Co. has been for the most part independently conducted, although a portion of the operating staffs of both companies is the same for economic reasons.

The mine is a drift operation and has three principal openings. Having been in operation for such a long period of time, the workings are quite extensive. It has evidently been considered dangerous from a dust and gas standpoint, reference being found in the Pennsylvania Mine Inspector's report for 1909, where the dust was being laid by a water wagon. In later reports of the Pennsylvania inspectors the mine is also rated as gaseous.

It is ventilated by an electrically driven Capell fan, which in 1911 was furnishing 129,000 cu.ft. of air per minute, at a developed water gage of 3 in., the fan running at 157 r.p.m. The inspector's report for 1910 shows that the air was divided into twelve splits, but this was reduced to eight in 1911, a portion of the mine evidently having been closed off during the intervening period.

The ventilation in the mine, according to the Pennsylvania Mine Inspector's report for 1911, was considered good in some portions and fair in others. The report further states that the defects were not due to lack of adequate power, or the most advantageous arrangement of openings and airways, but rather to a lack of attention to details and over-splitting the air. It appears that brick and concrete stoppings were freely used, there having been some 70 installed during the year 1911, together with three brick overcasts. The slope at the second opening was enlarged at this same time, a 10-ton locomotive put in service, and a Morgan-Gardner longwall electric mining machine installed.

Up to the present moment, the information available as regards the cause of the explosion is meager and entirely unreliable. It was, however, evidently of great force, press reports stating that windows in buildings several hundred feet from the mine mouth were shattered and a 15-ton locomotive completely turned over. The fan house and fan were also seriously damaged, and the ventilation of the mine badly crippled. It is evident, however, that the explosion was not general throughout the entire mine, as some 70 men made their escape. From the information now at hand, most of the fatalities have been caused by afterdamp rather than by the force of the explosion itself. A detailed report will be published in Coal Age next week.

EDITORIALS

The Prime Need of the Workingman

The average workman does not believe that the greatest of his personal needs is efficiency. The attainment of that quality, he thinks, is a pretty problem for his employer. He admits that there may be something dishonest about loafing but it is a vice which concerns only the corporation which employs him.

The social condition will never be bettered measurably till the operative, miner or mechanic, learns that he is engaged with others in supplying the world with what it needs. If he or his fellows in other industries produce but little, the world receives a smaller proportion of its wants and, as he is part of the world, he himself suffers.

Efficiency is the humbler worker's problem; if two blades be induced to grow where but one grew before, the second blade on the stalk, from its root almost to its very tip, will fall to him. We admit he is concerned in the relative distribution of the awards of labor but he is even more interested in the bulk of that prize of which the workers as a whole get by far the larger share.

The waste of labor and material is a moral question and it is an appropriate consideration for us all. The operator who fills his mine with men, in excess of his power to supply them with cars is depriving those men of their due opportunity to make money and is withdrawing from the world a certain amount of valuable labor. The man who neglects to put his mine in such shape that work can be performed with minimum effort is wasting the limited labor of the world's markets.

On the other hand, the miner who opposes improvements in production, mining machinery and mechanical devices is endeavoring to constrict the world's output which output is destined ultimately to find its way in part into his own home.

We read of the "class consciousness of the working man" and of the "solidarity of the laboring classes." Has the workman's social consciousness and his unionism done him much good if he has not learned that the main duty of the consuming worker to the working consumer is to work as efficiently as he possibly can.

Adequate Boiler Foundations

The matter of proper and adequate boiler foundations is one which is not infrequently neglected around coal mines. This is, generally speaking, not a wilful oversight but arises from ignorance.

In laying out and building boiler foundations, they should be made sufficiently deep in the ground to strike good, solid, natural earth, and not be laid upon any filling. A layer of concrete at least 8 in. thick should be placed under the entire boiler and setting, and not merely under the side walls.

Above this layer of concrete, and up to the floor line, the foundations for the boiler may be built up of either concrete or hard brick laid in cement mortar, care should be taken, however, to make the top of this foundation, or the points upon which the boiler supports rest, perfectly level.

If proper precautions are not thus taken to have the boiler set firm and true, it is almost certain, sooner or later, to settle at one or more points, thus bringing undue strains upon the pipelines, which are connected to the steam nozzle. These in course of time may cause rupture of the steam pipes with attendant danger and possible loss of life, to say nothing of the loss in time and the inconvenience required in making repairs.

The Purchase of Power

At the vast majority of collieries, or, for that matter, in most coal-mining regions, there is one and only one source of power, and that is coal.

There are some regions, however, which are situated within the reach of transmission lines from water-power developments. There are also many power companies, and their numbers are constantly increasing, that are generating current in central power plants, transmitting it at high voltage, and selling same to the various mining companies within reach of their transmission lines.

The question of buying power from some outside company, or generating it at the mining plant, hinges upon the difference between the cost of the power as supplied and the value of the coal which would be used in generating an equal amount. Where the rate charged per kilowatt-hour is high, and the coal which may be burned at the colliery in making steam is of a low grade, possessing but a small market value, the choice would naturally go against the central power company. If, on the other hand, the outside company can furnish power at a moderate or low rate, and the output of the mine possesses a good market value, no sensible mine operator will insist upon manufacturing his own current.

Concrete Underground

The employment of concrete or reinforced concrete underground is on the increase. It has not yet, however, in this country, at least, assumed such an importance as to be a serious competitor of wood.

Although utilized to a considerable degree for the building of stoppings and overcasts, concrete in mines is not used to the extent that engineers who work only above ground might anticipate, for, although almost ideal for supporting tender roofs on haulage roads, the necessary centering and the supports sustaining the same, for a considerable period of time, necessarily block the haulageway upon which they are placed. In many instances, this fact alone precludes the employment of concrete underground.

The many and varied methods of using wood have been so successful, that operators in general are loath to adopt any substitute, the utility and adaptability of which have

not been thoroughly proved. To the actual miner, the use of timber has become almost second nature and he distrusts any change introducing marked variations in his daily routine as being either useless or unnecessary.

It is possible that, although perhaps concrete may never be a strong rival of timber for room props and similar purposes, it may become a serious competitor of steel timbering on road and haulageways, where it is desirable to make the roof support of a permanent or semi-permanent nature. Reinforced-concrete posts and beams either made separately or cast *en bloc,* possess all the advantages of the steel timbering and require no painting or other protection from dampness.

The West Virginia Strike

Governor Hatfield, of West Virginia, will have performed a great service to the coal industry in general, and to the State of West Virginia in particular, if he succeeds in settling the bitter dispute between the operators and miners of his commonwealth. Industrial history affords no more prolonged, cruel fight than has been carried on during the last year in the southern coal fields of West Virginia.

Both factions in the controversy have been virulent in their campaign; both sides have been partly wrong and partly right. Many of the operators interested in this particular field have failed to keep pace with the advances in commercial industrialism. They have wielded their power in a thoughtless, selfish manner, often extracting the maximum of service and forcing the minimum reward.

For years a few of these same operators have held the whip hand and have successfully fought down every rebellion on the part of their employees. The country affected is not easily accessible and has practically no large towns so that physical conditions favor the establishment of company stores, which latter have been frequently operated in a manner unfair to the men. Time was not so far back when a miner who was not a good spender at the company's store was discharged, and his place filled by someone less careful in the matter of handling his hard-earned wages.

Such actions as this on the part of a few coal companies aggravated the acute labor situation of the field to the breaking point, and the more humane operators of the district have paid a fearful price for the shortsighted policy of their less wise breathren.

If in future contests between labor and capital in the coal industry the miners become masters of the situation and base their subsequent conduct on the idea that might should prevail rather than right or reason, some operators will have to concede that they themselves were the exponents of such a creed, and that the men are only following the example laid down by their worthy teachers. No man should whimper at having to take some of the same medicine he has forced down the throats of others.

A great many miners are mean and selfish, seeking to force concessions from their employers without regard to justice or legal procedure. Contracts have been violated knowingly by the union officials and wage agreements have, and are, today being disregarded with impunity. However, this unfortunate condition does not furnish a justification for employers to condemn labor organizations as a whole, any more than moral laxity on the part of one individual is sufficient cause for a general condemnation of the whole human race.

Every movement, whether industrial or social, if it is to succeed, must be built on a foundation of truth and honesty. The day is near when crooked labor leaders will be as popular with their men as a cholera patient at a social tea. On the other hand, it is quite possible that the very union so many coal operators have been fighting, will eventually prove the bulwark of their defense against such dangerous anarchistic bodies as the Industrial Workers of the World, which have already, and will again, try to gain control of the miners' union.

Only a short time ago the great railroads of America were crying out bitterly against the strictures placed on their business by our federal government. A few days ago this same government appeared before our Supreme Court as the champion of the roads in an appeal against the destructive attacks of individual states. Surely times do change.

The coal industry has enough outside enemies to keep it busy. Why can we not have peace within the family? Let us encourage the union to select honest, capable leaders who will fight to the "drop of the hat" for what they consider "fair rights of the men," but who will insist that every miner strictly observe his bargain, once a contract is made, just the same as the operator is supposed to do. No other plan is fair or right, and what is not fair and honest cannot permanently succeed.

Conservation and the Consumer

During recent years we have all heard much from the public platform and popular press concerning the conservation of our natural resources. Almost without exception this expression refers to coal in the ground, natural gas either in the earth or as it issues therefrom, mineral oil in a position similar to that of the gas above described, and standing timber in the forest.

Up to the present time, regardless of what efforts have been made toward saving for future generations what might truthfully be termed the nation's birthright, no legislator has been bold enough to advocate compulsory utilization of fuel-saving apparatus by the consumer. No would-be stateman has yet unlimbered his oratorical artillery in condemnation of the pernicious waste of heat in the furnaces of antiquated and inefficient steam boilers, with which the country is all too generously dotted.

The public in general is quick to criticize the producer of the world's fuel and clamor for drastic legislation governing the mining industry. These same people evidently forget the little cook stoves in their own kitchens which utilize in actual cooking perhaps 2 or 3 per cent. of the heat evolved in the combustion of the fuel and spill the balance up the chimney in the form of hot air and gas.

It is safe to say that the small consumers of the country by employing obsolete and extravagant methods of fuel burning and heat utilization annually waste amounts of coal which in actual cash value vastly exceeds that left in the ground impossible of recovery.

The conservation of natural resources is a laudable ambition and one worthy of strong commendation. Like most other great reforms, however, its practice should begin at home.

Dangers of Taking Powder Home

By H. G. Cockill*

The picture published herewith shows a house owned by the Knickerbocker Smokeless Coal Co., at Knickerbocker No. 2 mine, Hooversville, Penn., which was blown up Mar. 9, 1913, by a keg of powder.

Mike Truckley, a Slav, preparing for work with four other boarders at 5 a.m., went into the cellar to get powder for his day's work. He stepped near the red-hot stove in order to see more clearly and began pouring the powder into his cadger. The dust of the powder blew onto the stove and the flame passed back into the keg, which exploded with great violence.

Showing Result of Powder Explosion in Miner's Home

The explosion broke the 10-in. concrete walls and completely demolished the building. Four open kegs of powder standing near-by were untouched by the explosion. Mike's sister and her child were at the door upstairs and had to be taken down over the ladder shown in the picture, as the stairs were blown down. They escaped unharmed. Two porches of the house were blown a distance of 20 ft. The injured man, Mike Truckley, was removed to the Johnstown Hospital, where he died two weeks later.

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Our Front Cover This Week

The photograph on the front cover of this week's issue of Coal Age shows a No. A-1 ½-C-3 electric rotary drill in operation in mine of the New Pittsburgh Coal Co., Murray City, Ohio. This drill has met with considerable favor in bituminous mines because of its extreme simplicity. It may be readily handled by one man and is easily moved or set in position for drilling. Although especially designed for drilling coal, it can be used for drilling slate, shale, rocksalt, clay and gypsum. The drill is manufactured under patents owned by the Jeffrey Mfg. Co.

*Mining engineer, Knickerbocker Smokeless Coal Co., Hooversville, Penn.

The Shot Blew Through

By J. R. Allardyce

(Written expressly for "Coal Age.")

Old Tony Marconi, the Dago,
In the face of his room drilled a hole;
Says he, with a grin,
"I put powder in,
An' play helly-fire wi' da coal."

So he gave it six feet of a charge
And tamp'd it up tight as a gun;
Says he, "I come back
When he giva da crack,
An' maka da big pile o' mon!"

So he lit up the fuse and decamped,
To wait for the roar and the crash;
And munch'd at his ease
His garlic and cheese,
And reckon'd his labors in cash.

When the smoke rolled away from the face,
He crept back elate to the job;
But Tony felt punk
When he found not a chunk,
And he sat down and wept in the gob.

"Cara mia!" said he, "but I hear
Da big crack, an' I smella da smoke;
But I no see no coal,
An' da tamp in da hole—
Sancto Pietro! he no even broke."

And he quit the whole job in disgust,
While old Squeaky Pete with delight,
Loaded coal in the cars
Till he blink'd and saw stars,
From the shot that blew through on the right.

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Mining Meetings

The meeting of the committeemen at the Pittsburgh Experimental Station of the Bureau of Mines, which was scheduled for Apr. 7, has been postponed. The object of the meeting was to make provision for the organization of the American Mine Safety Association. It is the desire to organize the 15,000 men scattered throughout the United States, who have qualified as first-aid men into a compact body.

The idea is to model this organization after the far-famed St. John's Ambulance Association of Great Britain. The first step necessary is to have the members of the American Safety Association solidify the widely scattered local branches of that institution. So few of the members of the committee were present on Apr. 7, that it was decided to postpone the meeting until such time as would be most convenient for those concerned.

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The presence of blackdamp, a mixture of carbon dioxide and nitrogen, will often neutralize the effect of fire lamp on a flame. Analyses of mine gases which gave only a faint cap when tested with a safety lamp, have shown 4 per cent. of methane mixed with blackdamp. When testing with a lamp, remember that the flame is not as clear in these that have burned some time in a dusty atmosphere as in lamps which have burned but a short time in clear air.

DISCUSSION BY READERS

Education in Coal Mining

Letter No. 5—The unique suggestion of COAL AGE, that textbooks should be allowed students in examination, is a striking commentary on the system of mining education today. How true it is that system makes or mars the man. Favorable results, however, are often attained, despite the system employed; and when the results are otherwise, the system is more to be blamed, perhaps, than the capacity of the student. I have seen excellent work accomplished by a system confined to certain limits when the slightest deviation from the beaten track would produce confusion and disaster. Most unacademic systems err in their neglect of the study of principles, and this, even with the approbation of boards of education.

What, after all, is education but a knowledge of principles and their application. Therein lies the crucial test of any system. If the student is not enabled to grasp fundamentals and use them in the development or transposition of formulas, in the solution of problems, upon what does the system as a means of education rest? Here is where the function of examination lies—not in scrutinizing the mechanical results, to produce which the tools have been provided; but to ascertain, if possible, the extent of the pupil's mastery of principles and his ability to apply them efficiently in practice.

I would like to ask what is a man's efficiency, in a special branch of education, if his results are obtained by the mechanical handling of a ready-made formula? Would there be any obstacles to his acquiring the reputation of an "admirable Crichton," with accommodating textbooks at his elbow and a minimum of study and grind to his credit? What is my knowledge of the steam engine worth if it consists only in ability to substitute numerical values for the symbols in the formula

$$H = \frac{plan}{33{,}000}$$

Or, what is my conception of the mathematical relation of the sides of a right-angled triangle to one another, if it is determined by the mechanical substitution of figures in variations of the formula

$$Base = \sqrt{hyp.^2 - perp.^2}$$

No! Let us take the bull by the horns and, admitting the defects of method in our systems of teaching and taking a dose of Bacon or Descartes as a stimulant to our efforts, settle down to the production of something that will simplify instruction and yet provide a basis for a system that shall efficiently teach the essentials of the education needed in coal mining.

J. R. ALLARDYCE.

Saginaw, Mich.

❖

Letter No. 6—The education of the miner is a large subject to discuss. I believe every miner ought to be educated—at least he should have a common-school education; but I cannot see how we are going to educate the miners unless we start with the boys. I believe every boy ought to be compelled to attend school until he graduates from the high school. He will then have a start in life and if he has any ambition he can advance himself in any line.

On the other hand, if a boy is compelled to work about the mines at the ages of twelve and fourteen, he will lose all ambition to study and will not realize what he has lost until later in life. He is then ashamed to start back with the boys, and continues in the same old rut as his father did before him. To avoid this embarrassment every boy should be compelled to attend school till he completes the high-school course, as the miner needs education as well as any other class of men, so that if there is any chance for his advancement he will be capable of filling a higher position.

In coal mining, there is not a greater drawback than to be without an education; but if we educate the miner who is going to mine the coal? The educated man is not going to mine coal. And again a miner cannot educate his family on the average wage of $50.00 a month. I believe we will have to educate somebody higher than the miner and have them take more interest in educating the mine workers who cannot educate themselves. The great cry in the anthracite region of Pennsylvania is, "We must educate the miner." But the great trouble is that those who have been educated seem to get above their fellowmen and forget that they ever worked as common miners. We should educate the mine officials to get nearer to their men, and then we can do something towards educating the miner. I say, however, educate the miner by all means.

MINER.

Scranton, Penn.

❖

Letter No. 7—Owing to the failure of the state legislature of Washington to pass legislation on the new code of mine laws drawn up by the commission appointed by Governor Hay, who retired from office, Jan. 1, 1913, the state of Washington is deprived of the advantage to be gained by a new code of mine laws, for another two years. As I have stated in a previous article, in COAL AGE, the present law does not require a man to hold a certificate of competency in order to serve either as mine foreman or fireboss. The Northwestern Improvement Co., the largest and most progressive coal company in the state, does, however, require that in order to hold either of these positions, a man must have a certificate which is issued by the company, and examinations for such certificates are held by this company twice a year.

At the last examination, which was held during the fore part of the present month, the same method was pursued as in the previous examinations. The applicants for fireboss were given ten questions to answer in writing with a total marking of 50 per cent. Later, they were taken to a certain entry, in a mine in which the ventilating system had been disarranged, props knocked out and

others set wrong, drop sheets misplaced, and in several places small quantities of marsh gas (CH_4) could be found. Throughout this territory, experienced and competent men were stationed to watch the men as they made their inspections.

The candidates were stationed on the main parting under the inspection of a competent man, and when all was ready, they were started in, at intervals of ten minutes. When they had completed their inspection, each candidate was required to make a written report of the conditions as he found them; and this report was compared with the report of the inspectors, and the candidate given a mark, according to the following schedule:

	Points
Handling and testing of safety lamps	10
Drop sheets and ventilation	10
Gas in all places	10
Timbering	10
General deportment	10
Total	50

I have always been an advocate of allowing candidates the use of textbooks in these examinations, as long as the questions asked do not give the applicant a direct chance to copy, although by so doing the candidate would cheat no one but himself. In conducting the last two examinations held by the Northwestern Improvement Co., I found that several good men would have failed to pass the examination had I not allowed them the use of textbooks to find the formulas for certain questions asked. Knowing these men from having been connected with them in their work around the mine, I am satisfied that they will make much better mine foremen than the younger men who have studied hard to memorize all the formulas, and who have had some engineering experience, but who still lack the necessary practical experience in mining.

It has also been my experience that men who have studied hard previous to taking an examination, in order that they might memorize the formulas, constants and other data, after securing a position as foreman, forget these formulas and data and refer at once to their textbooks whenever obliged to make calculations that will enable them to contend successfully with the various difficulties that occur in daily mining practice.

FRANK GOOD.

Roslyn, Wash.

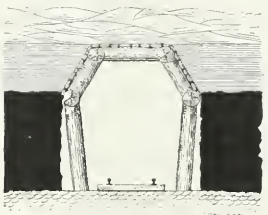
Waste of Mine Timber

The recent discussion on post timbering at the working face has called my attention to the large and in most cases unwarranted waste of timber in and around coal mines. This waste of timber is probably greater in mining than in any other industry. The unnecessary waste of timber can be greatly reduced; at the same time, the necessary waste portions can often be put to some good use, if the mine officials will give the matter proper attention. Greater consideration is given this matter in foreign countries than in America, because they have come to realize the necessity for so doing. As civilization advances and the population increases, suitable timber naturally becomes more scarce and higher in price and, for this reason, the practice of economy in its use is essential.

It is important to give all mine timber a careful inspection when it is received at the mine, as without this inspection much timber will be received that cannot be used and must be thrown aside. It is likewise important to give careful attention to the framing of timbers and avoid waste, as far as possible, by cutting down posts that are too large for the purpose. Much timber is lost in abandoned places, that could be used again if proper care be taken to recover and send it where it can be used.

Again, it is important that timber should be cut at the right time of the year and stored so that it will become seasoned. The life of mine timber is greatly increased by treating timber so as to preserve it from decay. Wood continually deteriorates under the stresses or loads to which it is subjected, and these ill effects are greatly increased by the conditions of moisture and temperature so common in mining.

Proper care should be used in placing timber, in order to secure the best service and prolong its life. In rooms, a systematic method of timbering is generally the safest plan to follow. Special conditions require special forms of framing. When mining under a week drawslate, and it is desired to maintain a permanent haulage road, it may be advisable to adopt a style of timbering similar to that shown in the accompanying sketch. In this system four longitudinal stringers are supported by two legs, two struts and a short collar or crossbar at the top. As shown in the figure, the legs of the timber frame are given a slight inclination inward, at the bottom, so as to better support the side thrust of the drawslate above the coal. The upper portion of the frame forms an arch and is lagged, as shown in the sketch. In special cases, where the roof has a tendency to cave high, it may be advisable to omit the collar, or crossbar, and extend the side struts as rafters until they meet a single stringer in the roof, which gives greater head room.



ARCHED TIMBER FRAME

Much timber can be saved by the miners and daymen engaged on pillar work, exercising suitable precaution. It often pays to set a couple of temporary props to save one timber that would otherwise be abandoned. Machines for drawing timbers are used to advantage by many companies. Much timber is lost through neglect. It is common to find posts that have been taken to working places and never used. A visit to most abandoned places will reveal many posts that should have been drawn and other timber covered by falls. It is common to find ties, wooden rails, brattice boards, etc., scattered through air courses and going to waste, because they have not been cleaned up and taken to where they could be used. Miners will often order timber sent in rather than gather the loose timber lying in the waste and left along the rib. Care should be taken to see that miners order the proper length of timber required, to avoid the waste of cutting long timbers where a shorter stick is needed.

For permanent work, when possible, steel and reinforced concrete should be used, as they have greater strength and longer life. Tile, brick or concrete stoppings, and overcasts are generally tighter and safer than those built of wood. The use of steel mine ties, in rooms and airways, will generally be found to be of advantage.

MINING ENGINEER.

Clarksburg, W. Va.

System in Timbering

It is both economical and advantageous to adopt a uniform and special method of timbering that will be suited to the particular conditions in a mine. The weight is thereby more evenly distributed over the coal face and the timber is more promptly set by the miners, because the system demands that another row of timbers must be stood at the specified distance from the face of the coal and the back timbers drawn regularly as the working face advances. If the miner fails to do this at the time, his neglect is observed by the foreman or his assistant on his first round and he is ordered to cease work on the coal till he has done the timbering as required by the regulations of the mine.

In my opinion, the miner should be held responsible for the timbering of his own working place as it advances. I believe this is a safer method to adopt than to employ a special timberman, because the miner working every day in the same place is more apt to note the changing conditions of the roof than the mine foreman or timberman, who spend but a portion of their time in one place and visit, perhaps, a hundred different working places, in the same shift. The miner should be supplied with plenty of timber of the right length so that he will have no excuse for not setting the same promptly, as the face advances.

Since the miner is not a proper judge of all the conditions that should determine where timbers ought to be placed, it is all the more important that he be required to set the timbers at the face according to some regular order or system. This system should be determined by the conditions and nature of the overlying and underlying strata; the thickness and nature of the coal; the depth below the surface; the pitch or inclination of the seam; and the method of mining the coal. When these conditions change, it will be necessary to change or modify the system of timbering, and the miner should be given proper instructions at such time.

But, after all has been said, in favor of systematic timbering, I believe that the method adopted for the working of the coal—the width of the openings and the size of pillars required is more important than even the adoption of a proper system of timbering. It must be remembered that timbering, at the working face, is only for the purpose of securing loose pieces of slate or roof against falling and to give the miner warning of impending danger and more evenly distribute the weight upon the pillars and the face of the coal. If the thickness of the pillars is too small and not made proportionate to the width of the opening, no amount of timber or system of timbering will avail to correct the evil.

BENJAMIN HARTILL.

Johnstown, Penn.

Study Course in Coal Mining

BY J. T. BEARD

The Coal Age Pocket Book

MINE GASES

The gases of most importance in coal mining, together with their chemical symbols, molecular weights, densities referred to hydrogen and specific gravities referred to air of the same temperature and pressure, are the following:

Gas	Symbols	Molecular Weights	Density H=1	Spec. Gravity Air=1
Methane (marsh gas)	CH_4	16	8	0.559
Olefiant gas	C_2H_4	28	14	0.978
Ethane	C_2H_6	30	15	1.0366
Carbon monoxide	CO	28	14	0.967
Carbon dioxide	CO_2	44	22	1.529
Hydrogen sulphide	H_2S	34	17	1.1912
Oxygen	O_2	32	16	1.1056
Nitrogen	N_2	28	14	0.9713
Hydrogen	H_2	2	1	0.06926

Occurrence of Mine Gases—Aside from the oxygen and nitrogen of the air, the gases commonly occurring in coal mines are methane, carbon dioxide, carbon monoxide, and less frequently or in less quantity, hydrogen sulphide and olefiant gas. These gases are produced by the processes of decomposition or combustion constantly going on in the mine, or they emanate from the coal or other strata, where they exist as natural gases.

Occluded Gases—The gases commonly occluded in the coal formations are methane, ethane, nitrogen, carbon dioxide and oxygen. They are the result of the chemical changes that took place in the formation of the coal; or are produced by the action of acid waters on certain limestones or other carbonates. Occluded gases are held in the pores of the coal and other strata, from which they drain into the mine openings, or work upward through such pervious strata as shale and sandstone. The process is called "emission" or "transpiration" of gases.

Pressure of Occluded Gas—At times, the gas is confined in the coal or other strata by an overlying stratum of clay or impervious limerock that prevents its escape to the surface, and the presure of the gas is then often very great, varying from 500 and 600 lb. per sq.in. to four or five times that amount. This presure is manifested in different ways. As the mine workings are extended the flow of gas into the mine increases with the exposure of fresh faces of coal, except where the conditions are such as to allow the gas to drain off and reach the surface.

Effect of Faults—Fault lines and other geological disturbances of the strata have opened channels by which the gas confined in certain strata escape to other strata or into the mine workings or to the surface. For this reason, the near approach of the working face to a fault line or a disturbed condition of the strata is often accompanied by a marked change in the gaseous condition of the mine air. The percentage of gas common to the mine may then either increase or decrease depending on the location of the gas and the nature of the fault.

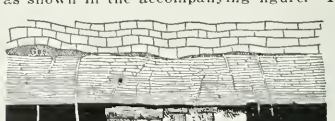
The Coal Age Pocket Book

Gas Feeders, Blowers—Any continuous flow of gas from a crack or crevice in the strata is called a "gas feeder," or simply a "feeder." The gas flowing from the crevice is known as "feeder gas."

When a gas feeder is under high pressure so that the gas issues with considerable velocity, the feeder is called a "blower" and the gas "blower gas."

Effect of Gas Pressure in Mining—The pressure of gas confined in the coal is often sufficient to splinter the coal in its effort to escape, the fine coal being thrown into the face of the miner at work. At times, the gas escapes from the coal with a peculiar hissing sound known as the "singing of the coal." The presure of gas in the roof frequently causes heavy roof falls, and gas in the floor causes the bottom to heave. In some instances, the gas pressure assists the extraction of the coal and lessens the work of the miner by helping to break down the coal.

Outbursts of Gas—In the mining of gaseous seams, it is not uncommon for gas to work in the strata as the coal is extracted. As a result, the gas often accumulates in pockets as shown in the accompanying figure. The settlement of the roof incident to the removal of the coal affords opportunity for the gas to expand and work forward toward the opening. The working of the gas in the strata is often accompanied by severe "poundings" or "bumps," due to sudden displacement of the gas. Such sounds often continue for several days previous to a sudden outburst of the gas into the mine workings. The continuance of these poundings are a sufficient warning to experienced miners to vacate that part of the mine till the strata have become more quiet by the gradual draining off of some of the gas.



SHOWING THE ACCUMULATION OF GAS IN POCKETS IN THE STRATA

In many cases, where the gas works down into the coal, either at the face or in the "ribs," as shown in the figure above, the pressure of the gas becomes distributed over a considerable surface, and is sufficiently great to throw down the coal. This is called an "outburst" of gas, since large volumes of gas and often hundreds of tons of coal are thrown violently into the opening.

INQUIRIES OF GENERAL INTEREST

Effect of Carbon Dioxide on Life and Flame

(a) What per cent. of carbon dioxide (CO_2) will cause a miner to notice that he is working in bad air? (b) What per cent. will ordinarily cause him to stop work? (c) What per cent. will cause unconsciousness, say after a half hour's work? (d) What per cent. will extinguish a miner's open lamp?

M. C. Butler.

Fairfax, Wash.

(a) The effect of carbon dioxide on the human system is not alone dependent on the percentage of this gas present, as the effect of the gas, both on life and flame, is greatly increased by the depletion of the oxygen in the air. Careful experiment has shown that when carbon dioxide is added to pure air, respiration becomes noticeably more difficult when the proportion of the gas in the air exceeeds 4 per cent. If there is 4 per cent. of carbon dioxide present, the proportion of pure air in the mixture is 100 — 4 = 96 per cent.; and since oxygen forms 20.9 per cent. of the pure air before the carbon dioxide is added, the proportion of oxygen present in this mixture is $0.209 \times 96 = 20.064$ per cent. In this case, therefore, the oxygen has only been depleted, by the addition of carbon dioxide, from 20.9 to 20.064 per cent.; but the presence of the 4 per cent. of carbon dioxide begins to make respiration difficult.

(b) No percentage can be stated as producing such effect as will cause a man to stop work owing to the presence of carbon dioxide in the mine air. The effect is greatly modified by the physical condition of the person, the character of work he is doing and the temperature of the air and amount of moisture present. All of these conditions greatly modify the effects of the gas on the system. As respiration becomes more difficult owing to the increasing percentages of the gas in the air, headache and nausea are produced. Some men are stronger and better able to withstand these effects and continue work longer than others; but, in general, from 6 to 8 per cent. of this gas present in the mine air may be considered sufficient to produce effects that will cause the ordinary miner to stop his work.

(c) The answer to this question must be modified by the same conditions we have just mentioned. For this reason, it can only be stated, in a general way, that from 10 to 14 per cent. of carbon dioxide present in the mine air may produce unconsciousness when breathed for one-half hour while at work.

(d) The depletion of the oxygen in the mine air increases the effect of carbon dioxide on the flame of the lamp to a much greater extent than it modifies the effect of this gas on the human system. For example, a lamp placed in a closed place, as under a bell-jar, and allowed to burn until it is extinguished, consumes some of the oxygen of the air and produces, at the same time, carbon dioxide. The depletion of the oxygen of the air and the percentage of carbon dioxide produced, at the moment the lamp is extinguished, are found to vary with the nature of the flame. A candle is extinguished when 3.2 per cent. of carbon dioxide is present and the oxygen of the air is depleted to 15.7 per cent. A lamp burning paraffin oil is extinguished when 3.0 per cent. of carbon dioxide is produced, the oxygen of the air being depleted to 16.6 per cent. The atmosphere remaining when the lamp is extinguished is called a residual atmosphere.

On the other hand, an artificial atmosphere, produced by adding carbon dioxide to pure air, will extinguish a candle flame when 13.4 per cent. of carbon dioxide is present, the oxygen being then depleted to 18.1 per cent. In like manner, an artificial atmosphere, produced by adding carbon dioxide to pure air, has been found to extinguish an oil lamp when 14.3 per cent. of carbon dioxide is present, the oxygen of the air being depleted to 17.9 per cent.

Owing to the free circulation of air in the mine, the mine air must be considered as more nearly approaching an artificial atmosphere than a residual atmosphere. It is true, however, that in portions of the mine workings that are poorly ventilated, the oxygen of the air has not been replenished as rapidly as it has been consumed and, in this case, a slightly less percentage of carbon dioxide present in the air will suffice to extinguish the lamp. Although 18 per cent. of carbon dioxide in air, under ordinary conditions, is stated as producing a *fatal* atmosphere while an oil lamp may be extinguished in air containing only 14 per cent., it is never safe to remain in an atmosphere where a lamp is extinguished. Less than 4 per cent. of carbon dioxide present in the mine air will cause the lamps to burn dim and this should warn men to seek better air.

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Heat Absorbed by Air

How many B.t.u. will be required to raise the temperature of 100,000 cu.ft. of air from 35 to 54 deg. F.?

Fireboss.

Monongahela, Penn.

The first step is to find the weight of 100,000 cu.ft. of air at the given temperature (35° F.), assuming a barometric pressure of, say 30 in. of mercury. Thus,

$$100{,}000 \left(\frac{1.3273 \times 30}{460 + 35}\right) = 8044 \text{ lb.}$$

Now, assume that the pressure remains constant and the air is allowed to expand freely under the stated rise of temperature. The specific heat of air, for constant pressure, being 0.2374, the heat absorbed by 1 lb. of air for each degree the temperature rises, is 0.2374 B.t.u. The rise of temperature, in this case, is 54 — 35 = 19 deg. The total heat absorbed in producing the rise of temperature, or the heat required to raise the temperature of 100,000 cu.ft. of dry air, under constant pressure, from 35 deg. to 54 deg. F., is

$$8044 \times 19 \times 0.2374 = 36{,}280 \text{ B.t.u.}$$

EXAMINATION QUESTIONS

Mensuration and Surveying

(Answered by Request)

Ques.—A certain entry is driven 9 ft. wide on the bottom, 7 ft. wide on the top and 6 ft. high, its section being in the form of a trapezoid. If this entry is half full of water—that is to say, contains half the water that it would hold if full, what is the depth of the water standing in the entry, and what is the width of the entry measured at the surface of the water?

Ans.—The area of a trapezoid is found by multiplying one-half the sum of its two parallel sides by the perpendicular distance between them; thus,

$$area = 6\left(\frac{7+9}{2}\right) = 48\ sq.ft.$$

One-half of this area, or 24 sq.ft., is the area of the cross-section of the water.

Now, observe that the width of this entry decreases 2 ft. in 6 ft. of vertical height. Therefore, calling the depth of the water x, the decrease in the width of the entry at the surface of the water will be $\frac{2}{6}$ or $\frac{1}{3}$ of x, making the width at the surface of the water $9 - \frac{1}{3}x$. The sum of the two widths measured at the bottom and at the surface of the water is then $9 + 9 - \frac{1}{3}x = 18 - \frac{1}{3}x$; and the half sum of these widths is $9 - \frac{1}{6}x$. Then, multiplying this half sum by the depth of the water x, we have for the area of the cross-section of the water

$$x\left(9 - \frac{x}{6}\right) = 9x - \frac{x^2}{6}$$

But since this area must equal 24 sq.ft., the value of x is found by solving the equation:

$$9x - \frac{x^2}{6} = 24$$

Or, multiplying through by 6 to clear of fractions, and changing the signs of all the terms, and writing x^2 first we have

$$x^2 - 54x = -144$$

Now, complete the square in the first member by adding to it the square of half the coefficient of x; or $27^2 = 729$; remembering that the same amount must be added to both sides of the equation, to preserve the equality; we have

$$x^2 - 54x + 729 = 729 - 144$$
$$x^2 - 54x + 27^2 = 585$$

The first member of this equation is now a perfect square, its square root being $x - 27$; hence, extracting the square root of each member, we have

$$x - 27 = \pm\sqrt{585} = \pm 24.187$$
$$x = 27 - 24.187 = 2.813\ ft.$$

The depth of the water is, therefore, 2.813 ft.; and the width of the entry at the surface of the water is

$$9 - \frac{x}{3} = 9 - \frac{2.813}{3} = 9 - 0.938 = 8.062\ ft.$$

Ques.—An entry measures 9 ft. on the bottom, 6 ft. at the top and is 5 ft. high. Find the depth of the water when the entry is half full.

Ans.—The area of this entry is $5\ (6 + 9) \div 2 = 37.5$ sq.ft. Since the width of the entry decreases 3 ft. in 5 ft. vertical height, and calling the depth of the water x, the decrease in width, at the surface of the water, is $^3/_5$ of $x = 0.6x$, making the width at the surface of the water $9 - 0.6x$, and the sectional area of the water

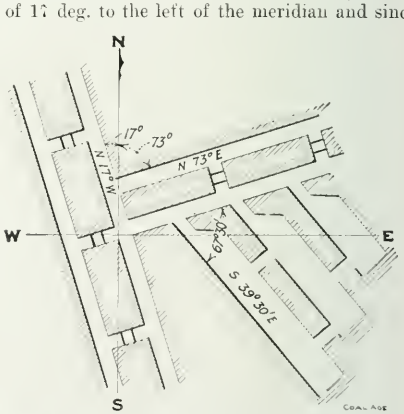
$$Area = x \times \tfrac{1}{2}\ (9 + 9 - 0.6x) = x\ (9 - 0.3x) = 9x - 0.3x^2$$

The area of the water being $37.5 \div 2 = 18.75$ sq.ft., we have

$$9x - 0.3x^2 = 18.75$$
$$x^2 - 30x = -62.5$$
$$x^2 - 30x + 15^2 = 225 - 62.5 = 162.5$$
$$x - 15 = \pm\sqrt{162.5} = \pm 12.75$$
$$x = 15 - 12.75 = 2.25\ ft.$$

Ques.—The course of the main entry in a certain mine is N 17° W: (a) What is the course of a cross-entry turned to the right at an angle of 90 deg.? (b) What is the course of the rooms turned off the cross-entry at an angle of 67° 30′ to the right?

Ans.—As shown in Fig. 2, the main entry makes an angle of 17 deg. to the left of the meridian and since the



PLAN OF MAIN AND CROSS-ENTRIES, SHOWING ROOMS

cross-entry is turned off at any angle of 90 deg. to the right of the main entry, it makes an angle of $90 - 17 = 73$ deg. to the right of the meridian. The bearing of the cross-entry is, therefore, N 73° E.

(b) Since the rooms are turned to the right of the cross-entry an angle of 67° 30′, the total angle measured from the north end of the meridian around the right, to the center line of the rooms is $73° + 67° 30′ = 140° 30′$. Since this angle is greater than 90 deg., the bearing of the rooms lies in the southeast quadrant. The angle of this bearing is measured from the south end of the meridian, and is $180° - 140° 30′ = 39° 30′$. The bearing of the rooms is, therefore, S 39° 30′ E.

COAL AND COKE NEWS

Washington, D. C.

Attorney-General McReynolds has developed a plan to govern the future administration of the Sherman act which, it is believed, may operate to change in some important particulars the present method of applying that law and would incidentally alter the mode of proceeding in the so called coal cases.

Mr. McReynolds' idea is to have the local federal legal authorities, instead of waiting for an elaborate investigation to be made by the Department of Justice, and instead of waiting for instructions from Washington, take action in all instances where they are advised that local violations of the Sherman act are being committed.

If this plan were to be followed, the effect would be that proceedings under the Sherman law would be rendered much more numerous and the amount of difficulty caused to those subject to prosecution would probably be largely increased.

Demand Coal Be Kept Dutiable

It is being unofficially stated that a strong demand is to be made by coal interests which are powerful in Congress for a restoration of rates of duty to some extent, or at all events for the insertion in the new law of a provision removing the duties on Canadian coal only in the event that Canada gives equally good treatment to America. This, however, is likely to be sharply rebutted by the New England manufacturers who have been feeling all along that they were being given but little consideration and who have recognized help for themselves in a small group of items used by them in the process of production and considerably reduced under the tariff bill or placed on the free list.

One of these was coal and there has been a strong disposition to regard the treatment of it in the act as nothing more than a bare recognition of their claims for something offsetting the heavy reductions on their goods which were carried in the act. It is therefore likely that a sharp struggle will occur before the dutiable status of coal will be altered.

Must Become Parties to the Government

According to information received by the Department of Justice it will be necessary for J. P. Morgan & Co. and the Central Trust Co., of New York, to become parties to the case of the Government against the combination of railroad and coal operators in which the Lake Shore & Michigan Southern, the Hocking Valley, and the Sunday Creek Coal Co. were involved.

This has now been held to be a trust in violation of the Sherman law under a decision of the Federal Circuit Court of Appeals at Cincinnati, Ohio. The decision holds that all persons interested in the stock of the coal company and all those holding property who are pledged to secure the dividing of the coal traffic moving over the roads in question shall be made parties to the suit of the Government. This involves the New York interests already referred to.

Coal in Our Export Trade

The Department of Commerce has compiled an analysis of the export trade of the United States which shows that ten countries take the bulk, or about three-fourths, of United States exports and among these considerable attention is given to coal and coke.

England is first in the list of countries and Canada second while in Canada's receipts of goods from the United States coal and coke rank second in value with $13,000,000. Germany is third in the list, France fourth, Netherlands fifth, Italy sixth, Cuba seventh and in Cuba's receipts coal ranks fifth with $3,000,000.

Mexico follows Cuba as eighth in the list, her receipts of coal from the United States being the seventh article of importance and amounting to about $1,500,000 annually. Japan is ninth and Argentina tenth, bituminous coal received by the latter from the United States amounting to $500,000 yearly.

Mining Institutes and Vocational Schools

According to the data which have been made public in regard to the mining institutes and vocational schools in the anthracite regions of Pennsylvania, the past season has been decidedly successful. Institutes were held at Wilkes-Barre, Scranton, Pittston, Lansford, Hazleton, Nanticoke, Shamokin, Mt. Carmel and Carbondale.

At present there are about 100 different positions in and about the mines for which special training is advisable or indispensable. In order to avoid embarrassing adult miners who dislike to show ignorance or enter classes with children the present method is to have the classes at night for men only. These have been held either three or five nights a week according to the disposition of the miners to attend.

The strong interest in the work has been quite acceptable to the mine operators as they believe it tends to bring about more efficient work and closer attention to duty on the part of the employees. Some of the coal roads have contributed largely to the expenses of the undertaking.

The President Will Not Interfere

The present understanding is that President Wilson will pursue the policy of not interfering with the men at the head of the scientific bureaus of the Government, and that in pursuance of this policy he probably will not make any changes in the Bureau of Mines or Geological Survey.

The action taken in removing the head of the Census Bureau was based on the belief that that institution had not been efficiently conducted and, curiously enough, it would seem that one of the most severe criticisms made with reference to it relates to the way in which it carried on the census of mines, particularly coal, this, however, being jointly managed by the census and the Geological Survey. There seems to be general approval for the policy of non-interference with the scientific bureaus of the Government.

PENNSYLVANIA

Anthracite

Hazelton—A recent strike of the mine workers at a colliery of the Lehigh & Wilkes-Barre Coal Co. has extended to all the operations of the corporation. Eighteen hundred men are idle. The strike was caused by the question of the wearing of union buttons.

Wilkes-Barre—Four men were killed and two fatally injured by an explosion of gas in the East Cooper slope of the Woodward mine of the Delaware, Lackawanna & Western Co. at Edwardsville, Apr. 12. Several others received burns and lesser injuries. A naked light was the cause of the explosion.

Scranton—Fire slightly damaged the breaker of the Diamond mine of the Lackawanna Coal Co. in West Scranton. The fire started in the loading shed of the building, and a serious blaze which might have destroyed the breaker was prevented by the timely discovery of the fire by two workmen employed about the breaker.

Fire believed to have been caused by children playing with matches nearly destroyed the old Mt. Pleasant washery of the Lackawanna Coal Co. at the West end of the Mulberry Street viaduct, in Scranton. The washery had been abandoned some time and was of little value.

Bituminous

Pittsburgh—Striking calkers and woodworkers employed at the marine ways of the Monongahela River Consolidated Coal & Coke Co. have been ordered to return to work or remove their tools. The striking men are demanding an increase in wages. They claim that the company has refused to meet their grievance committee.

Uniontown—Miners in this vicinity are said to be on strike owing to trouble which has arisen concerning the method of weighing.

Greensburg—The commissioners of Westmoreland County have recently fixed valuations for various coal lands for taxable purposes.

WEST VIRGINIA

Charleston—Governor Hatfield has served notice that he will arrest all persons who are caught, aiding in any way, insurrection in West Virginia.

The coal operators of Kanawha County have accepted the governor's proposal for a settlement of the miner's strike.

The miners' representatives, however, have not yet answered. It is said that the New River operators also have made peace.

A movement has been started by the United Mine Workers of America to help the miners and their families, who suffered during the recent floods. A committee has been going the rounds in this vicinity to see how many need assistance.

Morgantown—A six-week summer course will be given by the University of West Virginia department of mines to prepare men for mine foremen and fireboss positions. The course will begin June 23 and is intended to prepare miners for examinations for certificated mine positions.

The West Virginia Mining Institute will meet in this city June 24.

Clarksburg—The Consolidation Coal Co. is making its annual inspection of its coal mines in the West Virginia district.

Coal Valley—Local officers of the United Mine Workers have received word that 125 men are on strike in the Coal Valley mine in Boone County.

Wheeling—The plant of the Elm Grove Coal Co. was tied up Apr. 16 when 75 men went on tsrike. The strike is of an entirely local nature, involving the insurance policy of the company, and an early adjustment is expected.

KENTUCKY

Louisville—The Western Kentucky Coal Operators' Association met last week at the Seelbach Hotel in annual convention, for the purpose of electing officers for the ensuing year and attending to other business, mostly of a routine nature. The Association is composed exclusively of the operators of union mines in that section of the State, and representation was consequently confined to that class of the trade.

OHIO

Lisbon—The power plant and buildings of the Duquesne Coal Co., at Newhouse, a mining hamlet three miles east of this town, have been almost totally destroyed by fire.

INDIANA

Indianapolis—The Indiana Railroad Commission has not acted on the notification of some of the roads that they will raise their rate on Indiana coal, May 1, from 50 to 55c. per ton. Operators believe, however, that the higher rate will never prevail.

ILLINOIS

Springfield—It is stated on good authority that shotfirers will not be ousted from their jobs if machine mining is adopted in this section of the state. The machines will merely facilitate the undercutting of the coal, and shotfirers will still be a necessity.

Streator—The Munts Brothers have closed their operation and the 40 men employed there have sought work elsewhere. The mine will not be reopened until it has been disposed of.

MISSOURI

Kahoka—A seam of coal has been discovered on a farm a short distance south of Memphis.

KANSAS

Pittsburg—The Wear Mine No. 21 has been idle for more than three weeks, following a dispute between the miners and operators in regard to the distribution of the entries. Two hundred men have been out of work.

Fort Smith—It is reported that six men were entombed in mine No. 2 of the Western Coal & Mining Co., at Denning. An explosion wrecked the mine and set it afire. Efforts to reach the imprisoned men have met with little success.

FOREIGN NEWS

Brussels, Belgium—Between 300,000 and 400,000 miners employed in the Charleroi district are on strike for the ballot.

Hamborn, Germany—Sixteen miners were overcome by coal gas in a pit known as the "German Emperor", Apr. 16. Fire had broken out in the pit during the night.

Venezuela—Pell & Co. of New York are investigating the coal deposits of Venezuela and are proposing to engage in an extensive exploitation of them. In the same connection an examination of iron deposits in Venezuela and Colombia is being made and plans are under way to utilize the coal and iron in the establishment of an iron industry on the Caribean Sea.

PERSONALS

Judge Mitchell recently appointed Thomas Robinson receiver of the Hiawatha Coal Co., whose mine is located half a mile west of Urichsville. His bond was fixed at $5000.

The appointment was made upon the application of 65 miners, who claim they have not been paid wages earned during February.

Arthur C. Smith, formerly in charge of the office of the Bessemer Coal & Mining Co., is now connected with the St. Louis office of the Egyptian Coal & Mining Co.

Edwin M. Chance has severed his connection with the Philadelphia & Reading Coal & Iron Co., to become consulting chemist to a number of the larger anthracite and bituminous producers, and to enter into a general consulting practice in Wilkes-Barre.

James W. Turner, state superintendent of the Banner mine, which is leased by the State of Alabama from the Pratt Consolidated Coal Co., and operated by state convicts, has resigned his position, effective when his successor is appointed. His resignation has been accepted but his successor has not yet been named.

Governor Major, of Missouri, has appointed George Hill, of Bevier, as state inspector of mines. The office is a new one and pays a salary of $2000 a year and expenses. Mr. Hill has been a practical coal miner all of his life, and the governor in looking for his man wanted a practical miner from one of the largest coal-producing counties in the state.

OBITUARY

Alexander Fulton, aged 83, one of the best known and wealthiest coal operators in the anthracite region, died at Shamokin, Penn., on Apr. 15. During the early days of mining in this region, he was manager for John Jacob Astor, Franklin Delano and J. Langdon & Co. He came to the United States from Scotland in 1848.

TRADE CATALOGS

Wm. B. Scaife & Sons Co., Pittsburgh, Penn. Gasoline Storage Outfits. Welded Gasoline Tanks. 8 pp.; 7½x9¼ in.; ill.

Myers-Whaley Co., Knoxville, Tenn. Shoveling. Machines for Underground and Surface Work. 22 pp., 8x10 in., profusely illustrated. This is of especial interest to coal operators, as it describes machines which shovel the coal from the mine floor and load it into cars. The smallest machine described weighs 3 to 3½ tons, is 38 in. maximum height, consumes about 7½ hp. per minute. This machine will clean a heading or room 17 ft. in width.

CONSTRUCTION NEWS

Hillsboro, Ill.—The Clover Leaf Mining Co. has struck coal at its new air-shaft and it is understood that the work of sinking will soon be completed.

Sartell, Minn.—The Northern Pacific is planning to erect extensive coaling docks at Sartell this summer. It is intended that Sartell will be used as a coal supply depot for all through passenger trains.

Superior, Wis.—The Heyl & Patterson Contracting Co. is starting the erection of a big coal handling bridge on Northwestern dock No. 1. The company has recently completed the Island Creek dock at Duluth.

Henryetta, Okla.—The Pleasant Valley Coal & Coke Co. is sinking its No. 2 shaft north of the old 'Frisco tank on that road, about 5 miles north of town. The shaft will be 8x12 ft., 128 ft. deep, and will be built of concrete for a part of its depth.

Punxsutawney, Penn.—The P. & N. W. has started an extension of its spur that runs from Hilman into the Maderia Hill mines at Clover Run. It will be about two miles long and will tap a field of between five and six thousand acres of good coal.

Leavenworth, Kan.—It is understood that a Kansas syndicate has made an offer for the Brighton coal mine south of this city, 160 acres of land, 1200 acres of coal rights and the railroad from the mine to Lansing. It is the purpose of the syndicate to make a manufacturing center of Brighton. It is not the intention to sell any coal, but to use it for generating electric power.

Milwaukee, Wis.—The Milwaukee Western Fuel Co. and the Philadelphia & Reading Coal & Iron Co. are contemplating increasing the capacity of their docks at a cost of more than $1,000,000. The present capacity of the Milwaukee company is about 125,000 tons annually, while the capacity of the Reading company is 300,000 tons. It is expected that when the new machinery has been installed that the capacity of each will be doubled.

Grand Forks, B. C.—The Kettle Valley Ry. is building a spur to the Midway mines of the Boundary Mining and Exploration Co. As soon as this has been completed the road will use this coal for its locomotives. It is not the intention of the company to try to market any of the product, except that used by the railway, until next fall. A number of pumps, a compressor and a hoist are being installed at the mine.

NEW INCORPORATIONS

Birmingham, Ala.—The Burnwell Coal Mining Co.; capital stock, $50,000. Priestly Toulmin, president.

Birmingham, Ala.—The Wittichen Coal & Transfer Co.; capital stock, $25,000. Carl F. Wittichen, president and general manager.

Marissa, Ill.—The Marissa Coal & Mining Co.; capital stock, $2000. Incorporators: W. H. Hale, J. B. Brown and W. D. Newcom.

Frankfort, Ky.—The capital stock of the Elkhorn and Beaver Valley Ry. Co., of Ashland, has been increased from $30,000 to $130,000.

Little Rock, Ark.—The Quing Anthracite Coal Co.; capital stock, $75,000. J. T. Bullock, of Russelville, is named as agent for the company.

Dallas, Tex.—The Malkoff Lignite Co., capital stock, $10,000; purpose, mining. Incorporators: H. C. Jones, H. C. Maersch and Joseph Samuels.

Rich Hill, Mo.—The Eureka Coal Mining & Mercantile Co., capital stock, $20,000. Incorporators: F. A. Griffen, J. H. Williams and G. H. Davis.

New Straightsville, Ohio—The Calvin Essex Coal Co.; capital stock, $40,000. Incorporators: Calvin Essex, Sumner Cottingham, Fred Essex, E. R. Statler and J. A. Statler.

Chicago, Ill.—The New Enterprise Coal Co.; capital stock, $10,000; mining, treating and preparing coal for the market. Incorporators: F. C. Honnold, L. L. Dent and C. Y. Freeman.

Chicago, Ill.—The William Meusching Coal Co.; capital stock, $10,000; buying selling and dealing in coal, wood, ice, etc. Incorporators: E. A. Kimball, E. M. Kimball and J. E. McDowell.

Santa Fé, N. M.—A charter has been granted to the Superior Coal Co., capital, $25,000. Incorporators: Mrs. Elizabeth G. Kunz, Charles E. Kunz and Guy L. Rogers ,all of Albuquerque.

Huntington, W. Va.—The Big Ugly Creek Mining Co.; capital stock, $60,000; to mine coal, seek oil, gas, etc. Incorporators: A. J. Stein, G. Neace, G. J. McComas, H. E. Love and Daniel Dawson.

St. Louis, Mo.—The United Coal & Coke Co.; capital stock, $2000; to do wholesale and retail coal and coke bulsness. Incorporators: T. F. Nolde, C. E. Miller, L. C. Poon, J. P. Murphy and G. W. Hooper.

Phœnix, Ariz.—A charter was granted to the Mother Lode Gold & Copper Co., to deal in and operate minerals and mineral lands, including coal; capital, $1,000,000. Incorporators: Fred H. Larsen and M. A. Rabbitt, of Phœnix.

Mingo Junction, Ohio—The Brettel Bros. Co.; capital stock, $25,000; mining and dealing in coal and kindred products. Incorporators: Thomas Brettel, Sr., N. M. Brettel, M. Brettel, G. L. Thompson and James Brettel.

Cleveland, Ohio—The Short Creek Coal Co., of Cleveland, Ohio, has been incorporated with a capital stock of $600,000 to mine and deal in coal. Incorporators: J. J. Roby, E. B. Thomas, C. A. Niman, E. G. Hoag and L. T. Smythe.

Columbus, Ohio—The Central Pocahontas Coal Co., of Columbus, Ohio, has been incorporated with a capital stock of $100,000 to mine and deal in coal. Incorporators: J. S. McVey, S. McFadden, J. W. Miller, E. Bragunier and D. N. Postelwaite.

Phœnix, Ariz.—A charter was granted to the Golden Rescue Mining & Mercantile Co., of Phœnix; to deal in and operate mineral lands, including coal; capital, $1,500,000. Incorporators: W. G. Johnson, J. A. Jacoby, C. S. Norman and R. S. Watkins.

Phœnix, Ariz.—A charter has been granted to the Antelope Gold Placer Mining Co.; deal in and operate coal and other mineral lands in addition to gold; capital, $250,000. Incorporators: John L. Uhlik, of Octave, Ariz.; C. C. Castle, of Octave, and C. W. Trasey, of Octave.

INDUSTRIAL NEWS

New Albany, Ind.—The C. H. Menden Coal Co., formerly of Evansville, has moved its headquarters to this city.

Grove, Okla.—A bed of coal about 4 ft. across and 6 in. thick has been discovered on the John Kariho farm, 5 miles north of Grove.

Port Arthur, Tex.—Capt. W. W. Tyrrell has purchased an interest in the South Coast Coal and Fertilizer Co. with headquarters at Sabine.

Pittsburg, Kan.—Frank Pierce & Sons, of Sharpsville, have purchased 160 acres of coal land and are now making arrangements to develop the same.

Pine Bluff, Ark.—The Arkansas & Texas Consolidated Ice & Coal Company has disposed of its ice plant, street railway and light plant at Marshall, Tex.

Ashland, Penn.—The Reading Coal & Iron Co. is soon to make an effort to transplant the borough of Gilberton and more than 500 inhabitants from the present site.

Hazleton, Penn.—Many hands will be given employment when N. J. Cuyle & Co. open the new strippings at Laurel Hill for the Lehigh Valley Coal Co., east of this city.

Williamson, W. Va.—It is stated that a tract of 10,000 acres of coal land on Pond Creek, owned by Col. L. E. Tierney, will soon be leased to several well known operators.

Punxsutawney, Penn.—W. G. Wilkins & Co., Westinghouse building, Pittsburgh, have placed orders for the equipment of the power plant of the Sykesville Coal & Coke Co., Sykesville, Penn.

Pittsburgh, Penn.—J. V. Thompson, of Uniontown, has sold a tract of coal land to the Midland Steel Co. for $1,700,000, netting him a profit of nearly $1,000,000. The average price per acre was $800.

Sunbury, Penn.—A prospector has been seeking continuation of the Lykens Valley field, in lower Northumberland County. During the last year his efforts have been rewarded by striking a 5½-ft. seam.

Piedmont, W. Va.—The Franklin Coal Co., at Westernport, has recently filed a petition for receivership, and W. F. Coale, of Cumberland, has been appointed. The company alleges debts of over $16,000.

Welch, W. Va.—It is understood that the works of the U. S. Coal & Coke Co. on Tug River are again in full operation. They were shut down as a result of the car shortage caused by the recent high waters.

Mahaffey, Penn.—The Maderia Hill Coal Co. has purchased a tract of 5000 acres of coal land in the Clover Run district near this place. Operations are to begin at once and a large tipple has already been contracted for.

Freeport, Ill.—E. J. Thorne has been appointed receiver for the Fairbury Coal Mining Co., following a strike by the employees due to unpaid wages. The miners have returned to work pending the action of the receiver.

Hazard, Ky.—It is reported that several prominent coal operators have been making investigations in that vicinity, either with a view to acquiring properties or for the purpose of looking over lands which they already own.

Obersonia, Penn.—A large bed of coal has been discovered at Rocky Ridge, in the new workings of the Possum Hollow Coal & Coke Co. Special arrangements are being made to get the coal on the market. R. W. Jacobs is general manager.

Bluefield, W. Va.—The Boswell Coal Co. has recently been formed at Richlands. Thos. T. Boswell, of Baltimore, is general manager. The company has leased 23,000 acres of coal land on Coal Creek and will make extensive improvements.

Charleston, W. Va.—A tract of several hundred acres of coal land on Slab Fork near Mullens has been leased by Fayette capitalists form the Powell Lusk heirs. It is rumored that great developments will begin at once. This tract carries the famous Pocahontas No. 3 seam.

Pittsburg, Kan.—Mine No. 11 of the Cherokee & Pittsburg Coal Co., which was shut down a little more than a week ago by State Mine Inspector Francis Keegan, is again in operation. The managers have remedied the defects which caused Mr. Keegan to order the mine to be closed. The mine employs about 300 men.

Morgantown, Ky.—The Butler County Coal Co., recently incorporated, proposes immediately to begin development work on a tract of 800 acres, with a daily output of about 50 tons. The officers of the company are: J. A. Watkins, president; G. L. Drury, vice-president, and C. E. Sullivan, secretary, treasurer and manager.

Johnson City, Ill.—The Lake Creek mine, which has been idle for several years, and was recently taken over by a New York Syndicate, representing the Cotton Belt Ry., has been leased by the Consolidated Coal Co., of St. Louis, who are rapidly developing the property with a view to selling the output for railroad purposes.

McAlister, Okla.—W. E. Beatty, president of the Union Coal Mining Co. has given orders to the superintendent to open the company's mine at Adamson. The mine was closed in February for want of orders. Four hundred men will return to work and a long run is in prospect. This is one of the largest mines in the McAlister district.

Pittsburgh, Penn.—A special meeting of the stockholders of the Westmoreland Coal Co. has been called for June 16 for the purpose of voting on the proposition to increase the capital stock of the company by $1,000,000. The proceeds of the issue will be used to purchase new coal lands. This move would bring the capital up to $6,000,000.

Columbus, Ohio—Coal men in Columbus have received word that insurance on lake vessels is now in force and a good lake movement is expected from this time on. A number of vessels had been loaded before the formal opening of navigation and these moved as soon as word was received from the upper lake regions that the ice was melted.

Buffalo, N. Y.—The Noble-Williams Coal Co. has bought the property of the Outlook Coal Co., of Lackawanna County, Penn., consisting of 790 acres of partly developed anthracite land. The company proposes to mine about 300 tons of coal a day. It is controlledd by the Frank William & Co., which operates three bituminous mines in the Allegheny Valley.

Scranton, Penn.—T. P. Lewis, of Throop, has struck a 5-ft. vein of coal on a tract lying between Marshwood and the Mossic Mountain, and expects to open up one of the richest coal fields that has been discovered in this region in years. Mr. Lewis, who is foreman for the Pancoast company, owns 438 acres in that vicinity. The first seam was struck at a depth of 110 ft.

Johnstown, Penn.—The new drift at Rummel has recently sent out its first shipment of coal. The original Rummel drift was exhausted not long ago. Shortly before this, however, work was commenced on a trestle from the old hill mine to another hill across the valley. Coal is now brought from the new mine over the trestle and through the old drift to the tipple.

Pottsville, Penn.—An outcrop of virgin coal has been discovered on the property of S. A. Hogan by workmen who were excavating for a cellar. The seam measures 15 ft. in thickness and is of good quality. It will, however, be impossible to work the coal for market purposes, owing to the fact that it lies so close to the surface and in the residential section of the city.

McKeesport, Penn.—It is reported that the upper or Sewickley seam of coal, which is located 80 ft. above the Pittsburgh seam, has been discovered and opened up in North Versailles Township. This coal covers an area of several hundred acres and is easily accessible because of improved roads. It is said that the G. M. Cypher Co. is contemplating opening up this new field and operating it on an extensive scale.

Beaver Dam, Wis.—It is reported that a large coke plant is soon to locate at Mayville. The new plant will furnish employment for about 600 men most of whom will live in houses erected by the company. It is said that several furnaces will be built near the ore mines and that the gas obtained in the coke manufacture will be utilized in smelting the ore. The Mayville Coke & Gas Co. is behind the venture.

Springfield, Ohio—The Ohio Southern R.R., from Lima to Wellston, was sold recently to Henry J. Schumacher and Daniel I. Murray, representing the Central Trust Co., of New York, first-mortgage bond holders, at the upset price of $1,550,000.

The sale of the D. T. & I. from Lima north and from Wellston to Ironton was postponed to June 24, in view of the fact that there were no bids presented.

Winchester, Ky.—The Broadhead-Garrett Co. recently closed a deal for 3000 acres of Perry County coal and timber land. The tract is one of the largest undeveloped pieces of land in that part of the state, and has been sought by many investors and working companies. The consideration is said to have been in the neighborhood of $500,000. Green Garrett, of Winchester, a member of the Kentucky Railroad Commission, is president of the purchasing company.

Belleville, Ill.—Mine No. 2 of the St. Louis & O'Fallon Coal Co., at Nigger Hollow, claims the state record for the output of coal. One day recently the output of this mine was 4112 tons in six hours and fifty minutes, or 600 tons per hour. The previous state record was 4500 tons for eight and one-half hours, or 529 tons per hour. This mine uses the H. & H. automatic self-dumping cages, manufactured by the Herzler & Henniger Machine Works, Belleville, Ill.

Columbus, Ohio—The rumor that the Jeffrey Manufacturing Co., of Columbus, Ohio, is contemplating consolidation with another large concern in its line of manufacture and the removal of the larger part of the plant from Columbus has been emphatically denied recently by R. H. Jeffrey, vice-president of the concern. He says the plant will continue to operate in Columbus and, except for a slight modification of the system of the plant, there has been no particular change in the policy of the company.

DuQuoin, Ill.—The Central Illinois Utilities Co., a subsidiary of the Commonwealth Co. of Chicago, has taken over a large number of lighting plants in the Southern Illinois coal field. It is understood that it is the intention to operate them in connection with a new gas company which will have a monster plant at Marion. The gas will be made from Carterville coal with a purifier, and will be pumped to surrounding towns to the extent of 30 miles. The proposed plant will produce a big tonnage of domestic coke.

Welch, W. Va.—It is understood that the Berwind-White Coal Co. has made an offer to purchase the property and holdings of the Jed Coal & Coke Co. at a consideration of $300,000. This property has been in the hands of a receiver for the last year. The property consists of a shaft mine of Pocahontas No. 3 coal and is a part of a lease from the Pocahontas Coal & Coke Co. and the Bouvier-Iaeger Coal Land Co. The mines are adjacent to the U. S. Coal & Coke Co. The Berwind-White people expect to spend in the neighborhood of $200,000 on improvements.

Fort Smith, Ark.—A $2,000,000 deal has been consummated here whereby every mine in the Spadra field, with the exception of the Pennsylvania Mining Co., has become the property of a party of New York capitalists who are said to be closely allied with some of the railroads that traverse the Spadra field. Thirty-two mines are involved, together with 1800 miners. The purpose of the consolidation, it is understood, is to overcome the winter car shortage. Immense storage yards will be built in St. Louis, Kansas City, Little Rock and other points for summer shipments, leaving the cars available in the winter time for the scattered country trade. This will permit the operation of the mines in the summer months, which has never been done with any success in the past.

St. Louis, Mo.—All the property of the Southern Coal & Mining Co., in St. Louis and Illinois, including its several mines on the Southern Ry., has been acquired by the Southern Coal, Coke & Mining Co., with practically the same officers of the company holding these properties previously. The new company is a reorganization of the old company.

In a suit against the Watson Coal Co., of Herrin, Ill., for $29,000, for alleged damages, etc., the Mississippi Valley Fuel Co., of St. Louis, endeavored to tie up $29,000 worth of property of the Devoy & Kuhn Coal Co., claiming that Devoy & Kuhn were indebted for a large amount to the Watson Coal Co. for coal shipped under a contract.

In connection with this, the Watson Coal Co., in March, was given a judgment in the U. S. Supreme Court of about $14,000 against the Mississippi Valley Fuel Co., in a breach of contract suit.

COAL TRADE REVIEWS

GENERAL REVIEW

While the hard-coal dealers are fairly busy, they are not by any means as crowded as is usually the case at this time; as a rule they are having no difficulty in filling all requisitions, although there is coal going into storage. The situation in the wholesale trade is somewhat stronger and the originating companies as a rule are declining to commit themselves for any further deliveries at April prices; indications are that May will also be nearly as active in this department as April has been. It is becoming evident that the individuals are not cutting prices to the extent that was anticipated; this may be accounted for, however, by the fact that many of them have sold their entire summer production at the April circular.

The West Virginia labor trouble still continues to be the controlling feature in the Eastern Bituminous market. It is evident that there is a great deal of determination on both sides of the controversy, and the probabilities are that Pocahontas and New River shipments will be very materially restricted before long. The movement now is almost entirely on contracts, but as consumers are showing a disposition to take their full allotment it is evident that there is a good strong and consistent consumption. Prices in the New England markets still rule about 15c. above last year's level, but business is slow to close at these figures; consumers do not feel that the advance is justified and think that concessions will be offered later.

The Pittsburgh market developed a great deal of strength during the week due probably to a large unsatisfied demand for Lake coal. There is some shortage of railroad equipments particularly of certain descriptions, but operations are now up to about 75 per cent. capacity; local producers are watching the West Virginia labor difficulty with keen interst as a restriction of the production there will undoubtedly be reflected upon the Pittsburgh market. Conditions in this vicinity are evidently becoming steadily better in spite of the effort on the part of the consumers to depress the market; consumption is so enormous that it is taxing the capacity of the railroads, and it is tentatively conceded that the operators are in controll of the market.

It is now evident that it will be several weeks and possibly months before the movement in Ohio will again be entirely normal. There is still considerable congestion at junction points, but embargoes are being lifted in every direction, and production has probably reached 75 per cent. normal. The tidewater demand out of Hampton Road is light, but coastwise shipments are heavy, and have materially reduced the accumulated supplies; dumping at the piers has been good, and prices firm. In the Southern markets the steam coals are maintaining an unusually strong position hardly to be expected at this period of the year.

In the flood zone in the Middle West railroad yards and terminals are jammed with all kinds of freight, and the roads are making slow headway in the work of restoring conditions. The first shipments for more than three weeks over the Norfork & Western and Chesapeake & Ohio into Chicago, arrived last week. Coal at this latter point continues selling at the circular, but there is evidently a large unsatisfied demand. Screenings are somewhat stronger due to the meager production of domestic grades; prices are quite unstable and fluctuating over a large range.

BOSTON, MASS.

Bituminous—The mine workers' union is apparently confining its efforts to the New River field and is letting other districts alone for the present. A good sized sum of money is reported available for purposes of organization and for supplying necessaries to those who join and are thereby out of employment. There appears to be a good deal of determination on both sides and it is now expected that work at the New River operations will be under severe curtailment from lack of men.

It is too early yet, to say what would be the effect of a general strike in West Virginia on the market; the other fields are capable of a much increased output and unless the troubles in New River develope to serious proportions it may be that the results will be negligible, so far as prices are concerned. Buyers seem not to be disturbed over the outlook, and there is almost no change from a week ago. Sales of Pocahontas and New River are scattering, for the most part, and few contracts are being placed. There are many large orders in New England yet to be closed but purchasers feel that there will be concessions later and that conditions do not warrant higher prices than in 1912.

There has been an awakening of interest in the better grades from Pennsylvania. The differential with Pocahontas and New River is larger than usual and several buyers are experimenting with them in the hope of replacing some of the coal ordinarily taken from West Virginia, via Hampton Roads. Many have already found that certain of the coals from Cambria, Somerset and Clearfield, can be used with excellent results and from now on there is likely to be a better demand for these grades. The movement is good; the dullness early in the month has given way to a fairly strong demand, although prices remain where they were put, in order to induce April shipments.

Water Freights—Barges and large schooners are chartering at 75 to 80c., Hampton Roads to Boston, and while there is a regular demand there is no snap to the business. Steamers that ordinarily load New River, in one or two instances, have lately been diverted into Baltimore to load Georges Creek. On Long Island Sound 40c. to 45c. is the ruling rate from New York.

Anthracite—The cold weather has given an impetus to the retail demand and in some cases the originating companies are declining to commit themselves to the April price on boats entered between now and the end of the month. Broken, stove and pea are in relatively short supply and it looks as if May would prove to be almost as active in anthracite as the month just closing. The bulk of the hard-coal receipts continue to be from Philadelphia.

Current wholesale quotations are about as follows:

Clearfields, f.o.b. mine	$1 00@1.35
Clearfields, f.o.b. Philadelphia	2.25@2.60
Clearfields, f.o.b. New York	2.55@2.90
Cambrias, Somersets, f.o.b. mines	1.25@1.45
Cambrias, Somersets, f.o.b. Philadelphia	2 50@2.70
Cambrias, Somersets, f.o.b. New York	2.80@3.00
Georges Creeks, f.o.b. mine	1.67@1.77
Georges Creeks, f.o.b. Baltimore	2.85@2.95
Pocahontas, New River, f.o.b. Hampton Roads	2 75@2.85
Pocahontas, New River, on cars Boston	3.68@3.90
Pocahontas, New River, on cars Providence	3.58@3.80

NEW YORK

Bituminous—There is some very cheap soft coal being offered in the local spot market, but the volume moving is so small that these low quotations are not of great moment. There is very little demand for prompt coal, but owing to the restrictive measures of the operators there is an equally reduced supply available. Operators are showing every determination to obtain a stable and profitable figure for their product, and in some cases are restricting production entirely to contract requirements. The contracts in the local markets are now all pretty well closed up and this feature of the business has ceased to attract any further interest.

The car supply has been gradually tightening for some time, and was a trifle worse during last week. However, since the mines are not attempting to run full capacity the supply has so far been fully up to requirements. The shortage is ascribed to the large amount of equipment tied up in the flood zone, and it was stated by one company that the distribution for one day last week was only 10 per cent. the requirements. We continue last week's quotations, although there is some coal being offered at less, on the following basis: West Virginia steam, $2.55@2.60; fair grades, Pennsylvanias, $2.65@2.70, good grades of Pennsylvanias, $2.75@2.80; best Miller, Pennsylvania, $3.05@3.15; Georges Creek, $3.25@3.30.

Anthracite—The hard-coal market has developed no new features during the week. The companies have all the orders they can possibly take care of and it is clear they will not be able to fill all the requisitions for April tonnages. They are endeavoring to make as equitable a distribution of the production as possible. The demand is generally insistant on all grades, but is the most urgent on stove and rice, particularly the former.

Production at the mines is heavy, there being few interruptions to work, due to labor troubles or car supply, although there has been some slight delays occasioned by the latter. Toward the end of the week an occasional shortage develops

in the supply of open cars, but the railroads invariably catch up again over the week end so that the shortage has at no time been serious.

The local market is not quotably changed and we continue last week's prices as follows:

	Circular	Individual Lehigh	Individual Scranton
Broken	$4 50	$4.45	$4.50
Egg	4.75	4.70	4.75
Stove	4 75	4 70	4.75
Chestnut	5.00	4.95	5.00
Pea	3 50	3.35@3.45	3.50
Buckwheat	2 75	2.25@2.45	2.50@2.75
Rice	2.25	1.95@2.05	2.25@2.35
Barley	1.75	1.50@1.70	1.60@1.75

PHILADELPHIA, PENN.

There is practically little or no change in the anthracite coal trade in this vicinity. All the dealers seem to be fairly busy, although they report business is not what it should be. Most of them like to have their books crowded with orders, but now they claim they are having little or no difficulty in keeping up with those they are receiving. The demand for egg does not seem to be as brisk as would be desired, although this by no means indicates a general condition; requisitions from other points are absorbing all that is mined. The operations at the mines are still continuing at full time, with little troubles here and there on account of strikes. One of the largest companies had all of its mines tied up for some time, owing to the so called "button" decoration, which the mine workers seem to feel all the men should wear. These troubles, however, seem to be quickly adjusted now. Compared with 1911, which is the only comparison that can be made, inasmuch as the suspension was on at this time last year, all operating companies report that their tonnage is at least on a parity, but they do not look for any records to be broken.

Strange to say, notwithstanding the marked lack of snap to the trade, there does not seem to be as much cutting of prices by the individual operators as has been the case in former years. This has been commented on to some extent, but the explanation may be in the fact, that many of them have closed for almost their entire summer output, at the April circular. One very large operator claims that his tonnage for the next five months has been disposed of, although not indicating at what price such disposition had been made. Taking into consideration the fact that possibly these arrangements are being made, this may possibly explain the lack of cutting at the present time, the trade being perfectly willing to pay the present prices, if assured of obtaining them over such a long period.

The bituminous market is not distinguishing itself by any marked activity. There are consumers enough, but it is difficult to sell them, and they are driving hard bargains. Good grades of coal are holding fairly to quotations, but the medium and fair grades are going begging, in some instances. Contracts are still being held up, and the current movement at the present time is rather to the individual than the contract buyers.

PITTSBURGH, PENN.

Bituminous—The market is very strong. It is claimed that some producers have in the past week secured $1.50 for ¾-in. coal in the lake trade. A heavy business was done after the announcement of season prices, at $1.40 for ¾-in. coal, but it is understood some producers held off from contracting, expecting to do still better. There remains considerable unsatisfied demand in the Lake trade. Mine operations are the best yet this season and represent better than 75 per cent. of full capacity. Car shortage is heard of in some quarters, and flat bottom gondolas are being used in trade which much prefers hopper cars. It is claimed the railroads have not sufficient hopper cars, and some of the operators have been trying lately to make an issue with one of the leading roads, furnishing it coal for its own use in flat bottom cars when the road much prefers the hopper bottoms. Contrary to reports sent out last week from the scene of the trouble, the West Virginia labor difficulties are not settled and some operators in the Pittsburgh district expect production in that state to be curtailed all summer. The market is firm at regular prices, as follows: Slack, 90c.; nut and slack, $1.05; nut, $1.25; mine-run, $1.30; ¾-in., $1.40; 1¼-in., $1.55, per ton at mine, Pittsburgh district.

Connellsville Coke—The market is showing surprising stiffness. While a little coke backed up in the region on account of transportation difficulties growing out of the floods, it seems difficult to find enough coke to resume normal shipments. Trustworthy figures of shipments week before last showed less than 400,000 tons, whereas requirements of blast furnaces involve 425,000 tons at the very least, and it is doubtful whether full shipments were made even last week. There is very little demand for prompt coke, but the market seems strong at $2.25, with very few sellers. As to second-half contracts, there is nothing but opinion, there being no active negotiation, but the operators all insist that nothing can be done under $2.50. Foundry coke remains quotable at $3@3.50 for prompt or contract, these figures referring to standard brands of 72-hr. foundry.

BALTIMORE, MD.

The movement in the local market during the past week was confined almost entirely to contracts, especially in the tidewater business. As compared with last week, there was considerably more contract coal handled over the local piers, and this willingness of the consumers to take their full allotment, has caused a more cheerful feeling in the trade. While operators have been generally optimistic, there has not, as a rule, been anything tangible upon which to base such a feeling, but the increased business during the past week makes them now feel that the dull corner in the trade has been definitely rounded. More contracts have also been renewed at the customary advance.

The small demand in the spot market is ascribed to the heavy stocking early in March, when a protracted cold spell was anticipated. The low grades are quoted in the prompt market as 70 to 80 cents; slack is active, due to a rather sharp demand from cement works in Maryland. The labor situation in the West Virginia field is causing a slight feeling of uncertainty in the local trade. A number of the coke oven plants in the state have been shut down, and will not resume until there is more life in the coke market.

BUFFALO, N. Y.

The bituminous market is quite strong and appears to be gaining in steadiness from week to week in spite of the efforts of the consumers to depress it. The amount of unsold coal is not as large as it was and there would be none at all if everybody believed in the future soundness of business. The consumption is enormous, fairly taxing the railroads to handle it. The outlook is for a continuation of these conditions for an indefinite period.

All effects of the late floods have about disappeared from this section and the railroads running into Ohio are taking care of their business about as usual. The opening of the Lakes has improved the bituminous market, for it was found that there was not tonnage enough to handle the coal stored at various points. Something like the same conditions prevailed in anthracite for the Lake trade; shippers are complaining that when they can get tonnage they are often without coal.

Reports from all points in this bituminous sales-district agree that the demand is very strong. Shippers with a good organization and good coal behind them claim that they are selling a large output at paying prices and the outlook is very much better than it was a year ago. There is a good volume moving under contract and contracting is not concluded yet, but the consumer by no means controls the market, as he has done for so many seasons past. At the same time there is no great profit to anyone.

The Lake season opened here on Apr. 12 by the sailing of one steamer light, for a coal cargo at Toledo She was followed on Apr. 16 by 31 other steamers, mostly coal laden. The upper Lake ports are not open and they may all have to wait. Lake clearances to date include 280,000 tons.

It looked early in the month as if the bituminous market was going to break, so many people were offering coal at cut prices, but Pittsburgh and the largest concerns in the Allegheny Valley held firm and now the others are following suit. Quotations are fairly strong at $2.80 for Pittsburgh lump, $2.65 for three-quarter, $2.25 for mine-run and $2.15 for slack, with Allegheny Valley and Reynoldsville about 25c. less. Coke is stronger on the basis of $5 for best Connellsville foundry. Smithing and other special coals are active, but they seldom vary in price.

COLUMBUS, OHIO

The trade in Ohio shows signs of becoming normal again, since the disastrous floods. Railroads are gradually getting in shape and embargoes are being removed in every direction. There is still considerable congestion at junction points and it will require several weeks and possibly months for traffic to become normal again.

There is a good demand for practically every grade of coal from the Ohio fields. While the domestic demand is gradually running out, still orders are coming in from unexpected sources. The recent flood caused a rush of small domestic orders and all the broken natural gas mains are not yet repaired.

Steam business continues good and in a larger volume as plants are gradually resuming operation again. Prices for steam grades are strong and inclined to advance all along the line. The prospects for the future are believed to be good and producers think that steam business will rule

strong for the coming few months at least. There is also a better demand for railroad fuel as the freight movement increases. Sales managers of many of the Ohio companies are turning their attention to railroad fuel contracts which will be awarded in a short time. Some steam contracts are expiring at this time and prices generally are higher than last year.

Lake trade is also receiving its share of attention. Since insurance on lake vessels is in force, there is much activity in that direction. Movement of cargoes has started and within a short time a large tonnage will be on the way to the Northwest. In fact it is expected that the Lake movement will tax the capacity of the coal carrying roads in the Ohio fields. The demand for tonnage from the Northwest is strong and the season is expected to be a prosperous one.

Production is gradually getting larger. In the Hocking Valley the output during the past week has been about 75 per cent. normal and the same is true of Eastern Ohio. In the Pomeroy Band, where a number of mines were flooded, the production is about 60 per cent. of the average.

Quotations in the Ohio fields are as follows:

	Hocking	Pittsburgh	Pomeroy	Kanawha
Domestic lump	$1.50	...	$1.50	$1.50
¾-inch	1.35	$1.30	1.35	1.30
Nut	1.25	...	1.25	...
Mine-run	1 15	1.10	1.15	1.10
Nut, pea and slack	1.00	...	1.00	1.00
Coarse slack	0.85	0.90	0.90	0.85

LOUISVILLE, KY.

A continued spell of pleasant weather has reduced the demand for domestic grades and caused a corresponding shortage of screenings, but the steam consumption continues strong. The flood damage to the railroads seems to have been more general than was at first supposed. They are experiencing a great deal of trouble in restoring order and there is still a heavy congestion at the terminal. Belt lines are finding it difficult to move freight owing to the crowded condition of the yards and in some cases to the lack of adequate motive power. While all the roads are now handling traffic, the roadbeds, trestles and bridges are so unsafe that the train movement is considerably handicapped.

However, about the only inconvenience that is being experienced by the consumers is due to the shortage of screenings. Preferences as to quality on screenings are being disregarded because of the shortage; the Western Kentucky variety which usually sells 10 to 20c. off the Eastern Kentucky grade now readily brings 90c. and even higher, while Straight Creek and like qualities sell up to as high as $1.10 f.o.b. mines. Mine-run is rather heavy, operators being glad to obtain $1.25 to $1.35 for Eastern Kentucky grades.

HAMPTON ROADS, VA.

While there has been no heavy demand for coal at tidewater during the past week there have been some large shipments on Coastwise contracts which has considerably decreased the accumulated coal. Prices have remained firm, $2.85 being asked for spot coal. There have been some small shipments of high-volatile coals but there is little demand for this grade. The outlook is that prices will continue firm although the unrest in the New River-Pocahontas fields may have some effect on the market.

Dumpings at the three ports have been good, during the latter part of the week; a large tonnage was handled over the Sewalls Point Piers and it is expected that April dumpings there will run considerably over the March tonnage. It is rumored that one of the large shippers over these piers has acquired land at that point for the erection of a large and modern plant for the storage of steam coal; also that the contract has been let and that work on the plant will be commenced shortly.

Bids have been asked for on Government transport coal but operators have not responded on account of several of the requirements in the contract.

INDIANAPOLIS

Practically all parts of the state can again be reached with coal, although some in a roundabout way. Railroad conditions are far from normal, however, and it will be a month or two yet before that status will be reached. Shipments are still slow on all roads and a week to ten days must be allowed for the usual two to three days movement. Railroad yards at terminal and connecting points are jammed with all kinds of freight, including coal.

Under these conditions operators are not busy. With spring weather prevailing, the consumption of domestic coal has practically ended and the warm sun has cut down the needs of steam users, though, otherwise, the latter trade is about normal for the season. The floods left many of them with matters more pressing to attend to.

Not a car of Eastern coal has come to Indianapolis since the flood, Mar. 25. It is said the C. & O. has 6500 cars in Kentucky and West Virginia, ready to move through Cincinnati but held back because connecting lines in that city have been unable to accept shipments. Temporary bridges are being erected over the rivers in Indiana. The Big Four is only now getting into Chicago over its own lines. Coal prices are at summer level and run about as follows, f.o.b. mines:

No. 4 mine run	$1 10	3-inch domestic lump	$1.45
No. 5 and 6 mine run	1 05	4 and 5-inch	1.55
1½-in. steam lump	1 30	4 screenings	1.00
Nut	1 25	5 and 6 screenings	0.90
Egg	1.35	Brazil block	2.05

The f.o.b. price, Indianapolis, is 50c. higher than the above figures.

BIRMINGHAM, ALA.

The season of the year is here when the steam-coal market suffers most, but a thorough canvass of the various sales offices finds present business and the outlook better than for the past several years at this season. There is of course price cutting on the cheaper steam coals which do not find a ready market except during the period of the year when business is most active. A number of the local producers report heavy bookings of domestic orders, on which shipment is to begin at once, and continue through the entire winter season.

We give below prices of Corona coal for the ensuing season. Corona is one of the Standard coals with the domestic trade.

Month	Fancy Lump
April	$1.80
May	1.85
June	1.90
July	1.95
August	2.00
September	2.15
October to February, inc.	2.25

DETROIT, MICH.

Bituminous—The steam trade at this point is entirely featureless, and as quiet as it has been at any time during the last year. Spot business is confined entirely to small orders for filling out requirements until the new contracts go into effect. The larger buyers who failed to close up early in the season are still holding off, and no important business has been reported during the week.

The prevailing market is about as follows:

	W.Va. Splint	Gas	Hocking	Cambridge	No. 8	Pocahontas	Jackson Hill
Domestic lump	$1.50				....	$2.25	Open
Egg	1.50					2.25	Open
1½-in. lump	1 30					...	..
¾-in. lump	1 15	$1.15	1 20	$1 20	$1.20	....	
Mine-run	0 10	1.10	1 15	1.15	1.15	1.50	
Slack	0.90	0.90	0 90	0.90	0.90	1.25	

Anthracite—There is a light demand for hard coal, and the independent shippers are unable to dispose of much tonnage, with the result that they are cutting the circular prices freely. Egg and stove have been quoted down to $3.20, f.o.b. mines, with chestnut 25c. higher.

Coke—Ovens seem to be working up to a good capacity, but the demand for coke is far from strong. Connellsville is quoted at $2.75.

CHICAGO

Chicago coal dealers were agreeably surprised this week when shipments of coal via the Norfolk & Western and the Chesapeake & Ohio R.R. were received. These shipments included smokeless mine-run and they had been in transit for nearly three weeks. What little coal there is in Chicago is selling at circular prices. According to dealers, the market will absorb a large amount of coal as soon as shipments are heavier.

Prevailing prices in Chicago are:

	Springfield	Franklin Co.	Clinton	W. Va.
Domestic lump	$2 07	$2.40	$2 27	
Egg		2 40		$3.95
Steam lump	$1 82@1 87		2 17	
Mine-run	1 82@1 87	2.20@2 30	1 97	3.30
Screenings	1 62	1 95@2 00	1 62	

Coke—Connellsville and Wise County, $6@6.25; byproduct, egg, stove and nut, $4.45@4.75; gas house, $4.65@4.75.

ST. LOUIS, MO.

Screenings have been about the only coal on which there has been a change in price during the past week; Carterville screenings have gone as high $1, but the market is unsteady and they are liable to fall off to 80c. one day and be back to 95c. the next. Standard screenings are selling anywhere from 75c. to 80 and 85c., with a steady demand that is hard to supply, for the reason that there is no call for the screened domestic coal.

Carterville fell off to its lowest point during the past week, when it was offered for 95c. at the mines, for lump and egg. It is being quoted to large consumers at from $1 to $1.05, and mine-run as low as 95c. An order for 125 cars, lump, egg and nut, for immediate shipment, received quotations on all sizes at from 97½c. to $1.15.

The anthracite price cutting war still continues; one company is now selling to the retail trade at 25c. under the price that the first company made, when they announced a cut. If these people are paying the circular price they are delivering the coal without compensation for delivery. Even at that it is hard to move anthracite, on account of the poor preparation that a large tonnage has shown in this season's shipments.

There is no demand at all for smokeless, and likewise coke. The prevailing market is as follows:

	Carterville and Franklin Co.	Big Muddy	Mt. Olive	Standard
2-in. lump				$0.90
3-in. lump			$1 20	
6-in. lump	$1.15 @ 1.20		1 25	1.05
Lump and egg		$2 25		
No. 1 nut	1.05 @ 1.15			
Screenings	0.90 @ 0.95			0.85
Mine-run	1.00 @ 1.10			0.80
No. 1 washed nut	1.35			
No. 2 washed nut	1.35			
No. 3 washed nut	1.35			
No. 4 washed nut	1.35			
No. 5 washed nut	1.10			

MINNEAPOLIS—ST. PAUL

The trade in the Twin Cities and the Northwest is without any particular interest at this time. April so far has been very dull and were it not for the fact that the contract period is here business would be extremely slow. While some industrial plants are very reluctant about tieing up on contracts at this time, coal men generally predict a good summer in steam business. There is considerable spot coal to be had which is given as a reason for the holding off of some plants in signing up contracts. Wholesalers appreciate the fact that labor troubles in some fields are liable to develope and are making allowances for same in case of writing contracts over a years time.

OGDEN, UTAH

It has been customary at this time, for a number of years, for the Union Pacific, and Oregon Short Line Railroads to announce a reduction of 25c. per ton in the freight rate on lump and nut coal to take effect either May 1 or June 1 and continue for 90 days. This automatically establishes what is known as a storage period and the mine operators have coöperated with the railroad by announcing a reduction on coal for shipment during this time; this reduction, varies from 25c. to 50c. and in connection with the 25c. in freight rate makes a difference of from 50c. to 75c. to the dealer. As a change in tariff must be published thirty days before it becomes effective, it is evident that the storage period will not commence on May 1 this year, as no notices have so far been received.

PRODUCTION AND TRANSPORTATION STATISTICS

IMPORTS AND EXPORTS

The following is a comparative statement of imports and exports in the United States for February, 1912-13, and for the eight months ending February, 1911-12-13, in long tons:

	8 Months			February	
Imports from:	1911	1912	1913	1912	1913
United Kingdom	12,005	5,861	7,355	217	137
Canada	1,115,655	625,238	954,363	111,669	110,401
Japan	6,313	7,307	42,217	250	12,213
Australia & Tasmania	206,765	149,396	107,017	6,256	8,709
Other countries	4,709	1,444	3,257	529	2,809
Total	1,345,447	789,246	1,114,209	118,921	134,269
Exports:					
Anthracite	1,911,812	2,301,177	3,224,604	231,684	361,493
Bituminous.					
Canada	5,586,404	7,175,621	7,559,065	396,004	556,190
Panama	348,342	303,019	307,759	52,746	38,000
Mexico	438,853	211,374	206,908	26,072	51,692
Cuba	602,174	712,451	805,162	74,419	98,386
West Indies	340,823	442,694	402,705	67,074	73,269
Other countries	391,171	519,057	642,367	79,340	79,253
Total	7,714,367	9,664,216	9,923,966	695,655	896,790
Bunker coal	4,189,020	4,453,131	4,794,912	530,272	564,222

PENNSYLVANIA RAILROAD

The following is a statement of shipments over the P. R.R. Co.'s lines east of Pittsburgh and Erie for March, and first three months of this year and last year in short tons:

	March		Three Months	
	1913	1912	1913	1912
Anthracite	741,209	1,140,976	2,743,504	3,288,737
Bituminous	4,050,247	4,501,653	12,117,747	12,169,935
Coke	1,247,451	1,147,602	3,756,325	3,111,786
	6,038,907	6,780,231	18,617,576	18,570,458

FOREIGN MARKETS

GREAT BRITAIN

Apr. 11.—Strong conditions rule in all branches of the steam-coal trade, but new business for early shipments is considerably restricted owing to the heavy commitments already undertaken by the various collieries. For forward loading the inquiry is good.

The possibility of "nonunionist" strikes on a large scale at the end of this month is causing some anxiety.

Quotations are approximately as follows:

Best Welsh steam	$5.04	Best Monmouthshires	$4.50@4.60
Best seconds	4 80@4.92	Seconds	4.32
Seconds	4.56@4.80	Best Cardiff smalls	3.88
Best dry coals	4.56@4.80	Seconds	3.64

The prices for Cardiff coals are f.o.b. Cardiff, Penarth or Barry, while those for Monmouthshire descriptions are f.o.b. Newport; both exclusive of wharfage, and for cash in 30 days—less 2½%.

British Exports—The following is a comparative statement of British exports for March, and the first three months of the last three years, in long tons:

	March		3 Months		
	1911	1913	1911	1912	1913
Anthracite	110,805	216,151	597,551	558,004	701,516
Steam	1,104,644	4,144,761	11,054,747	9,046,223	12,609,068
Gas	208,527	833,547	2,442,009	1,938,998	2,610,246
Household	34,331	141,867	368,444	299,234	435,454
Other sorts	78,606	262,448	738,601	630,613	882,725
Total	1,536,913	5,598,774	15,201,352	12,473,072	17,239,009
Coke	55,083	76,340	251,671	277,123	282,190
Manufactured fuel	63,149	156,210	425,246	373,332	507,202
Grand total	1,655,145	5,831,324	15,878,269	13,123,527	18,028,401

COAL SECURITIES

The following table gives the range of various active coal securities and dividends paid during the week ending Apr. 19:

Stocks	Week's Range High	Low	Last	Year's Range High	Low
American Coal Products	87	87	87	87	87
American Coal Products Pref	109½	109½	109½	109½	109½
Colorado Fuel & Iron	34	33	33	41½	31
Colorado Fuel & Iron Pref	..	..	155	155	150
Consolidation Coal of Maryland	102½	102½	102½	102½	102½
Island Creek Coal Pref	225	210	215	..	..
Pittsburgh Coal	20	20	20	24⅞	19
Pittsburgh Coal Pref	83	83	83	95	80⅞
Pond Creek	23⅞	22	23⅞	28½	22
Reading	166⅝	163⅞	165⅛	168⅞	152⅜
Reading 1st Pref	92	90	91	92⅜	89⅞
Reading 2nd Pref	92½	92⅜	92½	95	87¼
Virginia Iron, Coal & Coke	50	50	50	54	44⅜

Bonds	Closing Bid	Asked	Week's Range or Last Sale		Year's Range	
Colo. F. & I. gen. s.f.g. 5s	96	98½	97⅛	97⅛	97⅛	99¼
Colo. F. & I. gen. 6s			107¼	June '12		
Col. Ind. 1st & coll. 5s. gu	81	Sale	81	81	78½	85
Cons. Ind. Coal Mc. 1st 5s	75	80	85	June '12	..	
Cons. Coal 1st and ref. 5s	..	94	93	Oct. '12	..	
Gr. Riv. Coal & C. 1st g 6s		100	102½	April '06		
K. & H. C. & C. 1st s f g 5s			98	Jan. '13	98	98
Pocah. Con. Coll. 1st s f 5s		87⅞	87⅞	Mar. '13	87½	87⅞
St. L. Rky. Mt. & Pac 1st 5s	78	81	57	Mar. '13	76	80
Tenn. Div. 1st g 6s	101½	102½	101½	102½	100½	103
Birm. Div. 1st consol 6s	101½	103½	101	April '13	101	103
Tenn. Div. 1st g 6s		103½	102	Feb. '13	102	102
Cah. C. M. Co. 1st g 6s	101½	104	110	Jan. '09	.	.
Utah Fuel 1st g 5s						
Victor Fuel 1st s f 5s	80	83½	79½	Feb. '13	79⅞	79
Va. I. Coal & Coke 1st g 5s	95	Sale	95	95	94½	98⅞

DIVIDENDS

Reading Co.—First Preferred—Regular quarterly of 1%, payable June 12 to holders of record May 27.

New Central Coal Co.—Dividend of 2%, payable May 1 to holders of record Apr. 28.

INDEX OF COAL LITERATURE

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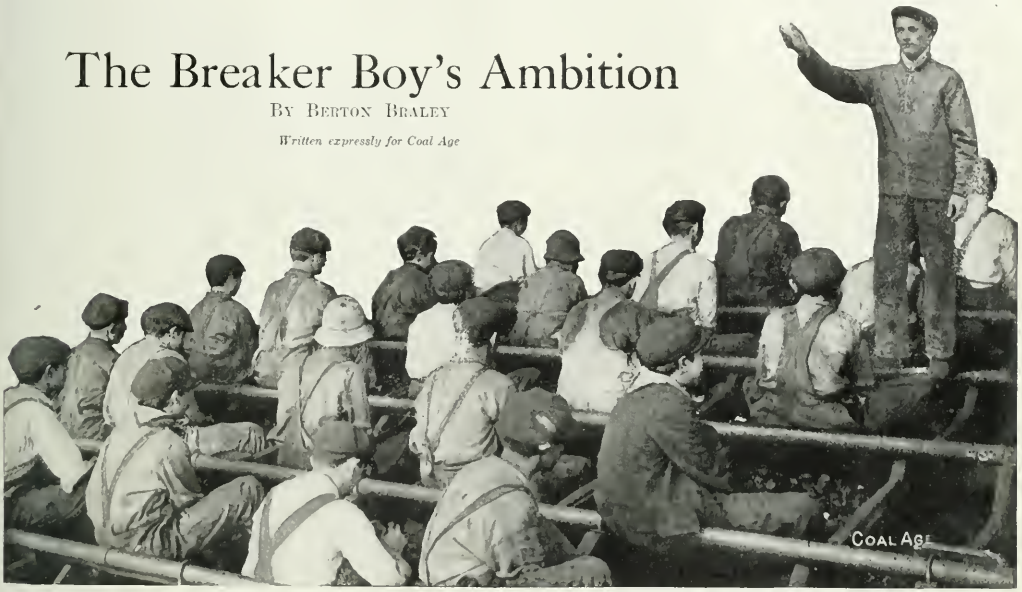
COAL AGE

Vol. 3 NEW YORK, MAY 3, 1913 No. 18

The Breaker Boy's Ambition

By Berton Braley

Written expressly for Coal Age



I'm pickin' slate in the breaker
And it isn't no fun, you bet,
Fer the dust is strong an' the shift is long
An' I'm covered with dirt an' sweat,
But I'm hopin' when I get older,
(An' I reckon of course I will)
I kin shake this mob on the breaker job
An' handle a ratchet drill.

I'm pickin' slate in the breaker,
But thinkin' of by an' by,
When I reach the age I kin ride the cage
Like a regular miner guy,
Go down with the gang of mornin's—
Say, wouldn't that strike me fine!
It's me dearest dream to work in the seam
Of an honest-to-goodness mine.

I'm pickin' slate in the breaker,
But after a while I'll be,
Way down below where the miners go
A miner—you bet, that's me!
With a light above me forehead
An' a steel drill in me hand,
I'll be too proud fer this breaker crowd,
I'm gonna be something grand!

I'm pickin' slate in the breaker
But it ain't the place I'll stay
I'm gonna be found way underground
A-drawin' a miner's pay,
An' takin' a miner's chances
(An' plenty of *them* there be)
It's me for the hole where they dig the coal,
A miner—you bet—that's Me!

A Combined Screening and Picking Table

By Frank E. Mueller*

SYNOPSIS—Probably every coal engineer has at one time felt the necessity of a combination arrangement, whereby the coal would be simultaneously screened and cleaned, and it is rather surprising that a successful arrangement for accomplishing this has never before been evolved. The device here described seems to have met the test of hard practical usage in foreign mines for a number of years and has also been advantageously applied in West Virginia.

The Pocahontas field of West Virginia has, among its various collieries, more picking, screening and washing plants than any other bituminous coal section of the United States. As each year passes, additional requirements are given the designers and builders of tipples in this section, due to the increasing demand for cleaner and better-sized coal. This demand includes shaking screens and picking tables for the larger grades of coal, such as nut, egg, and lump, and for washeries for improving the screenings.

Fig. 1. General View of the Carter Coal Co.'s Plant at Coalwood, W. Va.

The "Marcus" System in West Virginia

Great care must be exercised in the design of a tipple for this field because the Pocahontas coal, as everyone knows, breaks up very easily. It must be handled as little as possible, the screening, picking and other machinery being arranged to give the minimum breakage and at the same time be as effective as possible.

The common procedure in an ordinary screening and picking installation is to introduce a shaker screen with, say, 2-in. perforations. The coal passes over this screen onto the picking table, and is then discharged directly into railroad cars or a lowering boom. The slack from the screens passes directly to a washery, if there is one, or is conveyed to the end of the picking table to be mixed back with the picked lump coal in making picked run-of-mine; or it may be discharged directly into railroad cars.

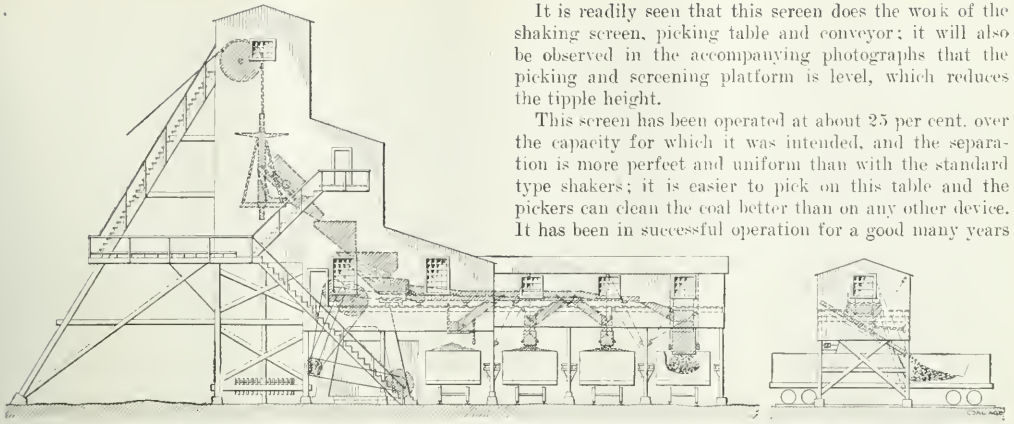
It is readily observed that a simple installation of this kind requires three units, which not only necessitates a large amount of machinery, but increased power, additional tipple height, greater attention and more maintenance, and, worst of all, a further handling of the coal, causing breakage or slack.

To overcome all these difficulties, the Carter Coal Co., at Coalwood, W. Va., have recently put into successful operation a new tipple, embodying the new "Marcus" combination screen and picking table, a brief description of the plant being as follows:

The coal, as shown in Fig. 1, is brought around the hillside to the dump house, where it is fed automatically onto a retarding conveyor, which delivers it to the "Marcus" combination screen and picking table. This screen, as shown in Fig. 2, is horizontal and comprises two decks. The upper deck, for the first 14 ft., is fitted with the 1½x2½-in. perforations; the balance of the screen, except a small portion at the end for rescreening, is comprised of a dead plate. The lower deck consists of a dead plate and simply serves the purpose of carrying the slack coal forward.

Fig. 2. Combined Screen and Picking Table

*Contract engineer, Roberts & Schaefer Co., Chicago, Ill.



It is readily seen that this screen does the work of the shaking screen, picking table and conveyor; it will also be observed in the accompanying photographs that the picking and screening platform is level, which reduces the tipple height.

This screen has been operated at about 25 per cent. over the capacity for which it was intended, and the separation is more perfect and uniform than with the standard type shakers; it is easier to pick on this table and the pickers can clean the coal better than on any other device. It has been in successful operation for a good many years

FIG. 3. THE MARION COUNTY COAL CO.'S FOUR-TRACK TIPPLE EQUIPPED WITH THE COMBINED SCREEN AND PICKING TABLE

COMBINATION SCREENING AND PICKING

This horizontal screen is given a peculiar to-and-fro motion, which effects a perfect screening of the coal, and at the same time moves forward that which has passed over the perforated plate so that it can be readily picked.

When the coal is received on the "Marcus" screen from the retarding conveyor above mentioned, the slack is removed at once, dropping below onto the horizontal dead plate. The nut, egg and lump remaining on the perforations, pass on over the dead plate, where they are picked, and then discharged directly onto a loading boom and loaded as lump coal; or they can be mixed again with the slack coal, which has also been brought forward on the lower deck, and shipped as run-of-mine. Gates have been provided in the lower deck for loading the slack on a separate track when picked lump is being prepared.

in England, Germany, Canada and other countries, and has just been introduced in the United States by the Roberts & Schaefer Co., of Chicago, Ill., who own the rights.

AN ILLINOIS INSTALLATION

The simplicity of the device and its method of installation, is shown in Fig. 3, which is the remodeled tipple of the Marion County Coal Co., at Centralia, Ill. This company originally had a three-track shaker-screen tipple, making lump, egg and screenings, a common form of tipple in use in Illinois. Within the past year, however, operators have considered the necessity of better preparing the lump and egg sizes which heretofore have been picked on the railroad cars. The installation of picking tables is now being considered and the Marion County Coal Co.

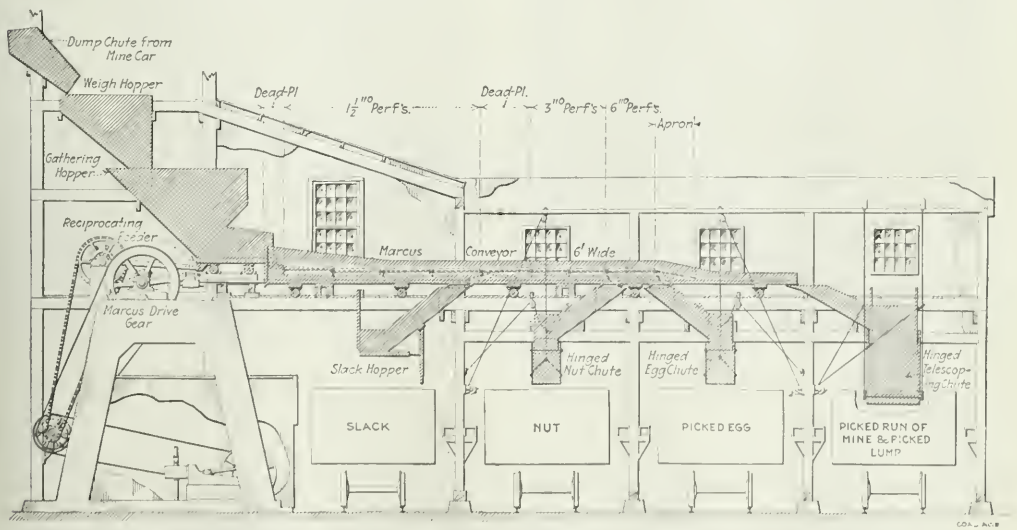


FIG. 4. AN ENLARGED VIEW OF THE "MARCUS" SCREENING ARRANGEMENT ON THE MARION COUNTY COAL CO.'S TIPPLE

is one of the first in Illinois to adopt this method in their tipple. After having carefully made an inspection of the "Marcus" installation at Coalwood, W. Va., they decided to rebuild their present three-track shaker-screen tipple, making it into a four-track plant. This could be accomplished by introducing the "Marcus" system, which also gave them the benefit of picking the lump and egg before it was discharged into the railroad cars.

The simplicity with which this device could be installed in the old tipple is readily apparent by observing Fig. 3. No change has been made in the arrangement of cages, sheave wheels, dump chutes or weigh hopper; in fact, there was sufficient height to install the screen between the bottom of the weigh hopper and the tracks, and also provide a reciprocating feeder. The coal from the self-dumping cages is discharged into a weigh hopper and then deposited in the small dump hopper, from which it is fed uniformly, by means of the reciprocating feeder onto the screen, the following sizes being prepared:

Lump over 6-in. perforation.
Egg over 3-in. perforation, through 6-in. perforation.
Nut over 1½-in. perforation, through 3-in. perforation.
Screenings through 1½-in. perforation.

The lump and egg is picked on the upper deck and by means of the valves shown, delivered to the railroad cars through the hinged and telescoping chutes; or by closing the valves, picked run-of-mine coal can be loaded on the outside track. Fig. 4 shows in an enlarged detail the arrangement.

This device has met with such favor abroad, in Canada, and in West Virginia, that the operators in this country will, no doubt, investigate it carefully, not only because of its better screening and cleaning possibilities, but owing to the fact that it eliminates the moving machinery that is necessary with screens, picking tables, and conveyors. At the same time it gives a cheaper tipple, due to its low cost, low power, maintenance and low cost of operation. Obviously a more effective cleaning can be done where the coal is handled in this way.

Coal Preparation in Eastern Kentucky

SYNOPSIS—Coal is here prepared for market in four sizes. Gravity screens, shaker screens, knocker screens, picking bands and loading booms are all used to secure effective separation and prevent degradation of lumps.

The VanLear mines, four in number, located on the Big Sandy division of the Chesapeake & Ohio R.R. in the newly developed coal field of eastern Kentucky and belonging to the Consolidation Coal Co., are worthy of more than casual notice, both on account of the machinery installed and the quality of the coal itself. This is a slabby lump bituminous, but quite hard and brittle, semi-anthracite in nature.

View along the Picking Band

The End of the Loading Boom

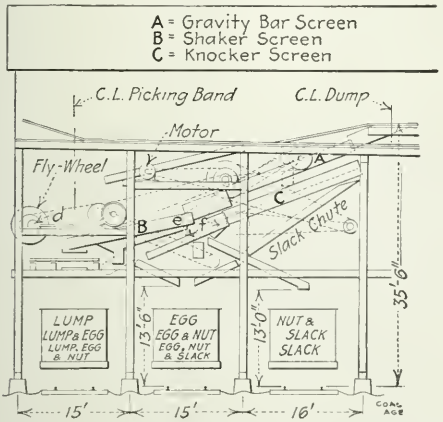
Before shipping this coal to market it is screened into four grades, the larger sizes being loaded so as to avoid as much as possible any breakage, and the utmost care is exercised in its preparation. Each of the four mines above mentioned is equipped with an extensive plant built by the Fairmont Mining Machinery Co. All conform closely to the one described and illustrated below.

The coal is first dumped from the mine cars and passes over a 3-in. gravity bar screen, set on a slope of 21 deg. On account of the large size and the flatness of some of the lumps, some fine coal tends to ride upon the larger pieces. This is dislodged by a drop of about 12 in. at the foot of the screen, which causes the lumps to either turn over or tilt. A shaker screen *B* then receives the coal, making a final separation of the lumps from the smaller sizes.

This screen is 5 ft. wide and 17 ft. long over all, the bottom being perforated with 3-in. diameter holes for 12 ft. of its length. It is set on a slope of 12 deg. and

driven by eccentrics and eccentric rods with 6 in. of a throw, the shaft making 100 r.p.m. From the shaker the clean lump coal passes onto the picking band.

The screenings from the shaker are caught in a pan attached underneath it and deflected to one side into a conveyor. This is of the scraper type set on a 32-deg. slope with a single strand of welded-steel link chain and flights 12 in. long by 8 in. deep curved slightly forward on the bottom, suspended at intervals. This conveyor delivers the screenings to the knocker screen *C* located directly below the bar screen *A*. Here the screenings from the shaker mingle with those from the gravity bar screen and pass over the knocker screens together.



Section of Screening Plant, Showing Screen Arrangement

The knocker screen *C* is pivoted at the upper end and raised at the lower end by means of offset cams on a shaft at the rate of 200 elevations per minute. The rise of the cams is 1½ in. and the return blow of the screen is taken by stout wood blocks. This screen is set on a slope of 21 deg. It is made in two decks, the bottom of the upper deck being perforated with 2½x1½-in. holes, the lower deck with ½x1¼-in. slots.

The egg coal which passes over may be dropped through a fly at *E* into a conveyor of similar construction to that previously described and elevated to the picking band, there mingling with the lump coal, or it may be loaded on track No. 2. The nut coal may either be thrown in with the egg or passed through a fly at *F* and loaded as shown.

The picking band is 3 ft. 6 in. wide, mounted on 12-in. pitch chain with 5-in. rollers every foot. It moves at a speed of 10 ft. per min. The horizontal portion of the band is 18 ft. long, allowing ample space for pickers to remove any slate from the coal.

To avoid dropping the coal into the cars a loading boom is provided, which consists of a structural-steel frame pivoted at the upper end and adjustable at the lower, and carrying guides for the picking band.

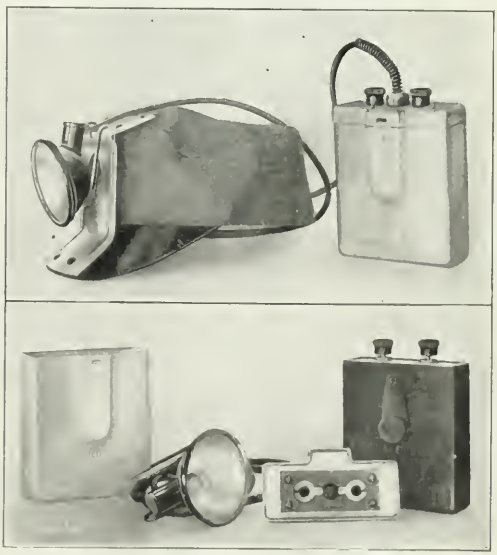
The lump coal, after leaving the shaker screen, is carried by the band and loading boom and placed either on the car bottom or on the pile in the car without appreciable breakage. The lowest slant of the boom is 22 deg. and its highest position may be horizontal, adjustment being gotten at any intermediate points as desired. Upon starting to load a car, it is used in its low position, being raised for topping out as soon as one end is filled and kept at this height until the car is loaded. By this means, a car may be trimmed without any danger whatever from a rush of coal.

The raising and lowering device for the loading boom is worthy of attention. Power is taken from the same motor that drives the picking band and is governed by means of a friction clutch located at *G*. A brake is also mounted on this same shaft. The levers are so arranged that when the clutch is thrown in, the brake is released, and, upon disengaging the clutch, the brake is at the same instant automatically applied.

The capacity of this plant is governed by the efficient capacity of the shaking screen. For good results, the average depth of coal upon this part of the apparatus should not exceed 6 in. The forward movement of the coal upon the screen is approximately 50 ft. per min. The capacity is thus 125 cu.ft. per min., or 187½ tons per hour, which is equivalent to 1500 tons per 8-hr. day.

A New Electric Miners' Lamp

By an ingenious arrangement of vent tubes, the Witherbee Igniter Co., of Springfield, Mass., has developed an acid-tight, lead storage battery, for the electric head lamp which permits of the use of free electrolite. Thus the standard construction of lead accumulators is adapted to the ordinary miners' use and the resulting gain in efficiency, life of plates and hours of service, in proportion to weight, is expected to greatly accelerate the fast growing popularity of this type of electric lamp. J. T. Jennings, electrical engineer of the Philadelphia & Reading Coal & Iron Co., placed a large number of these lamps in service over a year ago and the manufacturers acknowledge his valuable assistance in perfecting many of the details of construction of the Wico Safety Electric Lamp.



Detail View of the Lamp and Its Appurtenances

It might be called extraordinary, were it not so common an occurrence in inventions generally, that battery manufacturers have overlooked the possibility of venting a cell in the manner here employed. Two tubes are sealed into the cover of the acid chamber with their upper and lower extremities in diagonally opposite corners. A constant acid level is maintained by filling through a plug in the side of the jar, and while the battery is in the normal position, both tubes vent freely. If the battery be turned on its side, one of the tubes, of course, has its

VIEW SHOWING THE WICO LAMP IN USE

lower extremity within the acid chamber, below the acid level, but its upper extremity, projecting through the cover, is above the acid level so that none can escape. The other tube, being in the opposite position, has its lower extremity within the acid chamber, above the acid level, and is, therefore, entirely free to carry off the gases without the liquid spilling unless the battery be completely inverted, and this condition maintained; as the battery is turned from side to side, first one tube and then the other serves as the vent.

At no time are the plates uncovered, and in no position that the miner may assume, will his light be diminished. Although the capacity of the battery is more than adequate to furnish light for an entire shift, it is surprisingly small and light as a direct result of the increased efficiency. The active material of the five plates is formed in staggard grades, correctly proportioned to give the greatest capacity for weight at the desired discharge rate. The drawn aluminum housing is sufficiently stiff to resist the ordinary rough handling by miners and the connections from the battery terminals are strong and positive, spring contacts being avoided for the sake of reliability.

The latest type of bayonet-locking socket is employed to hold the tungsten bulb in the lamp, which reflects a smooth, sufficient and well diffused light and is arranged to fit on the standard oil-lamp support.

Several of the Philadelphia & Reading colliers are now equipped with the Wico Safety Lamp, and other operators are following suit. As evidence of the remarkable cleanliness of the battery, it is said that they are in great demand for candelabra equipment on hotel tables.

The Suitability of Explosives

The U. S. Bureau of Mines recently published *Bulletin* 48, dealing especially with tests which show the suitability of different classes of explosives for various kinds of work. It is one of a series dealing with tests of explosives and methods of reducing the risks involved in their use in mining.

Many explosives suitable for quarry work have proved unsuitable for use in mines or in closed workings. An explosive for use in gaseous or dusty coal mines must be so composed that its explosion temperature and the height and duration of its flame are reduced sufficiently to permit its being used with comparative safety. The nature of the gases evolved in detonation, the imperviousness of the explosives to moisture, their behavior in cold climates, their stability of freedom from chemical or physical change during warm weather, all have an important bearing upon their selection for any special work.

Practically every class and grade of commercial explosive is used in open-air work to meet varying conditions. This bulletin states the use to which each of the following explosives is best adapted: Black blasting powder, granulated nitroglycerin powder, "straight nitroglycerin dynamite," low-freezing dynamite, ammonia dynamite, and gelatin dynamite.

Black blasting powder is stated to be the best suited for work, in which a gradual pushing or heaving effort is desired, while "straight nitroglycerin dynamite" develops greater disruptive force than any of the other explosives tested. For this reason it should be employed for producing shattering effects, or for blasting very tough or hard materials.

The gelatin dynamites on detonation produced the smallest percentage of poisonous gases, but even these are far from being satisfactory in this respect. To obviate this objection, the Bureau had a special gelatin dynamite prepared, which, upon detonation, produced no poisonous gases. It is believed that this illustration of the possibility of producing an explosive of this class, that will not evolve poisonous gases, will result in its being commercially manufactured.

The bulletin closes with a table showing the relative potential energy, disruptive effort which bears a close relation to the shattering force of the explosive, the propulsive effect which corresponds to the pushing or heaving force of mine explosives of different classes and grades.

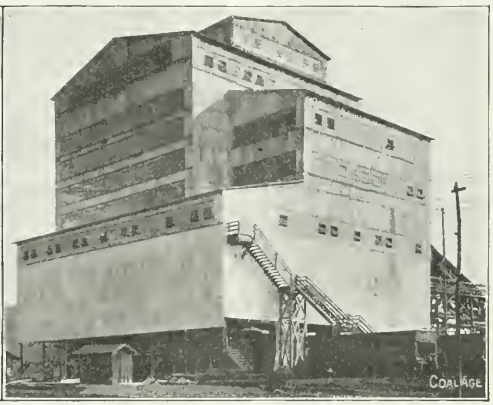
Preparation of Anthracite

By Hugh Archibald*

SYNOPSIS—A general discussion of present methods of cleaning and sizing hard coal in the anthracite field. Recent practice is quite different from the crude methods formerly used.

The means employed for the preparation of anthracite coal for market vary from mine to mine, according to the character of the coal which is being worked and the methods of development employed. When the coal, as it comes from the mines, is dry and bright, and the slate separates easily from the coal, the method known as dry preparation may be employed, in which no water is used in cleaning the coal. But when the run-of-mine coal is wet or stained so that it must be washed in order to make it look bright and so be more marketable, a strictly wet preparation may be used. In many breakers a combination of both wet and dry preparation is employed.

Chutes in an Old Breaker, Showing Crowded and Poorly Lighted Arrangement



Showing Steel- and Corrugated-Siding Construction on a Modern Breaker

In flat seams where the coal is shoveled over by the miner before it is loaded into the car, the preliminary preparation is given in the mine, the larger pieces of rock and bone being picked out by hand and stowed in the gob. Under these conditions a deduction is made from the price paid to the miner for a car of coal if there is more than a certain amount of rock in the car, this amount varying from 300 to 500 lb. In pitching seams where the coal is drawn from a battery, such a preliminary preparation is not possible to any great extent, as the coal cannot be shoveled over. In this case everything from the seam is loaded into the mine car and the preliminary cleaning is done on the surface.

Material Used in Breaker Construction

The majority of coal breakers in use, having been built for a number of years, have been constructed of wood, the older breakers being constructed with mortise and tenons, whereas in the more recent wooden structures, cast-iron shoulders and tie-rods are used. In a number of breakers which are under construction or have been built in the past few years, either steel or concrete or a combination of both have been used. The Sterrick Creek breaker of the Pennsylvania Coal Co., at Olyphant, Penn., is a large breaker which has been built out of steel with corrugated-iron siding. The same company is at present constructing a breaker known as the Underwood, near Throop, Penn., in which the pockets and foundations are made out of concrete, while the rest of the breaker is to be made out of steel.

The Lehigh Valley Coal Co.'s new breaker, at Mineral Spring, is built out of steel, the lining of the pockets and the flooring being made out of concrete. The D., L. & W. R.R. Co. has constructed a large breaker at Taylor, Penn., which is built entirely with reinforced concrete, the only steel work being the frame which carries the conveyor that lifts the coal from the shaft to the head of the breaker. This breaker is unusually steady, there being very little movement in it when all the machinery is running, a barrel of water at the top of the breaker not indicating any movement.

The Anthracite Mine Law of Pennsylvania, which was passed in 1871, required that any breakers constructed after the passage of the act should be placed a certain distance from the shaft. The purpose of this was to avoid a repetition of the Avondale disaster of 1869, when the breaker, which was located over the shaft, burned down, smothering the men in the mine from the smoke which was carried down the shaft.

This law has necessitated the handling of the coal between the shaft and the breaker. At some mines, this is done by hoisting the coal car high enough so that it can be run over a trestle directly into the breaker. A more common practice though, is to hoist the car to the surface and there dump the coal into a conveyor which lifts it to the head of the breaker.

An advantage in this is that pockets of the conveyor, holding only a portion of the coal in a car, deliver the

*Mining engineer, Scranton, Penn.

coal in a more uniform quantity than where the car itself is dumped directly at the head of the breaker, a better cleaning of the coal always being possible when it moves in a steady stream from the breaker. When the supply of coal from the mine comes from more than one source and is dumped from two points into the boot of the conveyor, the feed to the breaker is more even than when the cars from two points are dumped directly at the head.

Must Avoid Rough Handling

Coal should be handled in a breaker so that the least amount is broken into small sizes. It is stated that a reduction of 1 per cent. in the breakage amounts to a saving of $75,000 a year for one large company. As the average price of coal is about $2.40, a saving of 1 per cent. is equal to 2.4c. a ton, which can easily amount up to a large amount when the production is large. Breakage will occur as one piece of coal strikes against another or where the coal strikes against the side of the chute as it changes its direction of flow.

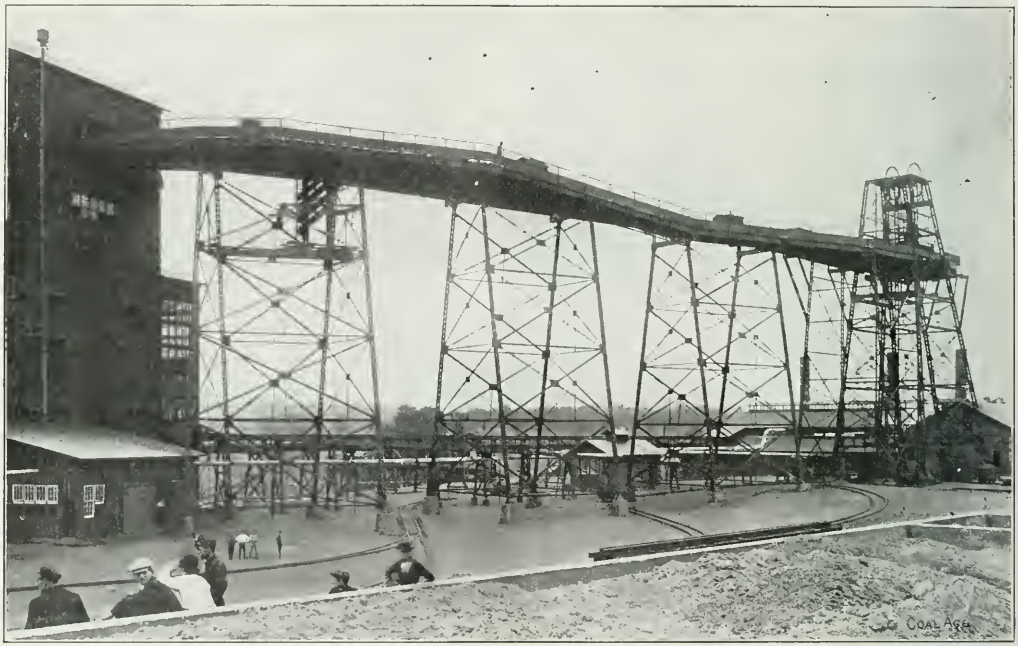
The coal on entering the breaker, passes over bars, either fixed or movable, or over shaking screens, so that the lump coal may be separated from that which is already broken to a more marketable size, and also to avoid passing all the coal through the rolls. The small coal is sent directly to the sizing and preparing machines.

Shaking screens are preferable to bars for making this preliminary separation, as the separation is more distinct, the reason for this being that when the coal slides down the chute and over the bars, that which should fall through, often gathers enough momentum to carry it over or may be so held by larger pieces of coal that it is carried along with them. Whereas if it is shaken free from all other pieces of coal, as will happen on a shaking screen, and given time to drop, it will pass through. The disadvantage is the power required for the screens and more complicated machinery.

The lump coal is given a preliminary cleaning before going to the rolls to be crushed. This may be done in a picking chute or on a moving table. When it is done on a moving table, better cleaning can be accomplished as the pieces of coal do not move so fast as when sliding down a chute, and are not piled up one on the other as is likely to happen at the end of a chute.

Necessity of Careful Cleaning at the Head

Cleaning the coal at the head is important, for it is easier to pick out one large piece of slate in the beginning than to pick out a number of smaller pieces later on. Five



Showing a Common Arrangement, Whereby Cars Are Taken from the Head of Shaft to Breaker

men at the Mineral Spring breaker of the Lehigh Valley Coal Co. do most of the hand picking which is done in that breaker. In this breaker there are three picking tables on the head. Shaking screens are employed for the preliminary sizing, and these make two products, lump, which is cleaned on the center table, and steamboat and broken, which are cleaned on tables at each side. The slate which is taken out at this point, goes directly to the waste.

After cleaning on the head, the lump coal passes through rolls to be broken down to the sizes desired. In a combination wet-and-dry breaker, it is generally the product from breaking down the lump coal that is cleaned by the dry method and goes to its separate part of the breaker.

The rolls generally employed are high-speed toothed

rolls, running at 900 r.p.m. Recently, however, slow-speed rolls, known as the Lloyd rolls, have come into use. In these rolls the revolutions have been reduced to 250 a minute and the saving in breakage below the desired sizes runs as high as 15 per cent. They are compound geared and the teeth are set in staggered rows and do not overlap as in the old high-speed, pointed-tooth rolls. To get the best results, rolls should be fed evenly with a sized product. Even feeding is better accomplished when moving tables are employed, as coal moving out of a chute, after being held back by a gate, travels in a mass, whereas with moving tables it falls evenly over the end of the table.

After passing through the rolls, coal is sized on shaking or revolving screens, each size being prepared separately. The sizes of prepared anthracite coal and the square holes through which they will pass are as follows: Steamboat, 5 in.; lump, 4 in.; broken, 2¾ in.; egg, 2 in.; stove, 1⅜ in.; chestnut, ¾ in.; pea, ½ in.; buckwheat, ¼ in.; rice, ⅛ inch.

In the early days of anthracite mining, no size below stove coal was prepared and the cleaning was done by hand. In those days the miner was required to rake over his coal in the chamber before loading a car and all the fine coal which passed through the rake was shoveled into the gob. The contrary is true of the present day, the smaller and cheaper sizes having increased steadily in demand, so that egg is the largest size made in some breakers. These breakers are so arranged that even egg coal can be broken into smaller sizes when there is no demand for it.

Dry Methods of Preparation

In breakers using the dry methods of preparation, the coal is first cleaned by mechanical pickers and then by hand. The mechanical pickers are of two types: the Emery picker and the spiral picker. In the Emery picker, the coal is separated from the slate as it slides down a chute in which there is a slot, the coal on account of its glassy surface, gaining enough velocity to make it jump the slot, whereas the slate being heavier and sliding at a slower rate, falls through. The spiral separator has a sheet-iron spiral which inclines toward the center down which the coal and slate slide. The coal, gaining greater velocity than the slate, is discharged over the edge by centrifugal force, while the slate remains on the spiral and is discharged in the center at the bottom.

In the modern breaker, built out of steel and corrugated-iron siding, attention is paid to lighting the inside of the breaker so that there may be plenty of light for picking the coal. In the old structures adapted to recent mines, the chutes for hand cleaning are often badly constructed and poorly lighted, the lack of daylight being made up by hanging an electric light over the picking chute in front of each boy. The hand picking of the coal is done by boys. It is avoided as much as possible nowadays; only the larger sizes are cleaned by hand. At one modern breaker, only two boys are employed on the clean coal, both of them working on egg coal after jigging. After picking, the clean coal is sent into the pockets for loading onto the cars, for shipment.

In a wet breaker the cleaning of coal is done by means of jigs, the coal being sent directly from the jigs to the pockets.

One of the hard things to eliminate in cleaning coal is flat slate. A machine has recently been devised to do this work, which can be attached to the end of the shaking screen or placed by itself in a chute. In this machine, the coal passes over a series of plates which overlap in the direction of the movement of the coal, so that as the machine moves forward, the flat slate passes back through the opening between the plates. The plates open a little at the end of each stroke in order to release any slate which may be caught between them.

Arrangement of Coal Pockets

The usual arrangement of the coal pockets is to have them parallel to the railroad track on which the loading is done. In the illustration shown of the Sterrick Creek breaker, two tracks are shown passing beneath the breaker, on both of which cars can be loaded. In contrast to this custom is the novel arrangement of the Mineral Spring breaker, where all the loading is done at one point and only one track is used. The pockets in this breaker are arranged in two opposed rows at right angles to the track, and the loading is done by means of a belt which passes through an alleyway between pockets and onto which the coal is loaded by gravity for delivery to the railroad cars. One man by a system of levers controls the gates in the pockets, the belt, and a box-car loader.

In loading by a belt, greater speed has to be given to it when the smaller sizes of coal are handled in order to throw them free from the belt at the end, and not have them stick to it, following it around. This system of loading is to be maintained in the new Franklin breaker which is being built by the same company. Another system of loading which is proposed for a breaker under construction by another company, will not have pockets in the breaker, but will have a separate track for each size of coal so as to load directly into the railroad cars.

The refuse from the breaker nowadays is generally ground up and sent back into the mines to fill up old workings. The ashes from the boiler plant are also flushed into the mines with water. The crushing is generally done with a "Williams No. 3" crusher, the largest slate sometimes being broken down in a Gates crusher.

BY THE WAY

Even a lion must defend itself against the flies.

⁂

"Let the unions try to organize my camp," a boastful superintendent threatened, "and I'll show them." They did. He didn't.

⁂

A dwarf on a giant's shoulder sees the further of the two.

⁂

The Philadelphia concern that offered its employees 15c. a day for taking a bath has created an opening for an awful roar from the Miners' Union.

⁂

Education may not end in eminence, but, without it, eminence can hardly be attained.

⁂

A party nonchalantly phoned us the other day for the address of the Anthracite Coal Trust. We referred him to ex-Attorney-General Wickersham.

⁂

(Problem)—The Criminal Courts in Georgia sentence a small boy to 11 years in jail for stealing a 5c. bottle of pop. How many years should the Pennsylvania courts sentence a greedy or careless miner for crossing the fireboss' dead line?

A Balanced Shaking Screen

SYNOPSIS—Double screens suspended by flexible wooden strips and driven by opposed eccentrics through resilient eccentric rods greatly reduce the noise of operation, the cost of installation and repairs, and the reflex action of the shaker upon the building.

Throughout most coal fields where the product of the mine is sized before going to market, the oscillating or shaking screen has, generally speaking, supplanted the revolving screen for sizing purposes. The principal objection to this type of apparatus has been its destructive action upon the building in which it is placed.

The third law of gravitation, which states that "for every action there is an equal and opposite reaction," holds as true between the coal screen and the structure whereby it is supported, as it does between the sun and the earth, or any other two heavenly bodies. The push exerted by the eccentric to force the shaker forward may be transmitted in the opposite direction to the timbers supporting the eccentric shaft, with the result that buildings not constructed with the especial idea in mind of resisting the action of the oscillating screens have sometimes, and not infrequently, been shaken to destruction.

Attempts have been frequently made, therefore, to counterbalance or neutralize the action of the eccentric shaft upon the building itself, and, although these were more or less successful, the heavier the screens were made, the greater and more disastrous were their effects upon the structure within which they were housed.

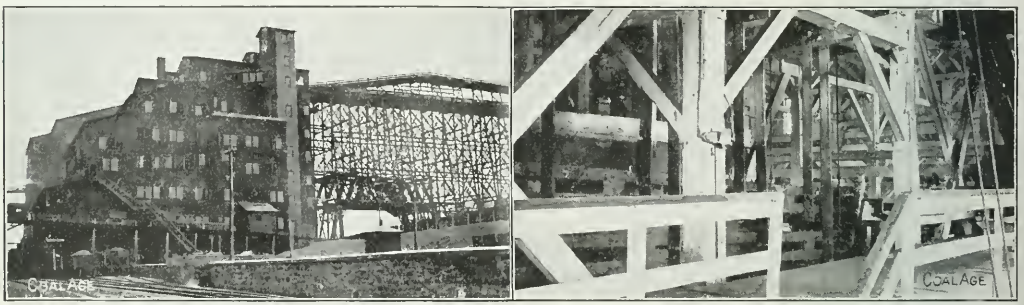
As ordinarily constructed, shaking screens are hung from above with rods provided with boxes to allow a slight rocking both at the point of suspension and point of support upon the screen. The eccentric rods were also attached to the screens in a similar manner, the points of attachment, however, being usually provided with brass boxings similar to those used upon the ordinary steam-engine connecting-rods.

Although there was comparatively little trouble experienced from heating, or undue friction, in these various boxes, great difficulty was encountered in keeping the various joints tight. It will be readily appreciated that any lost motion, either at the points of support or at the application of power, would cause a knock in the boxings which, if unattended to, would grow steadily worse, not from friction, but on account of the pounding action between the journal and box. The greater the weight of the screen itself, or of the coal carried upon it, and the more rapid its oscillation, the more severe would become any tendency to pound.

To overcome these difficulties the Wilmot Engineering Co., of Hazelton, Penn., has placed a screen on the market which is known as the Parrish flexible-arm shaker, which is in many respects decidedly different from the older type of shaking screens.

In this apparatus the framework, carrying the perforated plates by which the coal is sized, is built up entirely of wood, being thus somewhat lighter than if made of structural-steel shapes. This framework is hung from above on a series of 1x8-in. strips of seasoned ash, which are securely bolted to both the shaker proper and to the supporting beams overhead.

The backward and forward motion of the screen framework is made possible by the elasticity of these wooden hangers, and at either extreme position of the shaker they are bent and tend to force the suspended weight in the opposite direction. This serves to minimize the effect of the inertia of the screen-supporting framework.



A Colliery Where These Shakers Are Used and the Screens Themselves in Operation in the Washery

In order to obviate the necessity of connecting the eccentric rods to wristpins attached to the shaker, the elasticity of seasoned wood is again taken advantage of. One end of the eccentric rod is bolted securely to the shaker framework, while the other is bolted to the eccentric straps. Between these two ends, or points of attachment, a flat strip of thoroughly seasoned white oak is interposed and securely fastened.

In order to counteract as much as possible the action of the shakers upon the building, they are usually built double, that is, one shaker above the other, or upon the opposite side of the eccentric shaft. With this arrangement and the driving eccentrics opposed to each other, the direction of travel of the two screen-bearing frames is at all times opposite, which puts as little oscillatory shaking strain upon the building as possible.

The advantages of this construction are many. All of the principle parts except the screen plates themselves being made of wood, the shaker is light in weight and cheap to install. Renewals of either hangers or eccentric rods are not frequent, but when necessary such renewals can be accomplished quickly and at small expense by an ordinary carpenter.

Cincinnati Mine Explosion, Courtney, Penn.

By R. Dawson Hall

SYNOPSIS—A gas explosion occurred at the Cincinnati mine of the Monongahela River Consolidated Coal & Coke Co., near Courtney, Washington County, Penn., killing 96 men. The mine had been operated about three-quarters of a century and had extensive workings. Many of the men escaped through an unsuspected avenue of safety, all the provided roadways being blocked by afterdamp.

The Cincinnati mine is one of the oldest in the bituminous regions. It lays along the west or left bank of the Monongahela River, just north of the town of that name. The nearest railroad station is Courtney. A few men live in a block of wood houses between the Pennsylvania R.R. (Monongahela branch) and the river, and this block is shown in the view of the tipple. But there is no town near the mine, and the miners in general live in the many villages near-by, in Monongahela, New Eagle, Riverview, Findleyville and Gastonville, for at the Cincinnati mine the river rounds sharply against the hills and makes a steep bluff, affording little room for buildings at its base and none on its slopes.

General View of the Plant at Cincinnati Mine, Courtney, Washington County, Penn.

A Pioneer Mine

This mine and the abandoned Buffalo workings adjacent were opened almost 80 years ago. Cincinnati has been operated discontinuously since that time, having passed into many different hands, being owned at different times by the Fifth and Tradesmen's National Banks, at Pittsburgh, Robert Arthurs and C. M. Jutte & Co. At all times gas has been found, not in great quantities but sufficient to serve as a menace. At one time reports aver that the mine exploded and blew cars almost across the river, but this accident is said to have occurred 30 years ago, long before the operation came under the present ownership, and the damage was to property and not to human life. According to report, gas is occasionally found in large quantities. Nevertheless, accidents have been rare until the present disaster wiped out in one catastrophe 96 lives just at a time when the disaster seemed unlikely to occur.

The Slope Manway

When C. M. Jutte & Co. still owned the mine, Henry Louttit, being mine inspector of the district, declared that the escape of the men in case of an accident was not sufficiently provided for and insisted on a new opening on Fromans Run, a branch of Mingo Creek. The court appointed D. M. Anderson, a coal operator; Henry Cook, a miner, and George D. Jenkins, a mining engineer, to report to the court. They made an examination Oct. 13, 1893, and declared that a 20-deg. slope 550 ft. long should be constructed to connect with the surface in Fromans Run. This opening constitutes the drift marked in the illustration as Mingo manway. By this steep incline the men and mules enter the mine, and at its mouth the mule stable is located. It is a primitive adit such as a company might be expected to construct under legal necessity.

Thus there were two entries to the mine, the level main road with its rope haulage entering the hill opposite the tipple, and the manway about a mile away on a small run near the Mingo school house. By the first, the bodies were removed, and the rescuers entered the mine by the second. Five rescued mules were driven out of this opening about 70 hr. after the disaster, looking little the worse for their severe experience.

The Weather Conditions

The explosion occurred about 12:15 in the afternoon on Wednesday, Apr. 23. The temperature was about 80 deg. F., and the weather had been warm and, therefore, unfavorable for a dust explosion for several days. Since Apr. 7, the temperature had not fallen below 30 deg. F., though on Apr. 20 the temperature fell at 6 a.m. to the freezing point. The conditions did not favor a gas explosion any more than one of coal dust, for the day was

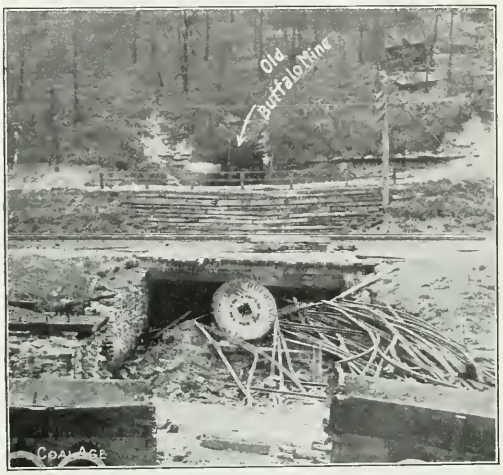
bright and the barometer did not show any marked decline. I quote the statement of the Weather Bureau:

BAROMETRIC READINGS AT PITTSBURGH STATION

Date	Hour	Inches
Apr. 20	8 a.m.	29.50
	8 p.m.	29.54
Apr. 21	8 a.m.	29.66
	8 p.m.	29.44
Apr. 22	8 a.m.	29.36
	8 p.m.	29.18
Apr. 23	8 a.m.	29.27
	8 p.m.	29.23
Apr. 24	8 a.m.	29.31
	8 p.m.	29.20

Mainly a Gas Explosion

Apparently the center of the explosion was not far from the 5th and 6th butts out of the 8th face. The accident



The Buffalo Workings Adjacent to the Cincinnati Mine. Some Think Much Gas Leaked from This Mine into the Cincinnati Workings

was probably largely a gas explosion, the violence not being greatly increased by the presence of dust. The coal is about 5 ft. thick, increasing in dips to 6 or 7 ft. Above the coal is about a foot of draw slate which is hard to maintain in place. This slate is always pulled or shot down. Thus the floor normally is covered with a certain amount of broken rock which mixes with the coal dust.

The violence of the explosion has, as is usual in such cases, been exaggerated by the press. The blast blew open the explosion doors of the fan, an illustration of which ventilator is shown in the last illustration. The doors were replaced by the fan tender, made tight with sacking and loaded with iron. The fan was in no way injured. As an evidence of violence it is said that in the mine, a locomotive was blown off the tracks.

There was, however, a great deal of afterdamp, which invaded both rooms and headings. Unfortunately, the accident occurred in a heading outby from the point where many men were working. These men were thus penned in behind the clouds of afterdamp, and many more might have perished had it not been for a fortunate circumstance.

The Unforeseen Exit

Three parallel entries formed the main approaches to the portion of the mine from which the bulk of the coal was obtained. From right to left these were No. 7, the main return, No. 8, a motor road and intake airway, and No. 9, a traveling road, also serving as an intake. Leading to the left out of these were several butt headings, each providing approach to or being prepared to provide approach to about 50 rooms. The last started was No. 21. Parallel to the face entries mentioned was No. 4 face entry, and the 15th butt heading from this entry struck across the new work not far from No. 21 butt heading. All the work in No. 4 face was nearly completed. The pillars and stumps had been largely drawn and extensive caving had taken place. Yet through No. 15 butt and No. 4 face, broken and caved as the former was, many men reached the surface.

Shipp Holmes, a colored man, was followed by 15 men into the end of No. 8 face workings and thence along No. 15 butt outward. Holmes had an unextinguished safety lamp, but the other men were in the dark, and, so five men were parted from the rest and perished. When the Boss Driver Todd discovered that Holmes had managed to reach the surface by way of the far workings of No. 4 face, he made the trip back over the ground, and finding Edward Furlong and William McDonald, brought them out.

Some Individual Experiences

Edward Furlong was a mule driver who worked in the 14th entry. Like other drivers, he collected cars from the room faces and delivered them near the mouth of the heading where it enters 8th face. From this place the cars were removed by a motor. He used an open lamp when driving down to No. 16 room. At that point he was in the habit of laying his open light down and then, taking the safety lamp in its place, would proceed down the heading.

At 12:15, on Wednesday, he was sitting at this No. 16 room, when the explosion occurred. It rolled him over a distance of about 12 ft. Picking himself up, he went to No. 8 face, and found all three face headings full of afterdamp. He tried to pass in the direction of the drift mouth but found the air terribly foul and remembering his deceased father's oft-repeated admonition, he decided

The Mingo Manway, Where the Rescuers Entered the Mine, a Steep and Narrow Slope

to go only half as far as he felt was safe so that retreat would be possible in case the air was too foul to permit his escape by the regular road. He went only a short distance and then returned to the mouth of the 14th butt entry and finally traveled as far down as butt entry 21. McDonald was with him and, as explained, he also escaped with the aid of Todd.

Many of the men were working in No. 4 face heading and the butt headings leading from it. These all escaped,

as did also some men, to the outby of the explosion. One man declared the explosion gave two distinct thuds. He was standing outside the mine foreman's shanty and after the explosion occurred he stepped inside and closed the door. As the foul air entered through the cracks around the door, he decided to leave and passed through a rear door to the intake and thence escaped.

Two Rescued after 59 Hours

The rescue of Charles R. Crall and Philip Legler aroused hope that many more men might be saved. They were located in butt entry No. 20 out of No. 8 face heading, after having been immured for about 59 hours. They were taken to the hospital, but they were soon in excellent condition and were permitted to go home. Like the other workers in the headings leading from No. 8 face they had retreated to the remote workings of the mine after the explosion, as the air in that direction was less contaminated.

In all, 96 men were killed either by shock, burning or suffocation. One man was completely decapitated, another had all the clothes burned from his body; on the other hand, some were found who had covered their heads with their coats to shut off the deadly fumes and had quietly lain down to die.

The ventilation of the mine is supplied by a Capell fan measuring 12 ft. in diameter, having a 6-ft. face and operated as an exhaust ventilator. It is driven by a continuous-current motor through gearing; this General Electric motor is rated at 525 hp. and has a speed of from 300 to 525 revolutions per minute.

Suggested Causes of the Explosion

It is early yet, before the mine inspectors have made their search and the inquest has been held, to suggest causes for the catastrophe. Some have assumed that gas entered from some of the many mines adjacent but now abandoned. The Buffalo and Garfield mines were both extensive. We show the old opening of the Buffalo mines, and the Champion or Murphy fan by which it was ventilated. In 1883, James, the father of Edward Furlong, who was rescued, was foreman of this mine. It is thought that in some way the stoppings keeping back the gas from these old mines leaked out and filled the Cincinnati mine with firedamp.

The Block of Houses Near the Cincinnati Mine and the River Tipple in the Background

There is also a disposition to blame near-by and abandoned gas wells for the catastrophe. It is said that at one time a machine cutter broke a hole into a well but fortunately no gas was found, so completely was the well exhausted or so tightly was it sealed. Some contend that the restarting of entries 5 and 6 is blameable for the accident. Report has it that these headings were closed down for a while because of the presence of gas and reopened shortly before the explosion.

Alexander McCauch, the state mine inspector, made an investigation of the mine about six weeks before the accident and found it free of gas, but those who know the mine are disposed to think that an investigation is only good for the period at which it is made, the gas generation being largely discontinuous and depending on working conditions.

Electrically Driven Mine Fan. The Explosion Doors in the Foreground Were Blown Open but the Fan Was Uninjured

The Mixed-Light System

It may be interesting to recall the mixed-light methods of the Pittsburgh district as in existence at this Cincinnati mine, because the much discussed question of their propriety will probably be revived by this disaster.

Two butt headings are driven up side by side with crosscuts between them. These are numbered, we will suppose, 14 and 15. No rooms are turned from entry 15, but they are started in regular succession from entry 14, beginning near the mouth and extending inward. The air enters at entry 15, passes to the end of that heading as far as completed and returns by entry 14. As the rooms are driven up, the pillars are drawn back and gas escapes from the broken roof. No naked lights are allowed in those rooms where pillars are being drawn or in the part of the heading from which those rooms are started. The men who are driving rooms ahead enter their working places through entry 15 and pass into entry 14 through a small door in the crosscut next above the last room where pillars are being drawn. They are forbidden to travel down to the places where the pillars are in process of removal.

In regular turn with the rooms in entry 14 rooms are turned off entry 15. That is, when *all* the rooms in the first entry are turned, a room is started from the end of entry 15 and thereafter other rooms are opened and the pillars drawn proceeding outby and not inby; that is retreating, not advancing. Thus, as the air current still continues to follow its old course, the new rooms are still all on intaking air and the pillar-drawing rooms are reached by the current which has ventilated the new rooms.

Mechanical Coal Picking

By Frank H. Kneeland

SYNOPSIS—A description of two machines which give good results. The first can be attached to any ordinary shaking screen and removes the flat slate. The second picks slate of any shape, either flat or otherwise, and is used mostly upon chestnut or larger sizes of anthracite coal, although there appears to be no good reason why it should not work with equal success upon the bituminous coal in nut, egg or lump sizes.

The preparation of coal for market, especially if it be anthracite, by no means ends with its extraction from the tenacious embrace of Mother Earth. In order to successfully meet the requirements of the consumer, it must be properly graded as to size and free from impurities, such as slate and rock.

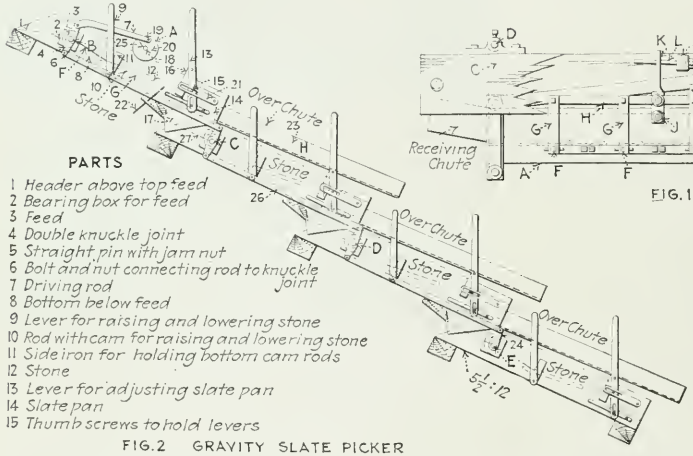

PARTS
1 Header above top feed
2 Bearing box for feed
3 Feed
4 Double knuckle joint
5 Straight pin with jam nut
6 Bolt and nut connecting rod to knuckle joint
7 Driving rod
8 Bottom below feed
9 Lever for raising and lowering stone
10 Rod with cam for raising and lowering stone
11 Side iron for holding bottom cam rods
12 Stone
13 Lever for adjusting slate pan
14 Slate pan
15 Thumb screws to hold levers
Over Chute
Stone
5½ : 12

FIG. 2 GRAVITY SLATE PICKER

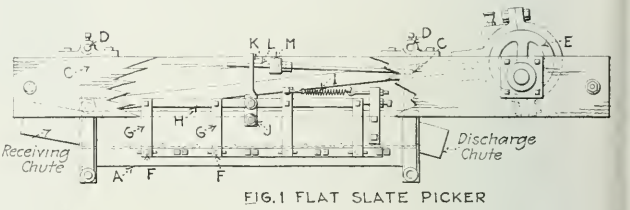


FIG. 1 FLAT SLATE PICKER

16 Side iron for holding lever
17 Gusset Plate
18 Driving shaft bearing
19 Crank pin
20 Crank disk
21 Brace and catch to hold levers
22 Division shutter
23 Over-chute
24 Single knuckle joint
25 Driving shaft
26 Rods connecting feed to knuckle joints
27 Tandem header

COAL AGE

Side View of Gravity and Flat Slate Pickers. List of Parts Refers to Gravity Picker Only

For many years, the final rock separation was accomplished by employing breaker boys to hand-pick the foreign matter from the coal, although it was clearly recognized that an efficient mechanical device for this purpose would prove not only a great convenience, but a great saving as well.

For a long time all attempts at mechanical picking proved failures. Recently, however, some such machines have been placed upon the market, one of the most successful of which, manufactured by F. H. Emery & Co., of Scranton, Penn., is herewith illustrated and described.

Fig. 1 shows a side view of a shaking picker, for the removal of flat slate. The framework *A* is suspended by four rods *C* from the points *D*, is free to oscillate backward and forward, and is driven by the eccentric *E*. Mounted in this framework *A* is a series of slightly bent transverse plates, every other one of which may be rocked slightly about the adjustable axes *F*. These axes are connected to the levers *G*, which are joined at their upper ends by the rod *H*. One lever is also connected to the spring *I*.

Pivoted at *J* and connected to the rod *H* is the lever *K*, through a slot in the upper end of which passes the rod *L*, which is attached at one end to the hanger *C*. At an adjustable point on the rod *L* is placed the stop *M*, which comes in contact with the lever *K* only when the picker is in its extreme forward position.

The bottom plates of the picker are separated from each other by slots, the width of which depends upon the maximum thickness of the slate which is to be removed from the coal. This distance in each separate machine is slightly adjustable. The coal entering the picker from the receiving chute is easily jigged forward across the plates. The slate on the other hand moves with greater difficulty and instead of progressing continuously forward, passes backward through the slots between the plates.

At the beginning of each rearward movement of the picker, the rocking plates are caused to move and slightly increase the opening or width of the slot by the lever *K*, coming in contact with stop *M*. It is impossible, therefore, for a piece of slate to become caught or jammed in these openings.

A careful inspection of the refuse discarded by this machine fails to show any appreciable amount of good coal, in fact, the ordinary operation of the picker leaves less than 2 per cent. of combustible matter in the refuse, while one-half of 1 per cent. is a result not infrequently achieved.

Another device manufactured by the same company and one whose field of usefulness is even broader than that of the machine above described, is what might be termed, a stationary slate picker. This is illustrated in Fig. 2.

The crank *A* is connected by a rod to the feeder *B*, and gives it a rocking motion. *B* in turn is connected through rods and levers to the similar feeders *C*, *D* and *E*.

These feeders are semi-cylindrical and in appearance resemble nothing so much as the valves of a Corliss engine. Their rocking movement within suitable seats al-

lows the coal to enter the separate stages or passes of the machine in intermittent batches, or "volleys."

From the feeder *B* the coal moves down the plate *F*, which is set at such an angle that the coal will slide readily. Upon reaching the stone slab *G*, its momentum is checked, but it is by no means brought to a standstill. The slate also is retarded through contact with the stone slab, but to a decidedly greater extent than is the coal. The result is that the clean coal reaches the lower edge of the slab at a higher velocity than the slate, and readily jumps an opening, into which the slate drops. Of course, some coal is retarded in crossing the slab by pieces of slate; this falls through the opening with the former and enters upon the second stage of the operation. The clean coal, which has jumped the opening above mentioned, is carried off by the over-chute *H*.

Four feeders and a like number of stages and slabs are provided in this machine, and by the time that the final slab is passed, the refuse falling through the last opening contains only about 5% of coal. This can be easily led

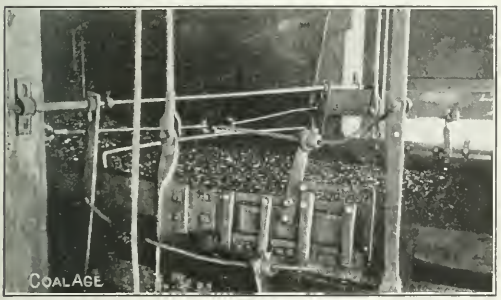


Fig. 3. Flat Slate Picker in Operation Attached to End of Shaking Screen

into a chute, where the coal may be removed by one breaker boy.

The above is the stationary picker in its simplest form. These machines can, however, be mounted in double or triple decks or in zig-zag form, depending upon the floor space and head-room available. Their work in any of the above types is practically uniform and identical.

The inclination of the various stages, as well as that of the stone slabs, will vary considerably, with different qualities and grades of coal. The width of the slot succeeding each slab is also important. Adjustments for these variations are made upon each machine.

A well known mine superintendent in the anthracite region, who has used these pickers for some time, makes the statement, that where he used to employ 40 boys to clean his coal, he now hires only 8, and if the head room in the breaker was sufficient to permit double decking of the machine, he would employ none at all, as he believes that a separation could be accomplished that would be so nearly perfect as not to warrant any hand picking whatever.

Although these machines are at present employed mostly in the preparation of anthracite, some are working successfully upon bituminous and there seems to be no good reason why it should not prove to be a cheap and efficient means of removing slate from practically all grades of this fuel, slack alone excepted.

Efficient Screens

Two efficient screens for sizing and cleaning coal are illustrated below, both being made by the Hendrick Mfg. Co., Carbondale, Penn.

Fig. 1 is designed for use in ordinary oscillating screens and is known as "Perisertread" shaker plate. It has proven effective in the proper cleaning of the smaller sizes, the perforated steps placed every 12 in. eliminating the necessity of strips of wood, angles or other shapes

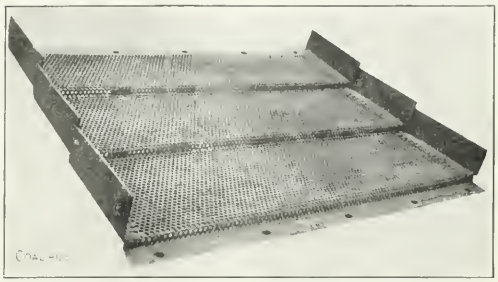


Fig. 1. Step Screen with Circular Perforations

being fastened to the screening surface to hold back or retard the mass of material passing over the shaker at the sacrifice of considerable screening area.

The steps not only retard the coal, but they also act as tumblers, as at each thrust of the eccentric, the coal rolls over at these points, causing better separation.

The increased screening surface over that of flat plates amounts to about eight per cent., and this is placed at the point where most needed, i.e., at the spot where the coal is turned over.

Another advantage gained in this construction is the strengthening of the plate by the steps, they doing away with the buckling which often occurs with light plates perforated with small holes.

The flanged-lip screen (Fig. 2) is the last screen the coal should pass over before being loaded for shipment.

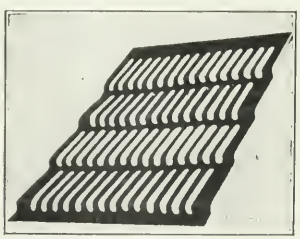


Fig. 2. Step Screen for Final Preparation of the Coal

The slots are 12 in. long, wider at the bottom than at the top, with 1½ in. of the large end of slot flanged down at the lower end.

Where these screens are used in loading chutes, they can always be depended upon to reduce the percentage of rock and slate and under-sized materials in the product that has not been eliminated by the usual screening and sizing methods. They can be manufactured in any size and to suit all conditions.

A Novel Screening Plant

By W. F. Schadel*

SYNOPSIS—The ordinary shaking screen, although admittedly efficient, has many objectionable characteristics, chief among which is its tendency to shake to pieces any structure within which it may be mounted. In the installation described this has been obviated by balancing the reciprocating parts and suspending them in a framework entirely independent of the mine tipple proper.

In the early stages of coal mining the consumer would gladly accept coal in any condition and of any quality, it being even thus vastly superior to wood and other fuels. This state of affairs, however, has been constantly changing. The consumer has gradually become enlightened, educated to the difference between good and bad fuel, between coal well prepared and that carelessly loaded, until today the average purchaser, especially the steam-coal user, is as well or better informed on the merits of the different coals as the producer.

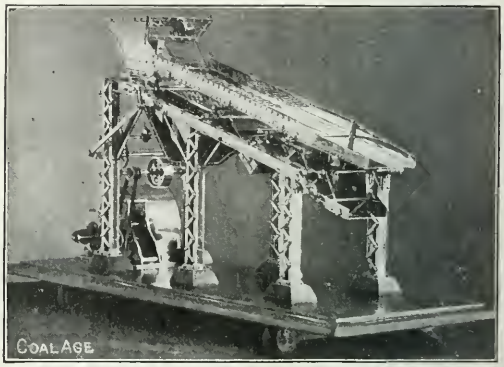
Science has taught the commercial coal consumer to test his fuel for heat value, city ordinances have compelled him to keep down the smoke nuisance, experience and his yearly balance have shown him which coal is the most economical to use and which gives the best results.

On the other hand, the domestic user perhaps does not go into the matter of heat value as scientifically as the producer of steam, but preparation is really of more importance to him than to the latter. The dealer must give him coal free from dirt and slack and if the shipper allows his product to go to the retailer in any other condition, it is the latter's loss, since he cannot sell dirt to his customers.

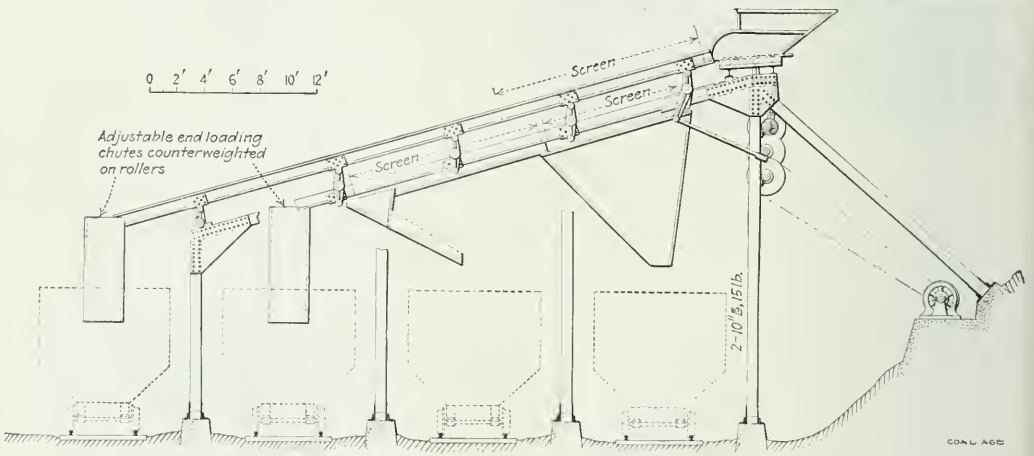
These conditions have caused a constant and increasing demand on the part of the trade for a better preparation of coal at the point of origin and have compelled the mine owner and operator to look to some means of improving the condition of the output. Various methods of screening and rescreening have accordingly been tried out with more or less success.

Shaking Screens Are Most Efficient

It is now generally conceded that the shaking screen is the most efficient means of grading coal, but the many difficulties encountered in the operation of this type of apparatus in its former crude state, have not only been expensive to those who have tried it, but have made others skeptical regarding something that they feared would be a constant source of annoyance and expense to them.



Photograph of a Working Model



Side View of Shaking Screens. Tipple Not Shown

It is a well known fact that the old-style shaker, which is hung to the tipple frame, has a destructive tendency and has even shaken tipples to pieces in a few years or even months. Much trouble with eccentrics, screen connections, etc., has also been encountered, causing delays which have possibly cost the operator in a few days of waiting for repairs the price of an entire outfit.

To say the least, it is a difficult matter to install a substantial mechanical screening outfit on truely scientific

*Wellston, Ohio.

principles in the ordinary lightly constructed, high-frame structure which is constantly deteriorating and being preyed upon by the various elements of destruction, so plentiful around a coal mine. These and other considerations have given the operator good grounds for being skeptical.

In order to overcome some of these difficulties, the Morrow Manufacturing Co., of Wellston, Ohio, have had their engineers at work for some time developing and perfecting an oscillating device which appears to have eliminated the most objectionable features of the old shaking screen and to have incorporated in its construction several features which adhere more closely to good practice in machine design. They are now installing for the Jewell Ridge Coal Corporation, at Tazewell, Va., a steel-frame self-contained shaker protected by a steel superstructure, which is entirely independent of the former.

The accompanying illustrations show the shaker which may be described as follows: The principal frame is of structural steel, the posts and top girders being built up of two 10-in. channels thoroughly tied together with steel lacing and gussets. The whole structure is well stayed laterally by angles and plates, and the principal longitudinal stiffening is effected by the two diagonal braces in the rear also built up of two 10-in. channels laced together, while the heavy double gussets also serve as bracing longitudinally.

How Shaker Is Fed

The receiving hopper is provided with a plate feeder, by means of which the coal is distributed evenly to the first screen of the apparatus. This feeder reciprocates on rollers at a speed of about 30 strokes per minute, and the feed is regulated by an adjustment which lengthens or shortens the travel of the plate. The upper and lower screens have been provided with a novel means of mounting on double arms, so that they reciprocate in opposite directions, thus reducing vibration to a minimum.

The upper or lump screen is provided with 4 perforated steel plates, each 4x6 ft., giving 96 sq.ft. of screening surface, over which the lump coal must pass. The upper end of the lower screen is provided with 12x6 ft. of perforated plate, which screens out the slack and the lower end has 12x6 ft. of a larger mesh, through which the nut passes, and over which the egg coal is carried.

This arrangement gives ample screening surface for all sizes of coal, and the plates, being inserted in sections, can be removed and changed readily if an alteration in grade is desired. Bell cranks instead of eccentrics have been employed to drive the shaker arms, and the connecting rods are provided with adjustable brass bearings similar to those commonly used on the connecting rod of a steam engine. The angular position of the drive cranks in relation to the screens tends to further break up the direction of motion and thus reduce vibration.

The lump and egg tracks are provided with receding chutes, which compensate for the difference in height of the cars furnished by the railroad. These are so arranged that picking tables and loading booms can be added at any time if desired. The other two tracks are furnished with plain chutes to convey the coal from the screens to the cars.

This whole screening structure is covered with an entirely independent steel headhouse, to which there is no possible chance of transmitting vibration. The plate feed is provided with a friction clutch, controlled from the headhouse so that the coal supply can be shut off at any time without stopping the shaker. Furthermore, the apparatus is driven by a motor which sets on its own foundation on the ground.

Preparing Coal for the Coke Ovens

By Milton J. Williams*

SYNOPSIS—Except in the immediate vicinity of Connellsville, coal must be crushed in order to make a good coke. The tendency in recent years has steadily been toward larger and heavier machines, which will handle more coal and produce a finer and more uniform pulverization.

There has been a notable change in the size of coal employed in coke manufacture during the past decade and a half. Twelve or 15 years ago the byproduct oven was little known in this country, and those making coke in bee-hive ovens at that time seldom used crushers, taking their slack or screenings and charging the ovens with coarse coal. It was not long, however, before someone discovered that great losses were incurred in coking coal in this manner, and tried a crusher. This was the beginning of what is now an important step in almost every large coking operation.

The First Crushers Made Coarse Coal

The first crushers used, produced a product ranging from 1 in. down to dust. The results obtained were encouraging, but the crude crushers used were of light construction, gave much trouble, were inaccessible for renewal or repair of parts, could not be adjusted for fine or coarse work in the same machine, and were, generally speaking, unsatisfactory.

Enterprising operators therefore began to search for a more substantial pulverizing machine, and one that would produce a finer and more uniform product. Their theory was that if 1-in. lump and finer gave better results than run-of-mine, a product ¾ in. or ½ in. and finer would give still better results.

About this time (1898) the Shawnee Coal & Coke Co., of Eckman, W. Va., secured from Milton F. Williams, of St. Louis, the first hammer crusher which he built. Within 18 months from the introduction of this machine there were in operation in West Virginia about 35 Williams' hammer crushers, most of these machines being equipped to crush to ¾ in. and finer.

It was not long, however, until all of these crushers were equipped with new cages for ½- in. to ⅜-in. crushing, and all new machines were built with ½-in. perforations. It is now seldom that coal for coking is crushed coarser than ¼ inch.

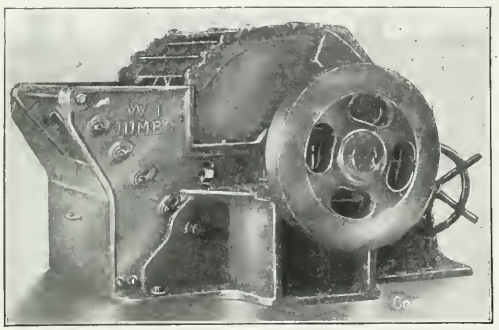
*Old Colony Building, Chicago, Ill.

These operators found that by reducing the size of their coal they were able to produce more coke per oven, and improve its texture, making it hard and firm, something that could not be accomplished without thorough pulverization. Today in many localities in Virginia, West Virginia, Pennsylvania and other coking regions, even with the bee-hive ovens, the requirements are for a product through ⅛-in. opening or finer.

Byproduct Ovens Require Fine Coal

The coal required for byproduct ovens has always been quite fine. When the Hamilton-Otto Coke Co. installed their ovens about 10 years ago, they undertook to charge them with screenings and slack, but soon found that making coke in this manner was a decided failure, as the product when exposed to the elements for but a short time disintegrated and crumbled to such an extent that it had the appearance of crushed coke.

Crushing to ¼ in. and finer gave better results, and it was not long until the byproduct operators all over this country were calling for from 70 to 90 per cent. through



Williams Jumbo Crusher. Note Substantial Construction

⅛-in. openings, and this basis of fineness has prevailed for the past four or five years. There is, of course, no good reason why an operator cannot have a product 90 per cent. through ⅛-in. openings at all times, but this means more expensive and careful attention to the crushers, as working under these conditions they must be adjusted frequently, and the coal must be reasonably dry for the best results.

Coking coal in byproduct ovens would be well nigh impossible were it not for the improved types of crushers. As for bee-hive ovens, many seams of coal are now coked, using slack and screenings. These are, however, practically all in the Connellsville region, where nature has been generous in that the product of the coal measures will produce a good coke without crushing.

Increase in Capacity of Crushers

Almost all other coking coals must, however, be crushed, in order to secure a good coke. Hence mechanical means must be employed to offset nature's neglect in those seams outside the immediate vicinity of Connellsville. In coal crushing today, there seems to be a constantly increasing demand for greater capacities and heavier weights. Twelve to fifteen years ago a crusher with a capacity of 100 tons per hour through a ½-in. openings was looked upon as a large unit. At the present time, crushers with a capacity of 200 tons per hour through ⅛ in. are considered only medium size, and not until we reach a capacity of 300 to 400 tons per hour through ⅛-in. openings is such a machine considered a large one.

In summing up the vast change that has taken place in the size of the product with which ovens are charged, it is evident that the crushing and sizing plant is one of the most important departments of any large coking operation. It is probable that many operators pay too little attention to the selection of the proper crushers as the increase in the percentage of coarse coal greatly affects the structure of the coke, and spoils many a charge that might have been a perfect product.

These conditions have been carefully studied with the result that crushers now manufactured and sold are, in most cases, machines weighing 10 to 20 tons, as compared with those of two to five tons made ten and fifteen years ago. Furthermore, the machines of today are equipped with adjustable hammers, cages and breaker plates to maintain the fineness and capacity.

If the coke operator would pay more attention to the selection of crushers, as important as this matter is to the success of his entire plant, he could save himself many thousands of dollars in equipment, reduce the amount of experimental work, and get results right from the start. Many corporation presidents, managers, superintendents, and purchasing agents have learned, however, that a crusher is an important and valuable piece of machinery and requires as much careful study and attention in installation as many other items about their plant that involve several times the outlay in money.

Germany's Coal Wealth

At the instance of the mining authorities at Bochnur, the coal deposits of the industrial districts of Right-Rhine and Westphalia have been carefully calculated. Within an area of 1532 sq.km. (about 591 sq.miles), which is now being worked, after deducting two billion tons as the amount already extracted, there remains to a depth of 1500 m. (4920 ft.) 32 billion tons of workable coal, while below the 1500-m. line there is estimated to be 10 billion tons additional.

A further area of 1728 sq.km., or about 666 sq.miles, has been opened by borings and is calculated to contain above a depth of 1500 m. a further 45 billion tons of coal. Finally, coal has been discovered in an additional area of about 2900 sq.km. (1120 sq.miles) through scattered borings, with the result that down to a depth of 1500 m. there are here deposits containing 18 billion tons, and at lower depths 151 billion tons.

Labor Conditions at Washington Mines

During the year 1912 the United Mine Workers of America organized local unions at the mines of the Carbon Coal & Clay Co., at Bayno, the Denny Renton Clay & Coal Co., at Taylor and Renton and the Puget Sound Traction Light & Power Co. (formerly the Seattle Electric Co.), at Renton. These companies, however, have refused to sign a contract with the union, and are either operating on the open-shop plan or have closed down.

Methods and Machines for Cleaning Coal

By A. Langerfeld*

SYNOPSIS—Classification of coals. Requirements in specifications for anthracite coal. Description of the different methods and machines that have been used for cleaning coal, particularly the anthracite-breaker methods and machinery. Improvements introduced to obtain a more perfect separation of coal from impure coal, bone, slate and rock. Detail description of the Langerfeld separator and recent improvements in the same. Cost of cleaning coal.

After screening and sizing coal, most of it must be further cleaned to make it marketable. That means that if there are more than certain percentages of impure coal or stone mixed with the coal, the excess must be taken out to make the coal salable.

Classification of Coals

Coal containing less than 25 per cent. of carbon is commonly classed as "rock"; that containing from 25 to 40 per cent., "slate"; from 40 to 60 or 65 per cent., "bone"; while higher percentages of carbon pass for coal of varying quality. It is common to class all coal containing sulphur, rock or other impurities as "slate." "Good bone" is that containing from 50 to 60 or 65 per cent. of carbon, while "bad bone" contains from about 30 to 50 per cent. In chestnut and the larger sizes bad bone is usually classed as slate. It is generally understood that if there is 10 per cent. of actual slate in pea coal, there must not be over 15 per cent. of bone. The same applies to all the smaller sizes.

Specifications for Anthracite Coal

In the soft-coal regions the percentages of slate and bone allowed in marketable coal and the regular market sizes vary in different localities, but in the anthracite-coal fields of Pennsylvania, these percentages and market sizes are nearly uniform. The specifications for anthracite coal usually demand the following sizes: Steamboat, 5 to 8 in., must be all coal; lump, 4 to 6 in., must contain no slate and not over 1 per cent. of bone; broken or grate, 3 to 5 in., must not contain over 1 per cent. slate, or 2 per cent. bone; egg, 2 to 3 in., must not contain over 2 per cent. slate, or 2 per cent. bone; stove, 1½ to 2 in., must not contain over 3 per cent. slate, or 3 per cent. bone. In many specifications, however, 4 per cent. slate and 3 per cent. bone are stated as the limits allowed; but this may be a clerical error, as what was probably intended was 3 per cent. slate and 4 per cent. bone; chestnut, commonly called "nut," ¾ to 1½ in., must not contain over 5 per cent. slate, or 5 per cent. bone. In some specifications the slate and bone in this size is limited to nearly the same percentages as stove coal. Pea, formerly called "peanut" coal, ½ to ¾ in., must not contain over 10 per cent. slate. The percentage of bone allowed here is not usually stated, good bone being classed as coal and bad bone as slate. Buck, or buckwheat No. 1, ⅜ to ½ in., must not contain over 15 per cent. slate, and not too much bone. Some specifications provide that buck must not contain over 15 per cent. of pieces that will sink in a liquid having a specific gravity of 1.7. This is a specific gravity test; often called the "acid test," because sulphuric acid was at first used as the liquid in which the tests were made. Rice, or buckwheat No. 2, ¼ to ⅜ in., is usually not limited in quality, because rice coal from breakers is always cleaner than buck; since the coal being more friable breaks to the smallest sizes in larger quantity than either slate or bone. Barley, about ⅛ to ¼ in. What is smaller than ⅛ or $\frac{3}{32}$ in. is called gunpowder or culm, and is generally allowed to go to waste, although it is nearly pure coal. Some of this is now being made into briquettes.

Recently, much of the slate and bone that formerly went to the culm dump is being ground down to the smallest sizes, it is probable that these small sizes will also be limited in quality in new specifications. Besides, the three smallest sizes, called "steam" coal, in distinction from the larger "domestic" sizes, are now largely sold by their actual heat value. Pure anthracite produces 11,500 B.t.u. per pound.

Methods of Cleaning Coal

There are seven different methods of cleaning coal, which are as follows: 1. Hand picking to remove the slate and bone. 2. Jigging. 3. Separation by frictional differentiation. 4. Separation by specific-gravity method. 5. Separation by washing. 6. Separation depending on the shape of the pieces. 7. Separation depending on difference in friability.

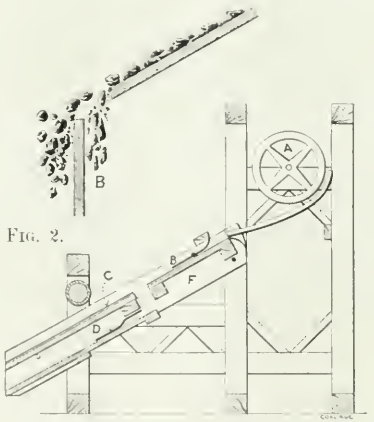


Fig. 2.

Fig. 1. The First Thomas Separator

Formerly, all the cleaning of anthracite coal was done by hand picking, costing from 8 to 30c. per ton, according to size and quality. In 1911, there were 6607 boys and 3201 men employed in the anthracite breakers of Pennsylvania to pick slate. The picking of coal by hand resulted in a loss of from 6 to 12 per cent. of the coal mined, owing to the fact that much of the coal is covered with a slate-colored veneer or layer of charcoal-like material as thin as paper, which deceives the pickers. Also a large percentage of salable bone is thrown out and lost in hand

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picking. Thirty per cent. of good coal in the pickings usually represents about 9 per cent. of the coal mined.

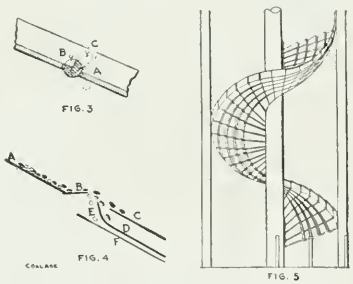
First Machines Were Jigs

Jigs of the most primitive construction were first used. These were gradually improved and a large number are still in use in anthracite breakers. The results obtained depend on the construction of the jig, the care with which it is attended, rate of feeding and the difference in the specific gravities of the coal, bone and slate. Some coals cannot be cleaned by jigging, owing to the coal being nearly as heavy as the bone.

Jigs equipped with elevators cause a large loss of the best coal, often amounting to 7 per cent., as shown by actual tests. The coal is caught in the boots of the elevator and crushed. Besides, there is a considerable loss of coal in the slate, in jigging. The expense in jigging is materially increased by corrosion, owing to the water being acidified by the action of the impurities in the coal.

Separation by Frictional Differentiation

This is the cheapest and most economical method of cleaning coal that has yet been found. It is based on the differences in friction between coal, bone, slate and rock, sliding on an inclined surface. Coal slides the quickest, bone next, slate next, and rock last, the friction of the rock on the inclined surface being greatest. By this method it is possible to separate the material into the following five classes: Coal, rough coal, called also "boney coal" or "good bone"; bone; "slaty coal" or "bad bone"; and rock. In the separation of anthracite coal, all but the clean coal, with its allowable percentage of bone and slate, are sent to the rolls to be broken to smaller sizes; except, of course, the rock, which is worthless and goes to the dump. The bone should be reduced one size smaller and the slate, two sizes smaller. Separators of this class are called "gravity pickers," because the coal slides down the



Improvements in Separators

incline by gravity. It would be more correct to call them "frictional separators." Specific gravity also plays a part in frictional separation, sometimes aiding and sometimes counteracting the separation of the impurities from the coal.

The Thomas Frictional Separator

The first patent for a frictional coal separator was granted to Septimus Thomas, in 1875. Without going into unnecessary details, the important principle of this machine is illustrated in Fig. 1. The coal is fed into the chute from a revolving screen *A*, which is not a part of the separator. A stream of coal as wide as the machine first passes under the apron *B*, the purpose of which is to prevent the tendency of the pieces to roll down the incline and start each piece to slide on the plane. As the different pieces of coal, bone, slate and rock have different velocities, they arrive at the opening above *C* at a different speed. The more swiftly sliding coal and bone jump this opening, while the slower-sliding slate and rock, for the most part, fall through the opening onto the lower chute *F*, which is provided with another apron *D* that serves the same purpose as the apron *B* in the chute above. In many separators of this kind that have been installed in the anthracite breakers, there are eight decks or chutes,

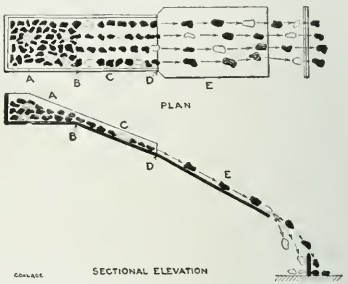


Fig. 6. Diagram Showing Features of the Langerfeld Separator

one under the other, to provide a more thorough separation of the coal from its impurities.

A number of improvements were made on this machine, both by Thomas and others, from time to time. In place of the opening (Fig. 1), a vertical partition *B* (Fig. 2) was fixed slightly below and in front of the end of the inclined plane. As illustrated in Fig. 2, the more quickly sliding coal and bone would fall beyond this partition, while the slower-sliding slate and rock would fall on the rear side of the partition, causing a more or less imperfect separation. It was soon observed that the principal difficulty was that the different pieces interfered with each other on the sliding plane. A piece of coal sliding behind a piece of slate overtakes it and accelerates its speed, while the speed of the coal is retarded. To overcome this difficulty intermittent feeding was adopted, the material being fed onto the incline in dashes or small amounts. While this was an improvement, the separation was still unsatisfactory.

The Emery Feeder

This improvement, in the manner of feeding the coal onto the incline plane, is shown in Fig. 3. It has been used in more breakers than any of the other improvements. It consists of a cylinder *A*, with a quarter section cut out, as shown at *B*. This cylinder was supported by two journals and rocked or turned to and fro, through a quarter of a revolution, by the arm *C*. This device provided a simple method of interrupting the flow of coal and produced good results.

In 1899, Caryl & Snyder introduced an important improvement, the principle of which is illustrated by the diagram, Fig. 4. The differentiating slide *A* terminated in a short apron *B*, inclined at such an angle as to give the material when it arrived at this point an upward direction. By thus throwing the pieces upward, the different flights or trajectories, resulting from the different

velocities of the material, caused them to separate more widely than before and made it possible to introduce two parters *C* and *D* beyond the opening. The lower deck or chute *D* was also provided with an apron *E*, inclined upward at its upper end. The swiftly flying coal was caught on the upper deck *C*, while the bone fell into the lower deck *D*. The slate and rock being the heaviest, and sliding more slowly, fell through the opening and was caught by the still lower deck *F*.

The Spiral Separator

In 1899, a patent was granted to Pardee for the spiral separator (Fig. 5), which depends on the frictional principle. Many of these machines were installed and gave good results in some breakers, while in others they were almost useless. They have been lately used, to a large extent, for repicking the slate that comes from the Emery pickers. Later, an adjustable spiral was patented by Rice, by which the inward pitch of the spirals could be altered so as to afford a better separation in different coals. Unfortunately, in this type of apparatus, the centrifugal action developed tends to send the rock the wrong way. The bone and slate being heavier than the coal have a tendency to move outward from the center and mix with the coal when the spirals are dry and dusty, or when the bone or slate has smooth surfaces.

Other Separators

Separators have been designed with inclined moving surfaces, and some of these have been used to advantage for partly separating the larger sizes of anthracite coal. A patent for such a machine was granted to Phillips, in 1896, and later, to Ayers. The machines, however, have a small capacity, and are therefore not useful for the sizes made in large quantities.

The Langerfeld Separator

In 1903, a patent was granted to the writer for a frictional separator designed to overcome the defects in the Thomas picker, in such a manner as to give a positive separation. This separator contains several new features, one of the chief of which is that the pieces are fed onto the chutes separately and apart, as illustrated in Fig. 6, showing the chute in plan and sectional elevation. The mixture of coal, bone, slate and rock, shown at *A*, is divided at *B*, in a manner to be described later, so that it passes onto the incline *C* in separate streams or files. In the diagram the coal is shown in solid black and the impurities in outline. At *D*, a single-piece feeder is so arranged that each piece is fed separately onto the chute *E* as shown in the figure. This arrangement of feeding allows no collisions between the pieces and permits each piece to arrive at the end of the chute, or slide, with a velocity determined by its kind.

It is upon this principle of feeding chiefly that the success of the separator depends. The same principle is applied throughout the system. This feeding mechanism has recently been perfected in every detail, so as to give the required capacity. The quantity of coal that can be fed into a separator, in this manner, can be positively cal-

Fig. 7. Showing a Series of Six Langerfeld Separators under One Roof

culated, by first ascertaining the number of pieces in a ton and then designing the machine to feed the required number of pieces a day. For example, the number of pieces in a ton of anthracite chestnut coal varies from 70,000 to 90,000, giving an average of 80,000 pieces per ton. The files of chestnut-size pieces, shown in sections *C* and *E*, Fig. 6, should be about 2 in. apart, and the pieces should be fed about 2 in. apart lengthwise or in the direction of slide. Experience has shown that from four to six pieces can be fed per second. The average run of coal of this size can be fed at the rate of six pieces per

FIG. 8. A PORTION OF A LANGERFELD SEPARATOR

second, but when the coal is very dirty, it has to be fed slower. This must be determined at the mine in question. But we may assume the average rate of feeding as five pieces per second.

In a thousand-ton breaker, the percentage of anthracite chestnut runs from 20 to 30 per cent., average 25 per cent., or 250 tons. Such breakers are usually built in two equal halves where the chestnut size is made, giving 125 tons of chestnut on each side of the breaker. In order to allow for delays and the subsequent rush of coal to make up for the time lost, it is necessary to calculate on 150 tons or better, 200 tons per day of, say nine hours; which gives an average of $(200 \times 80{,}000) \div (9 \times 60 \times 60) =$ say 500 pieces per second. Feeding at the rate of five pieces per second will then require 100 files in the feeder; and if these are 2 in. apart, the total feeding width must be 200 in. or nearly 17 ft. As this is an inconvenient width, the stream of coal is divided in half and two feeders, each 8 ft. wide, are used and have been found to give good results.

In Fig. 7 is shown a series of six Langerfeld separators under one roof. The construction of the separator is shown more in detail in Fig. 8, which represents one only of the series of separators. The coal first runs over a spreader that spreads it evenly from the width of the feed chute to the entire width of the machine, as shown above *A*, Fig. 8. A side elevation of the separator is shown in Fig. 9, while the movement of the coal through the separator is clearly illustrated by the diagram Fig. 10, which represents a vertical section through the several rolls, chutes and parters; and makes clear the separation of the several grades and qualities of material. The letters *A*, *B*, *C*, *D* refer to the same parts in Figs. 8 and 10, and likewise *A* and *B*, in Fig. 9. After passing over the spreader, the material is divided into two nearly equal streams, by a stream parter, consisting of the roller *A* and the parter *X*, Fig. 10, parallel to the roller and under its front downward-turning face.

As shown in Fig. 10, the parter *X* divides the stream of coal so that about one-half, consisting of the thicker pieces, is carried forward and the other half, consisting mostly of the thinner pieces, is carried backward under the roller. This partial separation sends nearly all the rock forward and nearly all the slate backward. This

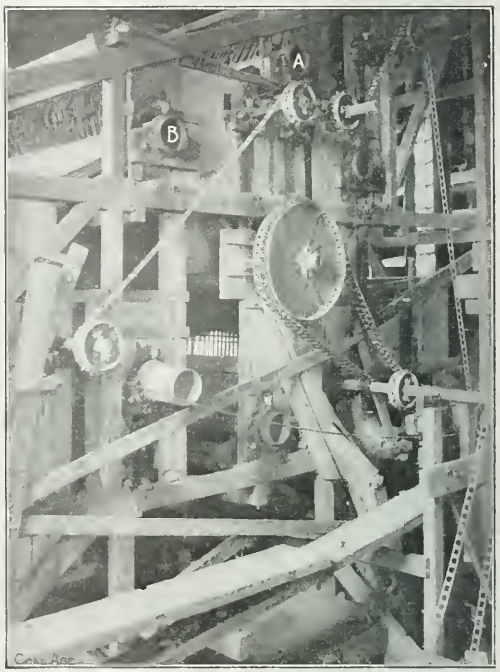


FIG. 9. SIDE VIEW OF STOVE-COAL SEPARATOR

separation is important as it facilitates the single-piece feeding that follows in each set, as illustrated in Fig. 10.

Leading to the top of each feed roller *B*, there is a channeled chute *E*, in which the pieces travel in files, as shown at *C* and *E*, Fig. 6. Above each roller *B* is a fringe of feeding fingers, which are clearly shown in Fig. 8. The purpose of these feeding fingers is to retard the movement of the pieces, separating them so that they are a certain distance apart, more or less, in each file or stream. The fingers are lifted each time a piece passes under it and drop back in time to catch the next following piece, so that no two pieces follow each other close enough to collide on the slide below the roller.

The channeled chute in each set is attached to a shaker *K*, Fig. 10. These shakers are perforated with small holes and let out the dirt and rub off much of the mud or particles that adhere to the moist pieces. The dirt falling into a hopper is carried away by a screw conveyor, shown at *V*, Fig. 10. From the roller *B* the material passes over the slide to the end *C*, from which it falls in a shower, as illustrated in the diagram, Fig.

10. These stream slides are made of corrugated soft steel or iron, as shown in Fig. 11. The advantage of this detail is that the coal is pulverized less and rides the ridges, as shown in Fig. 11, while the fine particles and dust slide down in the valleys between the ridges. The corrugations increase the efficiency of the slide very much over the old style of flat stone slab or plain steel. In those slides the coal and slate ride on the small particles and dust, with the result that the slate slides almost as quickly as the coal.

At the end *C* of the slide, the best coal has attained a velocity sufficient to send it over the parters *R*, Fig. 10, into the discharge chutes *D*. The purpose of the fringe *H* over these chutes is to prevent the breakage of the coal that has passed over the parter under a high velocity, which is reduced by the fringe sufficiently to avoid the breakage of the coal. The pieces that fall back of the parter pass down into another part of the machine designed for separating rough coal and bone from slate and rock. The construction shown in Fig. 12 is called an "invertor."

After passing over the roller *B*, in each set, and sliding down *F*, the pieces strike the invertor *G* that turns each piece over as it leaves the slide *F*, as illustrated in Fig. 12. There are many pieces that consist of a layer of slate or bone and a layer of coal. These are called capped pieces, and are classed as bone. They are apt to pass over with the coal if they slide on the coal side, and with the bone or slate if they slide on the other side; but the invertor makes the final separation of such pieces practically complete. Another advantage of the invertor is that it checks a rolling piece by acting to reverse its rotation, as shown in Fig. 12. When a piece rolls it moves faster than when sliding and may go to the wrong place. Again, the centrifugal action developed in passing the invertor causes the heavier pieces to rub harder against

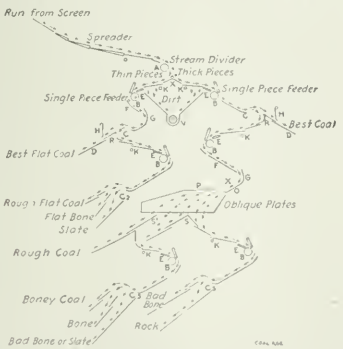
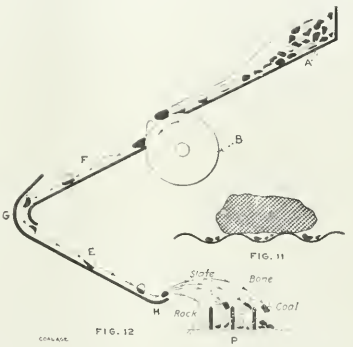


Fig. 10. Diagram Showing Course of Coal through Breaker

the deflecting sheet and retards their motion, which action assists in their proper separation.

The lower end of the second slide *E* is curved upward, as shown at *H*, Fig. 12, and, as previously explained, thus gives a greater divergence of the flying particles as they leave the chute, and makes possible a four-part separation; namely, coal, bone, slate and rock, by the insertion of three parters, as shown at *P*. In general, however, only a three-part separation is made in this part of the machine. In separators of this kind, designed for sizes larger than nut coal, the breakage of the coal is almost entirely prevented by giving the end plate a sidewise inclination, which causes the coal to slide to its proper place, instead of letting it fly or jump, as in the diagram, Fig. 12. This end plate is shown at *P*, Fig. 10. The end plate is warped or twisted so as to give the separation shown, the different materials sliding over the plate in the diverging curved lines indicated by the arrows. The parters *SS*, below the lower edge of this plate, carry the material to the proper places. These parters



Diagrams Showing Invertor and Section of Channeled Chute

are made adjustable to regulate the separation according to the condition of the material. I omitted to mention that Fig. 9 is a side view of the stove-coal machines, located at each end of the series of separators shown in Fig. 7.

In a breaker, the run-of-mine coal usually comes so clean as to require but little cleaning after sizing. In such cases, separators can be speeded to nearly double their intended capacity. But in a washery, or in breakers where very dirty coal is to be cleaned, the machines should be run at their intended speed. No boys are employed to pick slate, in the breaker shown in Fig. 7; but the wages saved by using these machines is a small item in comparison to the saving of coal and decrease in expenses and losses incident to the recleaning of condemned coal. A carefully conducted test made at one of the breakers equipped in the old way, showed a loss of 30 per cent. of the market value, in a car of chestnut coal that was run through the breaker a second time.

Automatic Regulation for Dry and Wet Coal

By the perfection recently made in another part of the machine, these separators are made automatic in separating runs that vary from dry to moist and wet coal; but the patents on this addition have not yet been issued. At the present time, these machines are set by means of a single lever, so as to separate dry, moist or wet runs. In breakers in which the run-of-mine changes in respect to being dry, moist, or wet, a runner is required to regulate the necessary changes. The regulation to which I refer is accomplished, at the present time, by moving the parters *RR*, Fig. 10, and the others in proportion, by suitable connections.

The Cost of Cleaning Coal

The cost of cleaning coal by means of such machines as I have described is about 1c. per ton, which covers all

expenses, including the average cost of renewing worn-out parts, in a dry breaker. In a wet breaker, the internal wear of the parts is greater on account of the acidity of the water, to which I have previously referred, and which increases the cost of separation to 1½ or 2c. per ton.

Separation by Specific Gravity

The separation of coal by specific-gravity methods cannot be done commercially, in large quantities. It costs too much. This method is of use only for the separation of samples for tests. Such a separation is accomplished by immersing the material in a liquid that is heavier than coal and lighter than bone or slate. The cheapest liquid for this purpose is sulphuric acid properly diluted. A less dangerous liquid to use is a solution of chloride of zinc. The average specific gravity of anthracite coal may be taken as 1.45; but pieces exceeding 1.75 are classed as slate.

The separation of coal from slate and bone by washing was accomplished in English collieries, many years ago, in the same manner that gold is washed in troughs, or sluices, with riffles on the bottom of the sluices. Two such sluiceways were used; and when one was full of bone and slate, the run of coal and the flow of water were turned into the other one, while the first was being cleaned; and this process was repeated, successively.

A few years ago a machine was patented in this country for washing the steam sizes of anthracite coal by dropping a sheet of such coal into a flowing stream of water. The coal being lightest, was carried the farthest down stream, the bone next and the slate and rock last. Good results were obtained, but there was little use for the machines.

Separation by Shape of Pieces

Separation depending on the shape of the pieces is too wasteful to be commercially useful, but, in most breakers, devices are used for separating flat pieces, because most of the slate is of that shape. There are, however, many flat pieces of coal as well as slate, and a further separation is necessary.

Separation by Crushing of Coal

Soft coal is often cleaned by crushing, in such a way as to crush the coal without crushing the slate, bone and sulphur. In most cases, this is done by dropping the material in revolving perforated cylinders, the drop being of sufficient height to break the coal, but not the slate, bone or sulphur. The fine coal passes out through the perforations, and the refuse passes out at the open end of the cylinder. Another method is to pass the coal through hammer crushers so adjusted as to crush only the coal. This method cannot be used at the present time, for anthracite coal; because fine anthracite coal brings a much lower price than the larger sizes.

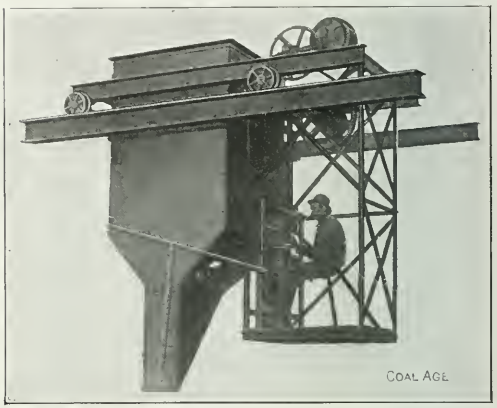
Knockers, or bumpers, are also used for cleaning soft coal. In this method, the coal is fed onto a slightly inclined plate near its middle. The plate is moved upward in the direction of its plane, slowly; then it is abruptly stopped and quickly moved in the opposite direction, which tends to move the slate upward on account of its greater weight, friction and momentum, while the coal moves downward. For anthracite coal, these machines would probably not be as economical as other separators, because there is considerably less difference in specific gravity between the anthracite coal and slate than there is between soft coal and slate.

Flexible System for Boiler Coal

Motor-driven coal hoppers, which can take coal from bunkers located anywhere and deliver it to any boiler in a battery, are coming more and more into favor. Their use does away with the system of overhead bunkers and individual chutes for each boiler, and permits all the coal to be concentrated in one bunker instead of in a series of pockets.

The bunkers can be placed at one end of the boiler room, or, for that matter, outside the building if necessary, so that the steam-generating plant can be designed and located with greater freedom, and plenty of space can be left above the boilers for light and air.

This system is also frequently preferred to conveyors



Traveling Hopper on Overhead Trackway

because it is cleaner, less liable to break down, cheaper in first cost, and does away with the difficulty of taking care of the surplus or overflow which a conveyor will carry on to the end of the line after the intermediate discharge gates are closed.

The hopper runs on a trackway parallel to the front of the boilers and is controlled by an operator in the same manner as an overhead crane. Accurate scales on the hopper make it possible to keep a precise record of the fuel burned by any boiler. If desired, a recording device can be installed so that a printed record of the weight of every discharge can be made by the operator. The hopper runs under the bunker and is filled by the operator, the scales indicating when it is full. It is then run into the boiler room to deliver its contents wherever it is wanted.

These hoppers are manufactured by the Bergen Point Iron Works, Bayonne, N. J., and Westinghouse motors are ordinarily used to propel them.

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The production figures of 1912 are being compiled as rapidly as possible and from reports already received it appears that the total output of Alabama mines will be well over 18,000,000 tons, which is approximately a 21 per cent. increase over 1911. This abnormal increase in coal consumption bespeaks the wonderful industrial progress now being made in Alabama and adjacent states. Many new mines are being opened with the expectation of getting a goodly supply of the coal business that will naturally develop in connection with the Panama Canal trade. If adequate shipping facilities are furnished, the year of 1913 will show a substantial increase over last year's production.

WHO'S WHO—IN COAL MINING

It has been aptly said that some men can do business well. Others can do business very well. A few can do business superbly well. And there be found—at long intervals—an occasional one who can do business so completely well that he has distanced the bunch and stands alone in his chosen field. To this latter select class Francis Stuyvesant Peabody seems to belong.

Mr. Peabody was born at Chicago in 1859. His ancestors on one side of the family were Dutch, the other branch English, although the Peabody family has now passed the two-century mark in this country. And it is only fair to say in passing that he comes by the "Stuyvesant" legitimately, his mother belonging to one of the old Knickerbocker families.

FRANCIS STUYVESANT PEABODY

After knocking about from "pillar to post" in various of the country's then meager educational institutes, he succeeded in capturing a sheepskin at the Sheffield Scientific School of Yale, in 1881. Thus equipped, he went through the customary painful disillusionment of the cub-graduate, waiting for the world to offer him a position, and finally "getting a job" as railroad messenger. Two years in various capacities as bank messenger and traveling salesman convinced young Peabody of the fallacy of getting rich on a salary; so in the year of 1883 we find him embarking in the coal trade, his sole assets being a team of white mules, an indifferent wagon and a well cultivated taste for cigarettes. But that he has now distanced the bunch and stands alone, even his most bitter rivals cheerfully concede.

To understand the man it is necessary to study the environment and conditions under which he waged his successful battle with life. It is a well known fact that most of the leaders in the coal industry today came up from the operating end, but Mr. Peabody is an exception in this respect, having made his *début* in trade circles. His broad knowledge of the producing end of the game has been acquired entirely in the hard school of practical experience; that he was an apt student one has only to compare the photo of his maiden effort, the "Old slope" mine (shown on next page) with any of the present-day efficient and high-powered Peabody operations.

The merciless competition which has characterized the past history of the coal business in Illinois does not seem to present a very inviting prospect. But when Frank Peabody became a power in that field he performed a service for the industry that it can never repay. He brought together contending interests and abolished intrigue and secret methods of doing business that threatened ruin to the contending principals and effectually discredited the industry in financial circles.

Previous to this time price-wars of the most reckless sort were precipitated upon the slightest pretext, or no pretext at all, while the trade was surfeited with irresponsible adventurers and business integrity was rapidly diminishing into an unknown quantity. Obviously a legitimate enterprise could not exist in the face of such conditions, and it remained for Mr. Peabody to set up new standards and inculcate new principles into the trade. He attacked the job with his usual indomitable enthusiasm and gradually inaugurated a new era in the Chicago coal trade —rejuvenated it and gave it a new vigor and a new strength. One of the tangible evidences of his labors was the formation of an association which collected some two hundred thousand dollars in bad debts from scheming consumers and unscrupulous small dealers.

Frank Peabody is a radical optimist of the most pronounced type. We endeavored to impress him with the grave possibilities of labor's latent brute power of passivity. We called his attention to the alarming prognostications of our most eminent authorities on economics regarding the concentration of enormous wealth that is being effected by the modern interlocking directorates. In fact we bombarded him with a perfect broadside of the subtle innuendos of the present-day alarmists, but without avail. In every case, he stoutly affirmed these were but temporary problems that would automatically solve themselves in due time and prove stepping-stones to higher and better things.

The coal industry itself knows the man as a consistent altruist and a conservation enthusiast. On his periodical visits to the mines he is more apt to inquire how Bill Jones was killed up in the Tenth North air course last month than why the cost of haulage on the Main West increased three cents. The humanitarian aspects of the mine-workers commands his first interest and he was among the first to adopt the modern slogan of "safety first." He regards the recent legislation in Illinois, pro-

viding more comprehensive and effective safeguards for the miners as only the beginning of a broad general movement in that direction.

In the matter of conservation, he is inclined to shoulder the greatest responsibility on the consumer. He regards the meager percentage of efficiency obtained from burning the coal as the gravest menace to the principles of true conservation. While conceding that the mining companies are also wasting enormous tonnages, he believes that no concern can properly conserve its coal and remain solvent, without a broad comprehensive governmental regulation of the systems of mining. Even so he is of the opinion that the operators have materially benefited the conservation cause by educating the consumer up to using the finer grades of coal, which have in the past been

ruthlessly scattered along the highways to improve the roadbed.

In some respects the subject of our sketch differs from the usual type of self-made man who tends rigidly to business up to the last gasp and dies with his boots on. Thus we find that he insists on an annual pilgrimage abroad, is an ardent fisherman, an enthusiastic equestrian and as boastful of his presidency of the Hinsdale Golf Club as he is indifferent to like offices he holds in some of Chicago's powerful financial institutions. He is a member of many popular clubs. On the whole, Frank Peabody is a genial, hospitable personage who has a boundless liking for his fellowman and an innate courtesy so entirely unaffected that one is immediately impressed with its sincerity.

He credits his conspicuous success to an infinite capacity for hard work and a faculty of letting the other fellow do the worrying. The most casual observer, however, catches a gleam of other things behind the kindly brown eyes. An alert, questioning, appraising—in fact a "show me" look that makes you feel glad your business with him is legitimate business. It hints of a coldly impersonal and unbiased mind that has, perhaps, intuitively or subconsciously, proved his great mascot.

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Paint Creek Strike at an End

The officials of the United Mines Workers of America have entered the country now under martial law along Paint, Cabin and Coal Creeks, by permission of Governor H. D. Hatfield. They are repared to instruct the mine workers to apply for their positions trusting in the assurances of the governor that the interpretation they put on the agreement will be accepted by the operators. The men have claimed that there was some ambiguity as to whether the adherents of the Union would be given an equal opportunity with others. There is no little rejoicing over the promising outlook for early peace.

Miners Less Efficient

A mathematical demonstration of the decrease in the efficiency of anthracite miners in recent years has just been prepared from the figures in the last report of the Department of Mines of Pennsylvania. When the breakers are not running, it is useless for the miners to cut coal, and hence, the only way to arrive at a right and just estimate of their efficiency is to divide the annual output of the mines by the product of the number of miners employed and the number of breaker days. The result of this calculation was as follows:

Year	No. of Miners Employed	Average No. of Days Worked	Total Miners' Working Days	Output in Tons	Average Production per Miner per Day
1901.....	37,804	195	7,371,780	59,905,951	$ 13
1902.....	36,392	116	4,221,472	36,911,549	$ 74
1903.....	36,823	211	7,769,653	67,171,951	$ 64
1904.....	39,848	213	8,487,624	65,709,258	$ 74
1905.....	42,078	208	8,752,224	70,220,554	$ 02
1906.....	41,801	206	8,611,006	64,410,277	$ 48
1907.....	43,035	227	9,768,945	76,836,082	$ 86
1908.....	44,340	211	9,355,740	74,592,181	$ 97
1909.....	44,675	205	9,158,375	71,628,422	$ 82
1910.....	43,651	212	9,254,012	74,717,852	$ 07
1911.....	45,324	234	10,605,816	81,176,050	$ 65

The variation of even a small fraction of a ton in the average production per day makes a tremendous difference on account of the great number of miners employed. As the variation in the above table is over a ton, it implies a decrease in efficiency of nearly 40,000 tons a day, when the highest and lowest figures are compared. This decrease in efficiency is attributed by James E. Roderick, chief of the Department of Mines, to the laxity with which miners' certificates have been issued by the Miners' Examining Boards to foreigners who cannot speak or understand English, and with whom the more intelligent and conscientious class of mine workers are unwilling to work as helpers for two years in order to qualify as miners themselves.

The great variation in the total number of working days also shows how costly to the mine workers are suspensions and strikes. In 1902, there were 3,150,308 fewer miners' working days than in the previous year. At the absurdly low estimate of $2 a day, this cost the miners alone $6,300,616. Since the miners form about a quarter of the total number of mine workers, the total loss in wages to all employees was approximately $25,000,000.

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Rolled Cast-Steel Flanges for High-Pressure Piping

The *Zeit. für Dampfkessel und Maschinenbetrieb* for Feb. 14 and 21, 1913, has the following in substance to say regarding the use of rolled cast-steel flanges for high-pressure piping: The welded-flange joint is always liable to produce local stresses at the weld, which may result in a lowering of the coefficient of safety of the plant. The rolled joint is both cheaper and safer. The cast-steel flange, when properly made and annealed, is much superior to wrought iron, but not every steel foundry can do such special work.

The tests made at the Royal Testing Laboratory at Gross-Lichterfelde, West., have shown the superiority of the cast-steel flange over other types. This superiority was due partly to the construction of the joint, which was a series of grooves and sharp-edged threads. By this means the working face between the pipe and the flange, owing to the softer material in the pipe, is made much larger than is the case with the usual construction.

EDITORIALS

The Flooding of a Mine in Illinois

On Apr. 6, the recent flood invaded the mine of the Gallatin Coal Co., and caused about $25,000 of damage. The shaft lies near the Saline River at a village called Equality. The rising of the Ohio River flooded the Saline Valley and filled up the mine, where about 150 acres of 5-ft. coal has been taken out. After the water poured in, the compression of the air caused a remarkable phenomenon. According to some observers, the water spouted up from the shaft mouth to a height of 200 ft. Great difference of opinion exists as to the cause of this geyser-like action. We are conducting an inquiry into the cause of the strange occurrence.

Shall Labor Be Immune?

Mr. Gompers is making a persistent and determined effort to push through his bill providing exemption of the labor unions from restraint under the Sherman Act—a move which, it is strongly intimated, is regarded with favor by the President. The bill is being introduced in the form of a "rider," which immediately condemns it in the eyes of all honest men, since a just cause may stand on its own merits and does not have to be tucked under the skirts of a legitimate and necessary measure which our national assembly feels honor bound to enact.

Nor is this the most obnoxious feature of the case, as Mr. Gompers and his associates are seeking to accomplish their purpose by a miserable subterfuge, so transparent as to be at once obvious to all. That is, instead of openly and boldly demanding exemption from the Sherman Act, they are seeking to make it ineffective by forbidding the application of the regular funds to the prosecution of those cases wherein the labor unions are infringing upon it.

We have had a glaring example of the irresponsibility of organized labor in the numerous unjustified strikes in the anthracite fields, and it is to be hoped that our lawmakers will take cognizance of these incidents, and see fit to put the same check on labor as on capital. Mr. Taft vetoed a previous effort to put this bill through, and it will be interesting to note the attitude of our new administration on the question.

The Press of Pittsburgh

The press of Pittsburgh has ever been disposed to view the corporational activities in the environs of that city with friendly judgment. If it has failed to record the whole truth, the error in its verdict has been in smugness and complacency rather than in fierce and unrelenting criticism. The newspapers have almost never been disposed to break into the conscienceless condemnation so common in other cities, where corporations, good, bad and indifferent, are flayed with superlative criticism whether they do well or do ill. When the Pittsburgh Survey was published, the press of Pittsburgh rose to a man and called the inquiry unholy and a travesty on the fair name of the city and its industries. In fact, the Pittsburghers are proud of their commercial supremacy and more jealous of the honor of their industrial captains than are the citizens of other municipalities, yet strange to say, the newspapers of Pittsburgh have, with remarkable unanimity, condemned the company operating the Cincinnati mine.

The mine, we must admit, does not justify the adage which declares that only model mines explode. The pictures accompanying our review of the disaster sufficiently bear witness to the fact that the mine at Courtney was not a show colliery. It is a relic of former years, and this fact is not disguised by the presence of electric machinery and an electrically-driven fan.

But apparently the mine was a better working proposition than exterior appearances would tend to make us admit. It has had for a generation a reasonably good record of freedom from accident. So there is no apparent cause for condemnation, and one is led to ask why the newspapers are disposed to take an unfair view. The answer is furnished by stating the untimely attitude of the company. In the year 1913, it is an anachronism for a corporation having an accident of such magnitude at a mine, to debar photographers and reporters and to decline to answer any fair and reasonable questions.

Met by the State Constabulary, forbidden to photograph the company's tipple and drift mouths from other points than the public roads, the reporter is naturally made sore and nettled. Refused information by the company officials, the newspaper man is driven to obtain his facts from parties whose misfortunes alone make them partial witnesses, even if these men of themselves are naturally honest and reliable in their statements. In fact, the inquirer almost inevitably drifts to the professional agitator, the loud-mouthed sorehead and the theorist who talks for the prominence thus obtained.

It is said that the company has the reports of the foremen and firebosses under lock and key, and other evidences of the condition of the mine are hard to find. The public is naturally suspicious; we think entirely without real reason but certainly not without occasion.

The railroads have long learned that openness in such cases pays and the Pittsburgh Coal Co. may also find it to its advantage to appoint someone to distribute reliable news to those desirous of obtaining it. The early declaration that the explosion was not severe surely has not profited the corporation a whit. The report, true or false, that it discouraged the Bureau of Mines from sending its rescue team has not made it popular. But of all its blunders the worst was its treatment of the press in the persons of a number of young reporters who were willing to do the company and the mishap at its mine more than even justice. Can these young men be blamed for thinking that some foul thing needs enshrouding? Why, otherwise, should the company cover it up so completely or guard it with such jealous circumspection?

A Dangerous Bill

Although we have already called attention to the direful consequences to the coal industry of Ohio should the proposed "Green" bill become a law, we are pressed by the seriousness of the situation to again point out the dangers that will result from the enactment of such unfair legislation.

There seems to be little hope that the Miners' Union, which organization has fathered the bill, will reconsider its purpose and withdraw support of this hostile measure. It is to be hoped, therefore, that the citizens of Ohio will give careful thought to the proposed act before the bill becomes a law. Certainly, the experiences of other states, where laws have been enacted compelling the coal oprator to pay the miner for his coal on a "mine-run" basis, should have some influence in the legislative course pursued by Ohio.

Careful investigation will show that in all states where the "run-of-mine" system has been adopted, the number of accidents has increased, and the price of domestic coal to the consumer has been raised. It is inevitable that when a miner is paid for his coal, irrespective of the size of the product, he will use an excessive amount of powder in shooting. As a result, the roof is shattered and the falls of slate and rock are more frequent.

Whatever affects coal mining in Ohio will have a similar affect on other great industries of the state. Should the "Green" bill become a law, coal mining in Ohio will be put back where it was half a generation ago. From the enviable position it now holds near the top of the list of progressive mining states, it will retrograde to a position among the few remaining states, where ill-advised legislation preserves a condition that causes the coal operators to be held up to ridicule.

The widespread effect of such an act by the legislature of Ohio can best be understood when it is stated that there are 648 mines operating in that state. The output of these mines last year was approximately 34,000,000 tons, having a value of more than $35,000,000 at the mouth of the mines. Under the present agreement the miners are paid $1 per ton for all coal that goes over a 1¼-in. screen. There is also an equivalent mine-run price of 71.4c. per ton. This, therefore, is a difference of 28.6c. per ton, which fully compensates the miner for the fine coal. As the agreement now stands, it is to the interest of the miner to send out clean coal. Under the new proposed act, he would be encouraged to load out whatever impurities the coal might contain, so that he could receive pay for it.

In the year 1883, this same question was extensively discussed in Ohio. A commission was appointed and the following conclusions were arrived at by the majority of this commission, after having taken testimony from miners and operators in practically every mining district of the state.

CONCLUSIONS

From as fair and unprejudiced study of the testimony and the facts of the case as they were able to give, the commissioners agreed in the conclusions that if the payment of wages for mining was based on the weight of the coal sent out by the miner without consideration of its quality as to size, the plan would prove, for a time at least, prejudicial to the interests of both parties; to the operator by putting him to an inevitable disadvantage in the market, and to the miner by reducing or cutting off his work.

The claim that good miners would make the best possible good grades of coal because it is wisest for them to make such grades, we do not find to be founded. The weight of at least indirect testimony is strictly opposed to this view. The claim that as a body they would mine their coal as large as possible from a motive of pride in doing their work well, or as one witness expressed it, "The operators could safely trust to the conscience and pride of the miners," in this respect we find to be of still less weight. It seems to us to be negatived by experience and invalidated by the laws of human nature. Against the steady interest of self-interest in the way of relief from hard work, such motives do not hold their ground except in a small minority of cases.

Under the third and fourth heads, however, the present screen system fully sustains itself. It gives all due advantage to the skilled miner, and it proves itself in operation a thoroughly practicable working scheme. It is simple, intelligible and easy of execution. The fact that it has won its way against all competing systems to its present prominence goes far to show that the miners are not suffering injustice from its operation. A system essentially and innately unjust would not have been allowed by them to grow to its present proportions. A number of experienced miners testified that though the general sentiment of their body was opposed, they themselves considered the system a fair and satisfactory one.

In 1905 the Legislature of Arkansas passed a mine-run bill similar to the one now proposed in Ohio. A. H. Purdue, State Geologist of Arkansas, made a careful investigation of the matter, and we quote from his report as follows:

The proportion of fine coal increases unless the men have some incentive to do better work.

Thirty-five cents a ton is a conservative estimate of the decrease in value of the Arkansas coal as a result of the influence of the mine-run law.

The heavy shooting following the passage of the mine-run law has progressively increased the amount of rock falling in the rooms to triple that of 1905, prior to the law. It is, therefore, directly responsible for at least half the deaths due to this cause in 1908.

The estimate of the proportion of deaths due to the mine-run law is shown to be conservative by the fact that the number of deaths per million tons of coal mined has increased more than 40 per cent. since 1905.

The consumers suffer and are compelled to pay an increased price for coal of inferior quality.

The unfair treatment of the men who have spent their money developing the coal mines, the impairment of the value of the fuel supply of the state and its increase in price, will tend to discourage the investment of more money in industrial enterprises.

William Green, who introduced the bill, is a miner and was a few years ago president of the Ohio Miners' Organization. For two years he has been statistician of the United Mine Workers of America. Although he does not draw pay from the miners' union while the legislature is in session, we understand that his salary from the miners' organization will commence automatically upon adjournment, so that he is really an officer of the miners' union. He is president protem of the Senate, which fact gives him prestige in legislative matters.

The "Green" bill passed the Senate and went to the House of Representatives, where after two weeks' delay it passed by one vote. A few days later it was reconsidered and slightly amended. The bill is now in one of the committees and may or may not be brought up again at this session, which is about ready to adjourn.

There is no doubt whatever but that the only purpose of this measure on the part of the miners is to obtain a greater price for their labor with a less amount of work. To enact such a law would be unfair to every coal operator in the State of Ohio, since it will remove the only method by which he can make contracts with his employees. It will counteract effectively all plans designed to safeguard the lives of the miners, and strikes a destructive blow at our present popular ideas concerning the conservation of the nation's resources.

Coaling Steamships

SYNOPSIS—Description of a portable apparatus which can unload barges or vessels at a high rate of speed without employing numerous shovelers or trimmers.

One of the most modern and unique machines for coaling steamships is the De Mayo unloading elevator, manufactured by the Robins Conveying Belt Co., of New York.

This coal-handling device consists of a series of sheet-steel buckets of rugged construction, the backs of which form part of an endless steel belt. Between each two

THE DE MAYO UNLOADING ELEVATOR IN OPERATION

buckets is a steel plate of about the same height as the bucket itself, acting as a spacer. The buckets and the spacer plates are connected by hinged joints through which steel pins are passed the full width of the bucket and project at each end. At the upper and lower ends of the elevator are two cast-iron sprockets of special shape provided with teeth which engage the aforesaid pins.

The buckets are self-clearing by virtue of their special construction, so that the backs of the buckets as well as the intermediate plates act as a chute for conducting the coal or other material from the head sprockets into the telescopic chute. The entire machine is inclosed in a steel dust-proof casing and the motor is set at the head end inside the casing and is rendered accessible by doors in the housing.

The lower end of the casing is open, the corner angles forming four legs which sink into the material in the vessel. The machine is suspended from a boom or mast by a cable and its weight is allowed to rest on the material to be dug. During the greater part of the operation the buckets are self-filling, although it is necessary to have a man or two near the elevator to help break down the pile and allow it to run toward the foot of the elevator.

Power is brought to the motor by a flexible cable from the dock or vessel being coaled. The average machine requires a 10-hp. motor and the larger sizes, which are some 40 ft. in length, require a 15-hp. motor. The smaller machines can deliver 75 tons per hour and the larger ones 100 tons per hour of steam coal.

Several steamship companies are now bunkering their coal under this arrangement. They state that it costs them considerably less and requires not more than one-third of the time necessitated by older methods. It also eliminates the dirt and dust, which are such a frightful nuisance in the coaling of passenger ships.

As compared with the above stated capacities of the machine, we will add that under the present or old method of coaling vessels by means of tubs, a gang of six or seven men with a tub is able to put only 15 tons of coal per hour into ports, to say nothing of the dirt involved and the loss of coal overboard.

Another great advantage of the machine is its flexibility. It can be hung and swung anywhere and easily raised and lowered to conform with the height of vessels or cargoes. In coaling steamships, it is generally customary to have four to six loaders on each side of the ship, which clean up the coal to the bottom of the barges; when this operation is completed, all of the machines are raised simultaneously, the barges are moved to a new position and the operation recommenced.

This machine is not only adapted for handling coal, but any sort of semi-hard material such as phosphate, sulphur, salt, etc. It can be used for loading from barges into vessels, from vessels into barges, or from railroad cars into bins. In fact its field of operation is quite extensive.

The Nitrogen in Coal

In his book on the "Carbonization of Coal," Vivian B. Lewes discusses the source of nitrogen in the fuel. He believes that not all of it is derived from the original vegetation.

In growing plants, small traces of nitrogen are found combined so as to form extremely stable compounds. Some plant forms contain more nitrogen than others, but as a rule 0.1 to 0.2 per cent. will represent fairly the amount present. Little nitrogen is disengaged as the vegetation changes into coal. Moreover the coal represents only a small fraction of the original deposit from which it was formed. These two facts suffice to explain why coal contains from 1 to 2 per cent. of nitrogen.

Peat, however, which is regarded by most authorities as an intermediate stage in the conversion of vegetable matter, often contains more nitrogen than is present in coal. While the highest percentage I have ever found in coal is 1.8 per cent., I have found 2.5 and even 3 per cent., in specially rich peats; so that it is probable that in its growth or decay, the sphagnum has a special power of directly absorbing and assimilating the nitrogen of the air.

DISCUSSION BY READERS

Education in Coal Mining

Letter No. 8—The value of education for the coal miner is strikingly illustrated by the careers of many men who have risen to high places of authority. The man in the mines who does not study may have no trouble in holding his job; but the man who acquires an education and learns about the job ahead of him is pretty sure to rise, provided of course that he possesses the proper moral qualifications. The direct money value of an education is evident. If a man is an inside laborer at $2.62 per day, or a motorman at $2.95, he can feel reasonably certain that if he earns his certificate he can secure a position as fireboss at about $3.40, which is a rise of 30 per cent. and 15 per cent., respectively.

An education may be obtained by private study, and we are all familiar with notable examples of success due to this method being followed. There are, however, certain advantages in attending a mining class. In the first place, if one is enrolled in a class he is much more apt to advance faster in a given space of time. His class meetings are definite periods, in his weekly calendar, and he is a great deal more likely to attend them regularly than he is to sit down and study by himself with the same regularity. Also a properly conducted class will lead a man to study more systematically, as the instructor should be able to carry the work along definite lines, without allowing students to wander off into endless and profitless discussion.

In the class we are conducting, an effort is made to divide the work into three rather clearly defined groups, as follows:

1. Elementary branches—Arithmetic; spelling; grammar.

2. Bituminous mining law—Writing down sections from dictation; study of the outline of the state mining laws.

3. Mining Coures—Mine gases; ventilation; drainage; haulage.

Arithmetic is taught by means of problems that have appeared in state examination papers and also by problems based on requirements of the mining laws. The work in grammar is necessarily brief, consisting of a study of sentence and paragraph construction, with practice in the use of punctuation marks.

Great emphasis is given to the study of the mining law, both in the matter of helping each man to acquire a good working knowledge of the law, for the purpose of promoting greater safety in the mines; and also, because a man must be familiar with the law before he can expect to make a good showing in any state examination.

In the mining courses, by far the greatest attention is paid to the study of ventilation. Numerous problems illustrating the three laws of friction are worked out; and a close study is made of ventilating apparatus. The properties of mine gases are studied thoroughly, while many problems in percentage are worked out, in this connection.

Regarding the character of mining examinations, we feel that the unrestricted use of textbooks would be undesirable. It is better that a person acquire a sound knowledge of mining principles than that he become an adept in the use of the index of a mining pocketbook. However, since it is well nigh impossible to commit to memory the great mass of technical data and formulas that must be used, we believe that a certain portion or certain sessions of the examination might well be devoted exclusively to the solution of mathematical problems and in these, books should be allowed. This would form a good test of the candidates' ability to intelligently apply the formulas and constants required.

The whole question of the use of textbooks is, however, in my opinion, secondary to that of the practicability of the questions asked. The only fair and reasonable questions to be asked in examinations for certificates of competency to act as fireboss or mine foreman, are those that involve a knowledge of the regular work in the mine and the conditions that exist or may be met. All mathematical problems ought to be based on such actual work and conditions or on those that could easily occur.

M. D. Cooper, Mining Engineer,
Ellsworth Collieries Co.

Ellsworth, Penn.

Letter No. 9—I am not in favor of the use of textbooks in examinations for certificates of competency in mining; because, if a person is anxious to pass the examination and receive a certificate for either of the following classes in Illinois: Mine manager (mine foreman), mine examiner (fireboss), hoisting engineer, or mine inspector, he should be willing to give a part of his time to preparing for the examination.

The average man can learn and retain the formulas necessary to pass successfully any of the above examinations, and I believe that the person who, after a great amount of study is successful in passing the same, without the aid of textbooks, will be a better man than the fellow who would pass by using textbooks. I feel like our good friend, Mr. Pickett, that when it comes to questions, the answering of which involves the use of sines, cosines, tangents, etc., they should be given with the question.

I believe that the use of textbooks in examination would give the advantage to the candidate who had received the most in the way of schooling, as they are more familiar with the use of books and in that way would pass the examination more readily than the candidate who had been deprived of the opportunity of the same amount of schooling. A man, after reaching the age prescribed by law, provided he had the practical experience necessary, could take the examination and with the use of textbooks make the grade required to pass. Unless there was a rigid oral examination, this man would pass with a better grade than another man, who perhaps had a great deal more experience than he and who would be a much safer man to employ as a mine manager.

I have known young men to appear for examination three or more times and make the written grade every time, because they had taken a high-school course; but they would fail in the oral or practical questions, which was the most important part of the examination.

I recall one instance of a miner, living in one of the southern counties of our state, and who came before the mining board to take the examination for certificate as mine manager. The first time he came he did very poorly in his written work and did not reach the oral part of the examination, although he had had a very large experience. Textbooks would have done him no good, because he would have been unable to apply the formulas had they been given him. He was not at all discouraged, because of his failure, but went home with a fixed determination to show the board that he could and would pass the examination. In less than two years he had reached the place where he did not need textbooks to pass the written grade and in the oral, or practical part of the examination, he had no trouble.

From my experience in connection with the work of the State Mining Board of Illinois, I believe that the use of textbooks in the examinations would be a mistake and should not be considered. What is worth having is surely worth the effort put forth to acquire.

MARTIN BOLT.
Chief Clerk, State Mining Board.
Springfield, Ill.

Letter No. 10—I welcome the opportunity of joining in this discussion. Education, in the line of the actual mining or digging of coal, consists partly of demonstrations by a miner who has learned by experience how to do the work. In like manner, a child learns how to draw a bucket of water from a well by watching the father or mother do the work. A boy learns how to pitch ball by watching another boy pitch and then improves his own pitching by practice. Few boys are actually shown how to pitch by professional baseball players. They must show some natural ability before the expert takes them in hand.

But the coal digger receives instructions from the official from the first day he commences work. Advice is given him in the undermining of coal and he is shown how to set timbers, drill a hole, etc. He is told what to do and what not to do, with a view to insuring his own safety and that of others. He then gains proficiency through practice. A knowledge of percentage, ratios or decimals would not assist him in this class of work. But if a man is a good coal digger and realizes the importance of study, a technical education in the science and principles of coal mining will make him no less capable as a coal digger.

The demand at the present day, however, should be for educated mine officials, and it will be time enough to think about the educated coal digger when more interest is taken in this demand. Many men who aspire to the position of mine foreman have held or are holding minor official positions, and we must deal with the education and examination of these men first. It is invariably the case that such men have forgotten most of the arithmetic they learned at school, and many unfortunately did not get much schooling as boys and are unable to intelligently express their knowledge of mining, in writing. They should be given first a grounding in elementary mathematics and after that they should study mensuration, ventilation and gases, hydraulics, etc. At the same time they should attend lectures and be taught how to think clearly and quickly and how to commit the knowledge they have gained in the mine and at school, to paper. In their advanced studies, the planning of mine workings so as to concentrate operations and facilitate haulage and ventilation will prove most valuable to them when the time comes for the practical application of the knowledge gained at the mining school. But, unfortunately, the official still exists who scorns the mining school. He proclaims on every available occasion: "I am a practical miner, my school was the pit." The pit is a pretty good school, but the good pitman is like the good coal digger, he loses nothing by an education similar to the one mentioned at the beginning of this letter. In this age of science, strength of muscle is to strength of mind as burnt flax to beaten iron. The colliery official can spare the former but must possess the later.

The time is rapidly approaching when there will be a scarcity of officials possessing the necessary education. In states where laws have been suddenly passed demanding that all officials from the foreman down be certificated, it is found that men who wish to go to night schools range from 20 to 50 years of age, and but few young fellows between the ages of 14 and 24 desire to attend. It appears men generally get to be twenty and thirty years old before they realize what they have been losing. And it is indeed often pitiful to watch their struggles then. The mind is out of pitch and the man has lost all interest in study. He discovers that he is like a man who puts on skates for the first time. The solving of ordinary problems often looks hopeless to him.

What is the remedy for this condition? The progressive employer realizes the value of educated officials. Will an education boom do any good? The rescue helmet has had its boom, but it is a fact that as the number of educated officials increases, the need for rescue helmets will decrease. The education of the official is the first step to take to promote safety in mines, it produces better efficiency, and thereby more economy.

It is my opinion that mine foremen, assistant mine foremen and firebosses should not be allowed the use of textbooks at the examinations for this reason: If they know that such books will be available they will become mere copyists and will develop only slight independent mind faculties of their own. In their home work, they will rely upon the books and at the examinations will copy the text in addition to using the mathematical examples to aid them in working out problems. On the other hand, they will be put to a fair test if they are given the more intricate mathematical formulas embodied in the examination papers, but printed on a separate sheet. At the examinations for mine superintendents or higher mine officials and state mine inspectors, formulas should not be given, and certainly no textbooks allowed. A candidate who passes an examination where books are allowed gives no proof of his ability to efficiently fill the the position. It is regrettable that it is not customary to require that mine superintendents stand a severe examination.

I am not overlooking the fact that education does not enable all mining men to become capable officials. An education does not always produce that trait called executive ability, nor does it always supply a man with the necessary moral backbone. But the aspirant can console

himself with this truth: that the mine official of the future will, to a certain extent, be educated.

College education does not always produce capable men; but the *system* that is drilled into them at college goes far to produce that result. Where a man stays at college until he reaches the twenties, it is not surprising that, in a mine, he will often appear like a fish out of water. The college education that is likely to produce the best results is the "sandwich system." Under this arrangement the student is at college for six months of each year and the remaining portion of the year is spent underground and in the workshops on the surface.

SAMUEL DEAN.

Delagua, Colo.

Legislation to Regulate Timbering

I was pleased to note the great interest that was manifested by those who took part in the discussion of mine timbering. I notice, however, that some of those who discussed this question thought that no "hard and fast" rule could be laid down to regulate methods of timbering in coal mines. I believe, on the contrary, that such a conclusion is wrong, and that legislation is greatly needed to regulate the question of timbering, in coal mining.

I do not want to be considered as radical when I say that I believe thoroughly in "hard and fast" rules, in mining. In support of this statement I will point out a few facts that must be evident to every mining man.

First, consider what is meant by a new mining law. It is an attempt to compel mining men to abide by a "hard and fast" rule. For example, in the operation of a gaseous mine, where it is necessary to use safety lamps, mining laws require that all tobacco pipes and matches shall be left outside. Men using safety lamps are compelled by law to keep them at a safe distance from the swing of their pick, where they will not be liable to injury or accident. There are laws regulating ventilation, explosives, and the use and handling of the same, and the manner of mining and shooting coal. In some instances, the law specifies how timbers shall be set.

Everyone of these laws is a "hard and fast" rule. In my opinion, there should be such a "hard and fast" rule regulating the maximum distance at which timbers should be set apart. The suggestion has been made to employ a timberman to set timbers. In Durham, England, this was done and the cost deducted from the price of mining. In this country, this would undoubtedly give rise to trouble. I am a firm believer in systematic timbering and am convinced that this would go far toward reducing the number of accidents at the working face.

WM. CROOKS,
Mine Foreman.

Quinton, Ala.

Study Course in Coal Mining

BY J. T. BEARD

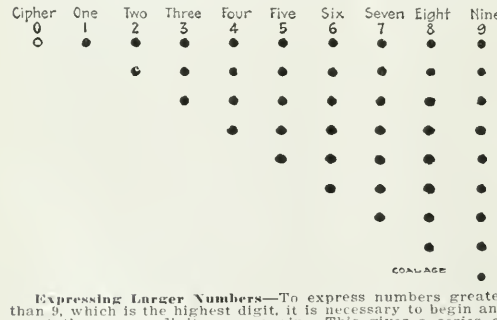
The Coal Age Pocket Book

ARITHMETIC

Arithmetic is the science of numbers. Numbers are used to express magnitude or quantity; as two, three, or four feet; two, three, or four apples; etc.

A unit is a single thing; as one foot, one apple, etc. One is the unit and foot or apple tells the kind. Numbers are used to express how many units are taken; as two feet means two units of one kind; three apples are three units of a kind.

The Digits and Cipher—There are ten characters used to express number, and by arranging these in certain ways, according to certain rules, it is possible to express any reasonable number or quantity. These ten characters are given below with their names and the spots or balls under each shows the number of units that character represents. The first character is called a "cipher" and is used to indicate no units. The remaining nine characters are called "digits."



Expressing Larger Numbers—To express numbers greater than 9, which is the highest digit, it is necessary to begin and count these same digits over again. This gives a series of digits or counts, and the number of the series is written before the cipher or digit, after the first series, as follows:

First series,	0	1	2	3	4	5	6	7	8	9	units
Second series	10	11	12	13	14	15	16	17	18	19	teens
Third series,	20	21	22	23	24	25	26	27	28	29	twenties
Fourth series,	30	31	32	33	34	35	36	37	38	39	thirties
Fifth series,	40	41	42	43	44	45	46	47	48	49	forties
Sixth series,	50	51	52	53	54	55	56	57	58	59	fifties
Seventh series,	60	61	62	63	64	65	66	67	68	69	sixties
Eighth series,	70	71	72	73	74	75	76	77	78	79	seventies
Ninth series,	80	81	82	83	84	85	86	87	88	89	eighties
Tenth series.	90	91	92	93	94	95	96	97	98	99	nineties

The Coal Age Pocket Book

Notation—The names of the first series of numbers have been given. The second series is called the "teens"; because, in this series, the names of most of the numbers end in "teen." The naming, in this series, is a little irregular; it is as follows: Ten 10, eleven 11, twelve 12, thirteen 13, fourteen 14, fifteen 15, sixteen 16, seventeen 17, eighteen 18, nineteen 19.

The numbers in each of the following series are named by writing the name of the series before the name of the digit and the cipher always taking the name of the series; thus, for the third series: Twenty (20), twenty one (21), twenty two (22), twenty three (23), etc.; and for the fourth series, likewise, thirty (30), thirty one (31), thirty two (32), etc., and so on throughout the ten series, the last number of the tenth series being ninety nine (99).

Beyond the tenth series, it is necessary to use another figure. Instead of two figures, three are now required to express a number, and a new period of ten series is started, which is the same as that just explained, except the figure one (1) precedes the other two figures of each number, to indicate this period. As before, the period has ten series.

One-hundred period											
First series,	100	101	102	103	104	105	106	107	108	109
Second series,	110	111	112	113	114	115	116	117	118	119
Third series,	120	121	122 etc.							
Fourth series,	130	131 etc.								
Fifth series,	140 etc.									
Sixth series,	150 etc.									
Seventh series,	160 etc.									
Eighth series,	170 etc.									
Ninth series,	180 etc.									
Tenth series,	190 etc.									199

There are evidently nine of these "hundreds" periods, corresponding to the nine digits, each of which, in turn, precedes the other two figures, as shown above. For example, the two-hundred period runs: Two hundred (200), two hundred and one (201), two hundred and two (202), etc., etc., to two hundred and ninety nine (299). Then follow, in turn, the three-hundred (300) period, four-hundred (400) period, etc., to the last period of the hundreds group, or the nine-hundred (900) period; the last number of this period being nine hundred and ninety nine (999).

Beyond this point, it is necessary to use four figures instead of three. This forms a new group of nine periods, called the "thousands" group or periods. As before, the nine digits, respectively and in turn, precede the other three figures, in each number of the group, which runs from one thousand (1,000), one thousand and one (1,001), one thousand and two (1,002), etc., etc., to nine thousand nine hundred and ninety nine (9,999).

Following this is the ten-thousand (10,000) group of five figures in each number and the hundred-thousand (100,000) group of six figures. Then comes millions, 7 figures; tens of millions, 8 figures; hundreds of millions, 9 figures. For example:

One hundred and sixty five million, two hundred and three thousand, six hundred and seventy nine...	165,203,679
Twenty million, four thousand, and six.....	20,004,006

EXAMINATION QUESTIONS

Mine Foremen's Examination, Northwestern Improvement Co., Roslyn, Wash.

(*Selected Questions*)

Ques.—What constitutes the make-up of a good mine foreman? What are his duties? What should be his first consideration; second consideration; third consideration?

Ans.—The principal qualifications of a good mine foreman are a wide experience and knowledge of mining in all its branches; a good judgment of mining conditions; a thorough knowledge of the mine of which he has charge; ability to handle men; skill in directing others and planning the work so as to accomplish the greatest results in the least time and at the smallest expense. A mine foreman must be fearless, firm, fair, just and considerate in all his dealings; a good judge of human nature and of what constitutes a day's work. He must be patient, industrious and sober.

It is the duty of the mine foreman to devote his entire time to the operations of the mine. He must superintend every detail of the work, either personally or through his assistants, and should, as far as possible, visit every working place at least every alternate day when the mine is working. He must inspect all machinery and appliances to see that they are in safe condition, giving particular attention to the ventilation and the drainage of the mine. He must inspect all airways, haulage roads and travelingways and remove all dangers found or that are reported to him, permitting no men to work in such places until the same are made safe. He must provide the needed supplies of timber and other material and must see that the mining laws and mine regulations are strictly obeyed.

The first and most important consideration is the safety of the men in his charge; second, the security and preservation of the property; third, the economical extraction of the coal so as to avoid undue loss and expense.

Ques.—If the safety lamp gives no indication of the presence of gas, is this fact proof that the atmosphere is safe to enter?

Ans.—No. The mine air may still contain poisonous gases in sufficient quantity to be dangerous or fatal to life. Air containing one-half of 1 per cent. of carbon monoxide gas may prove fatal to life in a short time. The presence of this gas would not be indicated by the safety lamp; but a caged mouse or bird, if carried into such an atmosphere, would betray by its actions that the air was not safe to breathe. These small animals are affected by the poisonous gases in much less time than is required to affect the human system.

Ques.—How would you proceed to remove firedamp (afterdamp?) from a section of a mine, after an explosion? What dangers would you expect and how would you overcome them?

Ans.—The removal of noxious or dangerous gases from a section of a mine, after an explosion, will depend on the conditions that exist in the mine. In general, the work must be conducted by first removing all men from the mine except those engaged in the work. Reliable men should be stationed at each approach to the return airway, leading from the affected section to prevent anyone from entering the return-air current. Only safety lamps should be used. The circulation of air should then be increased in that section of the mine, as much as possible, either by speeding the fan or by such a regulation of the air current as to supply a larger quantity of air to that particular section. The work must be performed on the intake side and its progress carefully watched, by making the necessary tests of the air, from time to time. Wherever necessary, temporary brattices should be erected so as to deflect the air current in such a manner as to sweep out the accumulated gases from the workings. In all cases, sufficient time should be given for the air to act upon the gases, diluting and removing them from their lodging places. Due precaution should be taken against unexpected roof falls driving the gas out upon the lamps of the workmen.

Ques.—An airway is 10 ft. 5 in. wide and 6 ft. 9 in. high; find the area of the airway. If the velocity of the air current is 450 ft. per min., what quantity of air is passing per minute in this airway?

Ans.—The sectional area of the airway is found as follows: 10 ft. 5 in. = 10.41 ft.; 6 ft. 9 in. = 6.75 ft. The sectional area is then $10.41 \times 6.75 = 70.27$ sq.ft., nearly. The quantity of air in circulation is then

$$Q = av = 70.27 \times 450 = \text{say } 31{,}620 \text{ cu.ft.}$$

Ques.—The quantity of air passing in an airway is 120,000 cu.ft. per min., and the water gage produced is 2 in.; what are the units of work performed each minute and the horsepower producing the circulation in the airway?

Ans.—A water gage of 2 in. corresponds to a pressure on the air of $2 \times 5.2 = 10.4$ lb. per sq.ft. The work performed each minute, or the power on the air, is found by multiplying the quantity of air in circulation by the pressure in pounds per square foot. Thus,

$$C = Qp = 120{,}000 \times 10.4 = 1{,}248{,}000 \text{ ft.-lb.}$$

The horsepower producing the circulation is the effective horsepower or the horsepower on the air, which is $1{,}248{,}000 \div 33{,}000 = 37.8$ hp.

Ques.—A slope is 2600 ft. long, measured on a pitch of 30 deg.; what will be the horizontal distance, and what is the vertical height of the slope? What is the pressure on a pump pumping water from the bottom of this slope, disregarding the pipe friction?

Ans.—The horizontal distance, or horizontal length of this slope is

$$2600 \times \cos 30^\circ = 2600 \times 0.866 = 2251.6 \text{ ft.}$$

The corresponding vertical height of the slope is

$$2600 \times \sin 30^\circ = 2600 \times 0.5 = 1300 \text{ ft.}$$

Since the water pressure due to a foot of vertical height is 0.434 lb. per sq.in., the pressure exerted on this pump is $1300 \times 0.434 = 564.2$ lb. per sq.in.

COAL AND COKE NEWS

Washington, D. C.

Representative Hamlin has introduced a bill (Apr. 23) to prohibit the interstate shipment or attempted shipment of convict-made goods, or products of mines in which convict labor is employed.

The bill requires that "no carrier of interstate commerce shall knowingly transport or accept for transportation any goods, wares or other articles of merchandise manufactured in whole or in part by convict labor, or knowingly transport or accept for transportation the products of any mine or factory in which convicts are employed or permitted to work, and which goods, wares or other articles of merchandise or products of mines are to be carried to any point in any state, district or territory of the United States outside of the state where produced or mined and each separate shipment prohibited herein shall constitute a separate and distinct offense."

The bill further provides that any agent of any interstate carrier who violates the law shall be adjudged guilty of a misdemeanor punishable by a fine of not less than $1000 or by imprisonment not to exceed six months. Furthermore the bill requires that "it shall be unlawful for any person, firm or corporation—to ship, attempt to ship or offer for shipment to any interstate carrier any goods, wares or other merchandise, or products of any mines—produced or manufactured wholly or in part by convict labor to any point in any district territory or state in the United States outside the state where such goods, wares or other merchandise or products of mines are made or produced." The same penalties are made to apply in this case as in the case of the violation of the earlier provisions of the measure.

Senator Crawford has introduced a bill which has been referred to the Committee on Public Lands, to provide for the leasing of public lands containing coal, reading in part as follows:

That all public lands and lands included in national forests containing workable deposits of coal are hereby classified as coal lands, and hereafter shall only be disposed of by leasing the same in the manner provided in this Act, and that the title in fee to all such coal lands shall remain in the United States.

Sec. 2. That any citizen of the United States of the age of twenty-one years who has not acquired title to coal lands from the United States, or any association of persons who are thus severally qualified, or any corporation duly empowered to transact business in the State or Territory in which the land is situated, not holding title to coal lands, may make application to the Secretary of the Interior to lease coal lands, and the Secretary of the Interior is hereby authorized to lease to such applicant or applicants not to exceed to any one person, association, or corporation two thousand five hundred and sixty acres of coal land, exclusive of the surface, in legal subdivisions of not less than one hundred and sixty acres each, which said subdivisions need not be contiguous, for a period not exceeding twenty-five years, as long as such person, association, or corporation shall conform to and abide by the terms of the lease and all of the laws of the United States and lawful regulations of the Department of the Interior as shall now or may hereafter be enacted or made.

Sec. 3—That the United States shall at all times have the preference right to purchase so much of the coal produced by any mine or mines operated under the provisions of this Act as may be deemed necessary for the use of its Army and Navy, and at such reasonable and remunerative price as may be fixed by the President, but the producer or producers of any coal so purchased who may be dissatisfied with the price thus fixed shall have the right to prosecute suits against the United States in the Court of Claims for the recovery of any additional sum or sums he or they may claim as justly due upon such purchase.

WILKES-BARRE, PENN.

Examinations for certificates for Mine Foreman and Assistant Mine Foreman were held at Pittston, Wilkes-Barre, Nanticoke and Plymouth on Apr. 22 and 23. Eighty-one men took the examination at Pittston, 65 at Wilkes-Barre, 49 at Plymouth and 55 at Nanticoke. The boards holding these examinations were presided over by Messrs. McDonald, Jennings, Davis, Williams and Walsh, state mine inspectors of the several districts contained in the Wyoming Valley.

The miners in the Five Foot Vein in the Henry Colliery of the Lehigh Valley Coal Co. are dissatisfied with the scale for rockwork, and at a meeting it was decided to refer the matter to the conciliation board for adjustment. Miners in the Red Ash Vein of the Dorrance Colliery of the same company, being dissatisfied with the yardage paid them, adopted another course of settling the dispute, but after being idle for eight days, decided to return to work, and allow the conciliation board to settle the trouble.

To bring the mining of coal to a point where all may have a chance to see the technical parts of the industry, the representatives of the different coal companies in and about Wilkes-Barre have prepared many interesting coal exhibits for the Greater Wilkes-Barre Industrial Exposition, to be held during the week of May 10-17.

Contractors have broken ground for a model village that is to be built around the Underwood Colliery of the Pennsylvania Coal Co, on the hills east of Throop. The village will consist of 28 double houses of extra-strong construction, to withstand mine settlings. The houses will be of timber, 28x40 ft. in size, and their sills or underframes are to be of 6-in. square Georgia pine, in single sticks for the length and breadth of the houses. Several frame dwelling houses are also to be erected for the colliery bosses. The village is to be laid out with wide streets and roomy garden plots for all the houses.

It will have a central plaza, and part of its equipment will be two public baths, one for men and one for women. The baths will be built of concrete, and modern in detail. Hower & Stender, contractors, of Scranton, are in charge of the construction work. The Underwood Colliery is to be one of the most modern in this part of the state. It will open up big tracts of virgin coal, and give employment to many men for several years. It is expected that the colliery will be ready for operation in a few weeks.

PENNSYLVANIA

Anthracite

Frackville—The Whip-Poor-Will breaker crashed to the ground recently in the course of a high wind storm. This colliery has not been in operation for the past five years.

Shamokin—Fifteen firemen, employed at the Reliance colliery, went on strike, Apr. 18, claiming that they were being overworked and demanding the assistance of more men.

A tie-up at the collieries of the Mineral R.R. & Mining Co. was caused by a strike of 2500 employees, Apr. 22. The men refused to work any longer until all the men at the mines had paid their back dues to the Mine Workers' organization.

Harrisburg—The McDermott bill, which proposed to make it unlawful to use the electric current in the mine where miners are loading or mining coal, or in gaseous mines, has been killed in the House on the second reading. If it had become a law it would have meant an increase in the price of coal.

Hazelton—The 1800 mine workers at the collieries of the Lehigh & Wilkes-Barre Coal Co. have voted to return to work after a two-day "button" strike.

Bituminous

Fayette City—Four miners were badly burned by an "after explosion" in O'Neil's mine, Apr. 18.

Finleyville—A terrific explosion killed perhaps over a hundred miners in the Cincinnati mine of the Monongahela River Consolidated Coal & Coke Co., Apr. 23. About 70 bodies have been recovered, but it is feared that many more are in the mine still.

Hakerton—The gigantic frame tipple of the Sterling Coal Co. has been destroyed by fire. The tipple was the largest in that section of the country and its destruction will cripple the workings.

WEST VIRGINIA

Charleston—By a vote of 84 to 9 the striking miners of Cabin and Paint Creeks accepted the proposition made recently by Governor Hatfield, with a view toward a settlement of the long strike. While the miners attempted to attach a construction to the proposition to the effect that there shall be no discrimination against union employees, they will leave the final construction to the governor. The operators accepted the proposition a week ago and have put it into effect in their mines.

The New River miners' convention has decided not to call a strike, pending efforts which they will make to have a conference with the operators of that field, to be held in Charleston, May 10. It is said that recognition of the union will be one of the points which the miners will insist upon. Should the operators decline a conference, the miners will then consider the question of a strike.

Wheeling—Two hundred miners employed in the Gaylord No. 2 mine have gone on strike and the mine is idle as a consequence. The refusal of the management to employ extra drivers caused the men to strike.

KENTUCKY

Louisville—The Louisville & Nashville R.R. Co. is authoritatively reported to have consented to an important concession to the operators in the Harlan County coal field, in the voluntary removal of the 10c. differential formerly charged on coal from that district to points north of the Ohio River over the rate from the Jellico district. The action of the road is almost wholly due to the efforts of the Southern Appalachian Coal Operators' Association, which has had the matter up with the company through its traffic committee for some time.

It is also possible that the same concession will be extended by the road to the Harlan operators with reference to Ohio River crossings and Kentucky points, although this is not an association matter, and has not been determined by the road. The removal of this differential is expected to give Harlan County coal a powerful impetus in the northwestern markets, where it has already established a high reputation.

Harlan—A systematic publicity campaign for Harlan County, Ky., and the Harlan coal fields, is being planned by the board of trade of Harlan, Ky., with a view to disseminating broadcast information regarding the resources of that section, which has experienced a remarkable development during the past two years, and which it is said is capable of still further and more extensive working. It is proposed to spend not less than $10,000 for this purpose.

One of the plans is the publication of a prospectus, showing the exact distribution of coal throughout the county, as far as possible. It is also the intention of the backers of the plan to make a powerful effort to induce the Southern Railway to build into the county to afford competition with the Louisville & Nashville, which now has a practical monopoly of the carrying of the coal and other products of the woods and mines of Harlan.

Spottsville—In the Henderson district, work has been begun with a view to reclaiming the coal mine at that place, which was completely flooded by the recent high water. It is not yet known how extensive the damage is which was done by the water, but it will reach $50,000 if the mine is not reclaimed.

OHIO

Columbus—A settlement of the miners' strike at the Trimble mine of the Hisylvania Coal Co., of Columbus, Ohio, was effected recently by John B. Moore, president of the local district of the United Mine Workers, and the officers of the company. By the terms of the settlement the company agreed to pay full wages to discharged men during the enforced idleness while a national representative of the Mine Workers conducts an investigation of the difference.

ILLINOIS

Galesburg—The Star Coal Co. has sustained a severe loss in the destruction by fire of the buildings of its large mine a short distance north of Cuba. The mine had been shut down for two weeks while improvements and repairs were being made. About 150 men are idle. The loss caused by the fire is estimated at approximately $30,000.

The company is undecided as to whether to rebuild or not.

FOREIGN NEWS

Beuthen, Germany—The strike of the miners in the upper Silesian coal fields is spreading rapidly. It is estimated that, to date, 25,000 men have laid down their tools.

South Wales—More than 50,000 miners in south Wales are expected to go out on strike as a protest against the employment of nonunion labor. An attempt to bring about an agreement with the employers has failed.

RECENT COAL AND COKE PATENTS

Automatic Dump Car—E. L. Stoltzfus, Gap, Penn., and I. B. Miller, Paradise, Penn. 1,057,683, Apr. 1, 1913. Filed Apr. 17, 1912. Serial No. 691,312.

Gravity Coal Bin—S. Otis, Chicago, Ill., assignor to Gravity Coal Bin Co. a corporation of Maine. 1,052,945, Feb. 11, 1913. Filed July 11, 1907. Serial No. 383,284.

Gravity Coal Screen and Bin.—S. Otis, Chicago, Ill., assignor to Gravity Coal Bin Co., a corporation of Maine, 1,052,946, Feb. 11, 1913. Filed July 7, 1907. Serial No. 383,285.

Method of Producing a Substantially Complete Combustion of Fuel. F. H. Brown, Philadelphia, Penn., 1,052,279, Feb. 11, 1913. Filed Dec. 9, 1908. Serial No. 466,530.

Igniting Device for Miners' Safety Lamps—P. Wolf, Zwickau, Germany, 1,052,783, Feb. 11, 1913. Filed April 30, 1912. Serial No. 694,190.

Adjustable Shoe for Mining Machines—C. E. Rogers, Logan, W. Va., 1,052,517 Feb. 11, 1913. Filed April 25, 1912. Serial No. 693,230.

Apparatus for Smoke Prevention and Fuel Economizing in Connection with Steam Generators. J. Rothwell, Walkden, Eng., 1,052,518, Feb. 11, 1913. Filed June 20, 1912. Serial No. 704,923.

Apparatus for Utilizing Coke Oven Heat—E. C. Morgan, assignor to Titlow Waste Heat Power Co., Uniontown, Penn. 1,054,859, March 4, 1913. Filed Jan. 28, 1909. Serial No. 474,641. Also 1,054,860, March 4, 1913. Filed April 26, 1909. Serial No. 492,133.

Miner's Lamp—A. L. Tombelaine, Villanuova-Minas, Spain. 1,044,001, March 4, 1913. Filed Dec. 15, 1911. Serial No. 665,884.

Coal and Ore Washer—H. W. Falker, Ashland, Penn. 1,055,731, March 11, 1913. Filed Sept. 7, 1912. Serial No. 719,067.

Apparatus for Handling Coke—W. Feicks, Bethlehem, Penn. 1,055,456, March 11, 1913. Filed March 31, 1910. Serial No. 552,667.

Retort Coke Oven—Chas H. Hughes, assignor to Semet Solvay Co., Syracuse, N. Y. 1,555,536. March 11, 1913. Filed August 19, 1912. Serial No. 715,736.

TRADE CATALOGS

The Joseph Dixon Crucible Co., Jersey City, N. J., has just issued a booklet entitled "Graphite for the Boiler." The action of graphite upon scale-forming impurities in boiler-feed water is not chemical. It neither dissolves the scale nor attacks the metal. The particles of graphite gradually penetrate existing scale and soften it to such an extent as to render it easily removable. Once removed scale can never firmly adhere to the boiler surfaces as long as graphite treatment is continued.

PERSONALS

John Mitchell, former president of the United Mine Workers of America, has been designated by Governor Sulzer, of New York, to be state labor commissioner.

C. J. Trager has resigned his position as senior inspector with the National Inspection Co., of Chicago, to accept the position of insurance manager of the Pittsburgh Coal Co. Mr. Trager took charge Apr. 16.

H. D. Johnson has recently started in the engineering business for himself. His specialties are civil, mining, consulting and economic engineering, and his office address is 617 Traders Bank Building, Scranton, Penn.

Earle Martin, of Chattanooga, Tenn., president of the Continental Coal Corporation of Tennessee and Wyoming, has resigned his position with that company. Vice-president H. L. Cory will assume the duties of president of the Tennessee company, while Vice-president W. L. Moss will assume the office of president of the Wyoming company.

CONSTRUCTION NEWS

Atlantic City, N. J.—Irwin & Leighton are estimating on plans for coal pockets and bins to be erected at Atlantic City for the Atlantic City R.R. W. Hunter is chief engineer.

Hazard, Ky.—It is reported that the work of preparing the D. Y. Combs property near this city for production by early fall is being pushed rapidly by the parties interested in its development.

Connellsville, Penn.—The Tide Water Coal Co.,, of Pittsburgh, has taken leases on 1000 acres of coal in Parker Township, near Bruin, W. Va., and has commenced the construction of a colliery.

Connellsville, Penn.—It is rumored that the Northwestern System of the Pennsylvania Lines is planning to extend the Cleveland & Pittsburgh branch from Powhatan, Ohio, to a point down the Ohio River, opposite New Martinsville, W. Va.

Rockford, Ill.—The construction of the Chicago & Northwestern extension south through central Illinois to connect with its line in the coal fields is being pushed rapidly. The road is being doubletracked to provide for a large traffic. This will give a new and shorter route between St. Louis and St. Paul.

Bristol, Tenn.—The Black Mountain Coal Land Corporation has awarded to the Montgomery Coal Washing & Manufacturing Co., of Birmingham, Ala., a contract for the construction of a coal-washing plant at Pockett, Ala., including jigs, settling tank, elevating machinery, screens, etc., with an hourly capacity of 150 tons.

Shenandoah, Penn.—The new shaft at the Hammond colliery will soon be connected with the breaker and the hoisting slopes will then be dispensed with. It is expected that the colliery will close down about May 1 in order to make the necessary connections. The work involved will require about one month's time.

Hazard, Ky.—The work of construction on the tipple, tracks, and other works of the Tennessee-Hazard Coal Co. has been placed under the direction of T. H. Hopkins, of Anthras, Tenn., a well known coal operator of that section, who will push the equipment of the company to early completion, the object being to start production during the current season.

Centralia, Penn.—The Rhoads Contracting Co., of Ashland, has started work on an extensive stripping contract for the Lehigh Valley Coal Co., at Centralia. Operations will be started on Mt. Carmel from the northwestern side of Centralia for a distance of 7 miles. The coal is of good quality and close to the surface and it is estimated that it will require from 7 to 10 years to get it all out.

St. Marys, Penn.—Work on the new Shawmut bridge across the Allegheny River, at Mahoning, has been resumed since the floods subsided and completion is promised in August. Operations at Furnace Run are progressing fast. The new tipple is finished and shipments will begin as soon as cars are provided by the Buffalo, Rochester & Pittsburgh R.R., which will handle the coal from these new mines till connection can be made with the Shawmut line by the completion of the bridge.

NEW INCORPORATIONS

Bergholz, Ohio—The Bergholz Coal Co. has filed papers with the secretary of state decreasing its capital stock from $20,000 to $10,000.

Los Angeles, Calif.—The Briquette Fuel Co., capital stock, $400,000. Directors: F. R. Thomas, F. W. Steddom, A. E. Steddom, Q. McCurdy and F. E. McCurdy.

Cleveland, Ohio—The Short Creek Coal Co.; capital stock, $600,000; to acquire coal lands and mine coal. Principal offices, Cleveland. Incorporators: J. J. Roby, E. B. Thomas and C. A. Niman.

Fairmont, W. Va.—The Fairmont & Cleveland Coal Co., capital stock, $600,000; to operate in Marion County. Incorporators: W. N. Engle, T. L. Henderson, R. R. Wallis, Anthony Bowen and J. R. Burns.

Wellston, Ohio—The Oreton Mining Co. has been incorporated with a capital stock of $100,000, to mine and deal in coal. The incorporators are: George B. Davis, E. B. Blair, George L. Cugle, C. Ims and N. M. Irwin.

INDUSTRIAL NEWS

Boise, Idaho—Coal has been discovered in Boise County on the farm of Julius Anson. The seam is 4 ft. thick and is a good commercial coal.

The Northern Briquetting Co. was organized last winter with a capital stock of $500,000. The new plant is to have an initial capacity of 50 tons of briquettes a day.

Colver, Penn.—The Ebensburgh Coal Co., which operates mines at Colver, is planning to start a dairy on its large farm. Holstein and Jersey cows have been purchased.

Plymouth, Penn.—The Kingston Coal Co. is installing a new electric pump on the river bank near Fletcherville Park, Plymouth, to furnish a supply of water for the Gaylord Colliery.

Williamson, W. Va.—The Leckie Collieries Co. expect to develop 1000 acres of coal at Williamson. They are getting a mine into shape which will have a daily capacity of 1500 tons.

Pottsville, Penn.—A large seam of coal has been opened near Pottsville by the St. Clair Coal Co., and it is claimed that this new operation will produce 10,000,000 tons of virgin anthracite.

Rochelle, Ill.—The Geo. D. Whitcomb Co. is moving into a new factory which they have just built. This step will enable them to more than double their present output of gasoline locomotives.

Punxsutawney, Penn.—Local men, said to be backed by New York Central R.R. interests, have leased 8000 acres of coal land at Marion Center. The acreage adjoins a large plot now held by the railroad. No price was mentioned.

Pittsburgh, Penn.—The Kendall Lumber Co., whose general offices are in the House Bldg., in Pittsburgh, Penn., has acquired some coal lands in West Virginia which it proposes to develop during the coming summer.

Connellsville, Penn.—The holdings of the Kingwood Coal & Coke Co., situated on the West Virginia Northern and the Morgantown & Kingwood railroads, in the vicinity of Kingwood, have been sold recently to Cleveland capitalists for $60,000.

Joplin, Mo.—The Ellsworth-Klaner Construction Co. has leased 240 acres of coal land, one mile south of Minton, Mo., and will develop it with a steam shovel. This land was recently purchased from L. C. Chancellor by E. V. and A. K. Lanyen.

Minot, N. D.—The Northern Briquetting Co. has purchased a building site, consisting of 5½ acres west of the Great Northern depot. It is understood that plans for building operations are under way and will be completed in a short time.

Rock Island, Ill.—The Carpenter Coal Co. has received a consignment of a new coal which is being put on the market, known as the Pocahontas. It is a crushed West Virginia smokeless, mixed with hydrocarbonized pine pitch under a pressure of 100 lb.

Seattle, Wash.—Sixteen students from the College of Mines, University of Washington, spent Apr. 5 to 14 in an inspection trip in the western part of the state. Rock tunneling, coal mining, placer mining and milling were among the subjects studied.

Mobile, Ala.—According to a statement made by Vice-president J. H. Bernhard, the Alabama & New Orleans Transportation Co. will operate barges between Tuscaloosa via Mobile and Gulfport to New Orleans, and will bring down 600,000 tons of coal annually.

Joliet, Ill.—The Murphy Linskey Kasher Coal Co. is planning to widen its field of operations. The company has recently purchased the mining property and rights of a Pontiac company at a court sale.

Batavia, N. Y.—It is said that an effort will be made to recommence work on a shaft which was sunk 40 years ago for the purpose of reaching and developing a bed of coal. Parties are endeavoring to obtain the necessary finances for this purpose.

Jellico, Tenn.—The Interstate Coal Co. has purchased the property of the Smith-Jellico Coal Co. in this section, aggregating about 1000 acres, and has also taken over the lease on the property held by the Anchor Coal Co. The purchaser will proceed to develop the property.

Salem, Ohio—The Salem Coal Co., which operated a mine east of Salem on the K. & O. electric line, has sold out its holdings to the Baldwin Mining Co. The purchaser contemplates improvements to the value of $10,000. The capacity of the mine will be largely increased.

Washington, Penn.—J. V. Thompson and others have closed a deal for 800 acres of coal land in Gilmore Township, Greene County, for $160,000. The land was bought from a number of farmers and adjoins a tract of 500 acres which was purchased by the same parties 2 weeks ago for $100,000.

Pittston, Penn.—The Delahunty Dyeing Machine Co. has placed upon the market a rivetless conveyor chain with one-piece inserted attachments. This chain requires the use of no tools of any kind and only slack enough to equal twice the diameter of the pin to enable anyone to either connect or disconnect the links.

Chicago, Ill.—A meeting of the St. Louis, Peoria & Northwestern R.R. has been called for June 18 to consider the purchase of the Macoupin County R.R. and the issuance of $10,000,000 in bonds to equip the roads. This purchase will mark the extension of the Chicago & Northwestern lines into the coal fields of Illinois.

DuQuoin, Ill.—It is rumored that a large gas company is soon to be formed in Illinois. The plan is to erect a monster coke plant at some central point, probably Marion, and to supply gas to the surrounding towns. Marion is located in the heart of the field and is considered the most practicable place for the location of the plant.

Williamson, W. Va.—The Skillet Fork Land Co. has taken over the 1600-acre tract of coal land on Gilbert Creek, owned by Lee Ellis. This purchase has again revived the talk of a railroad extension along the Guyan River. It is believed that the Chesapeake & Ohio will be the first road to build. The price paid was in the enighborhood of $60,000.

Philipsburg, Penn.—John Lodhrie, of Windber, has leased 400 acres of coal land near Dunio. A shaft will be sunk at once and it is expected that 1000 tons will be mined daily within a short time. The agreement provides that Mr. Lodhrie shall not mine less than 2000 tons of coal daily as soon as the developments contemplated are completed.

Connellsville, Penn.—W. E. Woods and M. A. Hadden have options on more than 16,000 acres of land in Jefferson Township and are now drilling test holes on their property. They have also taken options on about 6000 acres of land north of Sullivan and will shortly begin testing that, together with 12,000 acres west of Scott City which they have also optioned.

Pittsburg, Kan.—By order of the state inspector three mines belonging to the Central Coal & Coke Co., the Western Coal & Mining Co. and the Chapman Coal Co. have been closed down. The inspectors found unsanitary conditions, poor ventilation and an insufficient number of manholes. The companies promise to have the mines in good condition by next week.

Charleston, W. Va.—The West Virginia Equipment Co. has opened offices and salesrooms at 901 Kanawha St., Charleston, W. Va. This firm has secured the local agency for many of the best known and most reliable firms in the country manufacturing mining and power-plant equipment, and is, therefore, prepared to quote upon steam or mine specialties of all descriptions.

Salt Lake City, Utah—D. S. Tracy and W. Norton, of Ogden, have purchased from the government 280 acres of coal land in Carbon County for $40,600. The land lies near Spring Glen, on the Denver & Rio Grande. It is understood that the purchasers except other Ogden men to acquire adjoining lands and eventually open up a coal mine. The rate of the purchase was about $145 an acre.

Dante, Va.—Recent estimates state that the Carolina, Clichfield & Ohio R.R. carries annually over 15 lines 20,000,000 tons of coal from the mines about Dante to the southern and southeastern markets. This road is now being extended through the Virginia-Kentucky mountain from Dante to Elkhorn City, Ky., a distance of 10 miles. The new work will include the longest tunnel in the South.

Fort Scott, Kan.—It is reported that the Frisco road intends to develop the coal underlying the southern part of Bourbon County. The railroad has taken options on thousands of acres of farm lands in that district and has secured leases which were held by the Miller Bros. company. A 3-ft. seam is said to underly all this part of the county. Should coal be found the land is to be purchased for $100 an acre.

Royalton, Ill.—The mine of the Royal Big Muddy Co., which went into the hands of receivers over a year ago, has been taken over and is being put in operation by J. L. Mitchell, operator of the North mine at this place, and also of mines at Coffeen. During the past week there has been a strike at this mine, and the mine manager contends that it is another case of where the miners want to dominate the policy of the company.

Petersburg, Ind.—Jean, Brown & Co., coal operators, have leased about 100 acres east of this city, along the E. & I. R.R. and will sink a shaft for a railroad mine. Vein No. 2 will be worked at about a depth of 130 ft. The work of pumping out the Blackburn mines continues. It will take 90 days to complete the work. Operations have been resumed at the Littles mine and Ayrshire No. 7, and two more mines of the Ayrshire company will be pumped out in 30 days.

Wilkes-Barre, Penn.—The new breaker of the Madeira-Hill Co., purchaser of the Joseph Stark Colliery, at Hudson, has been placed in operation. This breaker replaces the one formerly operated in connection with Mr. Stark's mine, and when in full operation will have a capacity of 800 tons daily. All machinery, including the hoisting engines, is electrically operated, the current being supplied by the Lackawanna & Wyoming Valley R.R. Co., from the Plains power station.

Connellsville, Penn.—The moving picture machine has been put into action by the H. C. Frick Coke Co. as a means of bringing home to all their employees the value of the "safety first" campaign. The Frick company has been the pioneer in this movement and is still leading all the work in this line. A corps of men has started to make a tour of every plant of the company in the Upper and Lower Connellsville regions, and will give these educational entertainments at each plant.

Somerset, Penn.—It is predicted that Somerset may have another large coal operation along the Somerset & Cambria branch of the Baltimore & Ohio R.R. in the near future. The land in question consists of 750 acres of Miller vein and Prime C coal. It is supposed that the controlling force of the new venture is the Glazier Coal & Coke Co. This company has an option on the tract and will probably begin operations in the near future. The property now has 2 openings facing the Baltimore & Ohio R.R.

Baltimore, Md.—The Elkhorn Fuel Co. has become permanently organized and will at once proceed with the development of its 300,000 acres of southern coal land. The Chesapeake & Ohio Ry. will construct a branch from Beaver Creek, Ky., in order to provide transportation facilities to the new field. It is proposed to begin coal shipments by the end of the year. A great part of the lands will be leased on a royalty basis to operating companies. The Elkhorn Fuel Co. was incorporated last February with a capital stock of $30,000,000.

Philadelphia, Penn.—The Manor Real Estate Co. has practically completed the purchase of 18,000 acres of coal land in Indiana County, adjoining the Cambria County coal field. The average price was $400 an acre. Five drills are already testing the new field.

It is also stated that the Manor company has entered into negotiations with the Greenwich Coal Co. and will soon take over the holdings of that concern, amounting to several thousand acres and several fully equipped modern mines. Plans have already been made to extend the Cambria & Indiana R.R. and the Cherry Hill & Dixonville R.R. into the new field.

Clarksville, Ark.—J. E. Daley, president of the Scranton Anthracite Coal Co., has closed the preliminaries of a deal which involves $2,000,000 worth of coal mining property in Jackson County. The land in question occupies all the Spadra district except that owned by the Pennsylvania Mining Co.

The new company will be composed of Eastern capitalists. Branch agencies and storage yards will be established at Kansas City and Omaha. More than 1500 miners will be employed continuously. New machinery will be installed at a cost of $150,000 and the mines will be opened for a steady run about June 1.

Philadelphia, Penn.—It has been learned that a special meeting of the board of directors of the Lehigh Coal & Navigation Co. was held recently and a determination was reached to make a proposition for the purchase of a controlling interest in the Harwood Electric Co., west of Hazelton. The Harwood company has a total capital stock of $6,831,500 and was organized last year. Possession of this concern would mean for the L. C. & N. Co., the control of the power in the Lehigh, Schuylkill and Susquehanna Valleys.

In addition to its power plant the Harwood company owns the Harwood mine which is estimated to contain about 2,750,000 tons of marketable anthracite.

COAL TRADE REVIEWS

GENERAL REVIEW

The May anthracite trade is starting up with a good volume of business on hand, the West and Northwest opening up particularly strong. The April demand, while somewhat less than normal, was still larger than was anticipated. There is an excellent undertone to the market and a general feeling seems to pervade the trade that there will be another shortage the coming fall.

A general shortage of labor, together with the impending strike in the West Virginia field, has had a steadying effect on the Eastern bituminous market, which is in a somewhat precarious condition. There is only a modesrate buying by consumers and price cutting on the lower-grade fuels is reducing the demand for the better qualities, such as Pocahontas and New River. The accumulations at Hampton Roads are becoming so heavy that the yards are badly congested and the movement seriously restricted; the coastwise trade is light, but some relief may be obtained in the export business, which has developed to rather large proportions temporarily.

Lake shippers are opening up in a way that promises to result in a general and consistent smashing of all previous records. The demand in the Northwest is so heavy, that some are even inclined to believe that it will not be possible to supply the requirements during the time navigation is open; in such an event, this will throw a heavy load on the railroads in the Northwest just at a time when they are least prepared to handle it. Pittsburgh mine-run prices have advanced 10c. per ton to $1.50, and the majority of the companies are sold up for the season and may even have difficulty in meeting their contracts; at other outside points some large operators are already being forced into the open market to fill out their requirements. In all of the Lake shipping districts,reports of low prices have entirely disappeared and the producers are in a stronger position than at any time this year. In Ohio the railroads are calling for bids on fuel contracts which, together with a heavier steam consumption, is creating quite an active market; prices are hard and showing no tendency to decrease.

There is a shortage of cars in the Kentucky field, and a scarcity of the small steam grades because of the light demand for the domestic sizes. In the Southern market the steam coals have become slightly heavier, due to the sharp decline in the pig-iron market. Retailers in the flooded zone in the Middlewest are still short of supplies and continue holding at the winter circular except on certain grades; mines are working good, but the railroad service has not been fully restored. There is some concern being felt, even at this distant point, over the West Virginia labor situation. Contracting has been more than usually active during the week, the closing prices being stated as satisfactory to both consumers and producers.

BOSTON, MASS.

Bituminous—Prices on Pocahontas and New River continue firm, largely on account of the shortage of labor in the West Virginia fields and the threatened troubles in New River. There is only moderate buying, however, and many of the consumers are still awaiting developments in the hope that conditions will have eased materially by June or July. The accumulations at the Hampton Roads terminals are reported to be large, particularly on New River, but the export business is good and is expected to take care of any surplus. A considerable tonnage in New England has been lost to Pocahontas and New River by reason of lower prices on grades from Pennsylvania and from other districts in West Virginia.

All-rail there is a better movement and this in spite of an unusually large supply of water for the mills. A number of steam users, ordinarly dependent on Hampton Roads and Baltimore coals forwarded from tidewater points, are turning to rail delivery on account of the high prices held on the former, and the last week a considerable tonnage has been placed in that direction. Bituminous generally is in better shape than at any time since the January slump. There are fewer weak spots and for Georges Creek as well as for the choice Pennsylvania grades there is a better demand.

Anthracite—The demand for April coal in New England was much larger than was anticipated. Several of the dealers are disappointed in the proportion shipped them at the minimum price, but all cannot be served in a single month. May starts in with a good volume of business on hand, at least for the shippers who regularly look after this market. Independent coals are still quoted freely and at a discount from the company circular, but for the most part they go begging. An active demand for hard coal is reported in every direction and with the West starting up and the opinion that anthracite may be short again in the late fall becoming more general, it looks as if in the summer months the trade would not be so slow, after all.

Bituminous quotations at wholesale are about as follows:

	Clearfields	Camb. & Somer.	Georges Creek	Poca. & New R.
Mines*	$1 00@1.35	$1 25@1 45		
Philadelphia*.	2 25@2.60	2 50@2 70		
New York*	2 55@2.90	2 80@3 00		
Baltimore*			$2.85	
Hampton Roads*				$2 85
Providence†.				3.73@3.78
Boston†.				3.78@3.90

*F.o.b. †On cars.

PHILADELPHIA, PENN.

There seems to be a slightly better tone to the market, judging from the reports from various directions and the outlook for May business is much better than was anticipated when the spring or opening prices were first announced. This is doubtless due to the fact that the dealers are getting cleaned out of the coal laid in during the latter part of the winter, and are now in the market for fresh supplies. They have probably figured that the difference of 10c. per ton does not amount to much, anyhow. As a matter of fact, some of the coal that went into the stocks of the large companies, is now coming out again, to fill the current business; the mines are working full, and with the entire output, with the possible exception of some of the steam sizes, being absorbed, the outlook for the immediate future is excellent.

There seems to be a variety of opinion as regards business for the month of May. Some are optimistic, and claim that the tonnage will equal that of June, and that present indications are for even better business, while others point to the corresponding period of 1911, when business during the latter part of the month fell off considerably, that is, on direct sales. Most of the companies are kept busy during the late spring and early summer months, forwarding coal for stocking purposes in the Northwest and at the head of the Lakes, and a large proportion of this is not disposed of until the fall and winter.

The bituminous market still continues in a somewhat hazy condition, although it is reported that several large contracts have been consummated, at the prices of the operators. Taking the market in general, however, it is inclined to be dull. There seems to be a lack of the inferior coals, which were almost a glut during the past three or four weeks, and higher grade coals when sold, are realizing fairly good prices.

NEW YORK

Bituminous—There is a good heavy movement of soft coal on contract, but aside from this the local market is quite heavy and dull. There is little demand for spot coal, and odd tonnages are being offered at unusually low prices. However, supplies at tide are rather low, being somewhat reduced from last week, and the prompt market occupies a relatively strong position in that it is not being flooded with heavy shipments of consignment coal. On the whole, the local situation is regarded as normally favorable to the operators at the moment. One of the larger local companies reports that its contract requirements alone calls for approximately 70 per cent. of the highest production during last winter.

With most of their tonnage now fairly well covered, producers are showing a disposition to take drastic measures with consumers who are still holding off on contracts. Thus one operator who still has a number of contracts pending expects to withdraw his quotation shortly. The spot market is not quotably changed from last week, prices continuing nominally on the following basis: West Virginia steam, $2.55@2.60; fair grades, Pennsylvanias, $2.65@2.70; good grades of Pennsylvanias, $2.75@2.80; best Miller, Pennsylvania, $3.05@3.15; Georges Creek, $3.25@3.30.

Anthracite—The reduction of the anthracite discount from 50 to 40c. on Thursday of this week, has tended to bring about a further dullness in the anthracite trade. The market is more than normally supplied with coal for this season, but even so it is doubtful if all consumers will get as much as they require. The mines are working fairly heavy, except that the button strikes are still occurring periodically and restricting production to a certain extent. There appears to be a certain prescribed policy being adopted by the strikers now. Thus a certain colliery, or group of collieries, are subjected to the strike, which is persevered in until the union men accomplish their end and the trouble is then precipitated at another point.

Stove coal is still in the heaviest demand and is becoming quite short in supply. With the heavier production through April, the steam grades have naturally become somewhat longer and are now fairly easy with the exception of rice, which appears to be permanently in short supply. With the curtailed work at the mine, because of the button strikes, the car supply has been sufficient for all requirements. The indications are that May will see the trade rather less active than in previous years. The current market is about as follows:

	Circular	Individual—Lehigh	Individual—Scranton
Broken	$4 60	$4 45	$4 60
Egg	4 85	4 70	4 85
Stove	4 85	4 70	4 85
Chestnut	5 10	4 95	5 10
Pea	3 50	3 35@3.45	3 10@3.20
Buckwheat	2 75	2 25@2 45	2 50@2 75
Rice	2 25	1 90@2.00	2 25@2 35
Barley	1 75	1 45@1.70	1 60@1 75

PITTSBURGH, PENN.

Bituminous—Operators controlling the major part of the Pittsburgh district production have now advanced prices on mine-run and nut coal by 10c., this being in line with our report of last week, stating that some sales of lake coal had already been made at $1.50. Some operators who have formally taken the position on the higher prices quote them only on new inquiry, undertaking for the present at least to cover belated old customers at the former prices, but others are quoting the advances in every instance. No change is made in slack and nut, as they are relatively plentiful during the lake season, but an advance in these is naturally presaged for the fall, if conditions hold good. Prices are now quotable as follows: Slack, 90c.; nut and slack, $1.05; nut, $1.25; mine-run, $1.30@1.40; ¾-in., $1.40@$1.50; 1¼-in., $1.55@1.65, per ton at mine, Pittsburgh district

On the basis of production at the rate the operators are likely to achieve, making reasonable allowances for car and labor shortage, etc., the great majority of the companies are now sold up for the season. They may easily have difficulty in making full shipments against their present contract obligations, while on the other hand particularly good operations may result in free coal being offered from time to time. There appears to be considerable Lake demand still unsatisfied. Car supply is fairly satisfactory, but the movement is sometimes poor, closing mines occasionally for a day because the previous day's run is not moved; the first day of the week two important mines were reported closed from this cause. About 75 per cent. of the full rated capacity of the district is in operation.

Connellsville Coke—The market showed softening tendencies in the late days of last week, some prompt furnace coke being sold down to $2.10 and even $2, but the offerings were light at these figures and the cut prices were due simply to the light absorbing power of the market. The Producers' Coke Co. continued to quote $2.25. Last Sunday was the Greek Easter, and work at the opening of the week has been light, operators failing to make full shipments on contracts, which is likely to bring in inquiry later in the week and stiffen the market. Meanwhile it is quotable nominally at $2.25. Contract coke is purely nominal, the figure set by some operators being $2.50, for second-half. Foundry coke remains quotable at $3@3.50 for both prompt and contract, on recognized brands, but indifferent coke can be had for less.

BUFFALO, N. Y.

A Buffalo mine representative claims that his company has withdrawn quotations from the entire jobbing trade for the reason that their coal is sold so far ahead that they have to buy in the open market right along. Many of the other heavy operators also refuse to make any more sales as their entire output for the season is placed. This report from the bituminous trade is becoming common. The market has stiffened so steadily for several weeks that the seller is now more confident of the future than he has been at any time in several months. It appears that all sections are eager for coal, not because production is light, but because consumption is heavy. All reports of low-priced coal on the market have disappeared, though they were plenty enough a month or so ago. At that time even the bulls in the trade were beginning to weaken, most of them seeming to look for the market to break before long. The trade is now safe for several months at least, at prices that are decidedly more satisfactory than they were a year ago. As a rule all sellers have contracted as much as they care to this season and will not accept any more business except at their own prices.

The stiffness in bituminous is beginning to be felt in the steam sizes of anthracite, which in some instances have sold at an advance of 10c. a ton. Slack is strong, some dealers not being able to get as much of it as they need. With such conditions in effect all bituminous prices are strong, quotations being on the basis of $2.80 for Pittsburgh select lump, $2.65 for three-quarter, $2.55 for mine-run and $2.15 for slack. Coke is also stronger, the top price being $5 for best Connellsville foundry.

The general anthracite trade is quiet, jobbers and consumers even refusing to wake up as the end of the month approaches. There must be some Eastern trade, as the shipments for the Lakes are not sufficient to satisfy the needs, though the anthracite line trade is light. There was more coal held over by consumers than has been the case in recent years, which accounts for the light demand. Shipments by lake for the week were 131,000 tons.

BALTIMORE, MD.

The local market has shown considerable increased strength and there are some reports to the effect that the supplies are becoming inadequate. There seems to be a feeling among consumers that prices have touched the low point and, as a result, there is a general movement to cover requirements. The better grade coals became scarce toward the close of the week, Georges Creek selling around $1.70, with the next lower grade at about $1.45 on contract, and the demand strong. The low grades have shown no improvement, and are still being quoted at 70c. with the market being over-supplied.

Shipments appear to be rather light at the present time, a number of the mines taking advantage of the dull period to effect long-needed repairs. The car supply is also rather poor, considerable of the coal equipment having been withdrawn for use in repairing the tracks washed out by the flood. It is believed in some quarters that the long delay to traffic occasioned by the flood will set back the general movement so materially that there are probabilities of an acute situation developing the coming fall. It seems reasonable to believe that Lake shipments will not be up to the usual tonnage during the early part of the season, so that the total movement to the Northwest, by way of the Lakes, will not be up to requirements. In such an event, the deficiency will have to be made up by rail shipments which will throw a heavy strain on the roads just at a time when they are least prepared to handle it.

COLUMBUS, OHIO

Warmer weather during the past week caused a falling off in domestic business, but the greater activity of the Lake trade, coupled with a steady demand for steam grades have made the market in Ohio rather firm. Prices are ruling strong at about last week's level and outside of a slight weakness in fine coal, there is no tendency to decrease quotations.

One of the best features of the trade is the call on the part of several railroads for bids for fuel requirements for the coming year. None of the larger contracts have been awarded as yet although some action in that direction will likely be taken by May 1. Sales managers of the larger producing concerns are busy in the railroad fuel business now; it is believed that prices will average 5c. more on the ton than last year.

A number of steam contracts have also expired and they are being renewed generally at an advance of 5c. on the ton. Some of the steam users are buying their supply on the open market since the expiration of their contracts. There has been a slight let up in the demand for steam tonnage, but this condition is believed to be only temporary.

Retailers are trying to curtail their stocks for the coming summer. Outside of an occasional order for domestic sizes, there will be little doing in that department until the period for stocking up. Retail stocks are slightly larger than ordinary at this time of the year, due to the expected demand after the recent high waters.

Lake trade continues active and there is every indication for a good demand from the Northwest for the entire season. Dockmen are clamoring for coal and every effort will be made to ship a good tonnage. Prices on the docks are at the same level which prevailed in 1911. Last season a decline

of 10c. on the ton caused some trouble among lake shippers. Prices f.o.b. vessels are $2.10 instead of $2, the price in 1912.

Production shows a small increase in every mining section in Ohio. In the Hocking Valley, the output is estimated at 70 per cent. of the average and in the Pomeroy Bend district it is about 65 per cent. In the domestic fields the output has been small. In eastern Ohio production is slightly more than 50 per cent.

Quotations in the Ohio fields are as follows:

	Hocking	Pittsburgh	Pomeroy	Kanawha
Domestic lump	$1.50	...	$1 50	$1 50
¾-inch	1 35	$1 25	1.35	1.30
Nut	1.25	...	1.25	....
Mine-run	1 15	1 10	1 15	1 10
Nut, pea and slack	0 90	...	0 90	0 90
Coarse slack	0 80	0.85	0 80	0.80

HAMPTON ROADS, VA.

Shipments from tidewater during the last week have fallen off considerably at all the piers. The early part of the week saw some large export shipments for the Austrian and Italian Governments, these two countries so far this month having taken approximately 40,000 tons. There has also been a fair demand by the U. S. Navy, one of the large colliers taking about 13,000 tons. Coastwise business, however, has been slack during the entire week.

There has been no change in prices for standard coals which remain at $2.60 to $2.85 the latter being for contract business. There have been small sales of high-volatile coals at $2.45 and $2.50 but very little demand for this particular grade. On account of the small dumping during the week there is an accumulation of coal and the yards at the three ports are in a badly congested condition. Unless shippers arrange to move coal promptly there is a prospect of a shortage of cars and the railroads are urging shippers to make disposition of consignments.

Ground has been broken and work commenced on the coal storage plant at Sewalls Point, mention of which was made last week and it is expected when this is completed that it will take care of in the neighborhood of 50,000 tons.

Advices from England are that David A. Thomas, the British coal operator, who was here some months ago looking over the coal terminals of the different roads, sailed for this country on the S.S. "Olympic" Apr. 22. It is said that Mr. Thomas is expected in Norfolk again shortly to arrange for the exportation of coal to South America and that his shipments will probably amount to 4,000,000 tons during the first year.

BIRMINGHAM, ALA.

The local steam-coal market has grown slightly heavier during the week. There is an additional sympathetic weakness owing to the sharp decline in the pig-iron market, around which all other markets in this district revolve. It is believed that iron has touched bottom and that the steam coal and coke markets will not be seriously weakened by the closing down of any local furnace or steel plants.

The export tonnage from Alabama mines is the largest in the history of coal mining in Alabama. Dumping facilities are being enlarged at ports on the Gulf of Mexico to take care of increased export coal business already realized and the further increase that is sure to come with the opening of the Canal.

Prices on Montevalo fancy domestic lump (the highest price domestic coal in Alabama) are quoted as follows for the coming season: May delivery $3.15 with a 10c. advance in June, 15c. in July and August, 10c. in both September and October, reaching the maximum of $3.75, which price will be maintained through to February.

LOUISVILLE, KY.

The general situation in Kentucky remains unchanged except that there has been some easing up in the pressure for steam grades in certain sections, although there is still a noticeable scarcity of nut and slack. Western Kentucky operators report a sufficient production of these grades to meet requirements only; there is certainly little to be had in the spot market, and prices are exhibiting a gratifying steadiness.

Lump and block, and the cheaper domestic grades are practically unsalable at the present time and apparently with no prospects of any demand appearing in the immediate future. The customary storage season for these grades is now at hand but dealers appear to be holding off for some reason, in spite of the fact that prices are certainly attractive. This meager demand for the larger sizes is the cause of the short supply of the screened grades.

There has been some car shortage in nearly all the producing sections, especially on the lines of the Louisville & Nashville. This condition is ascribed to the heavy movement of perishable freight from the South, coal and other slow moving commodities being given little consideration at such a time. The long standing embargo of the Louisville & Nashville against Chicago, and other Northwestern points, together with the large amount of equipment still tied up or seriously delayed in the flood zone, is also operating against the favorable movement of coal.

Eastern Kentucky lump is quoted down to $1.40 and No. 2 mine-run at 85@90c.; Western Kentucky nut and slack is strong and active at 85c., with pea and slack at 35@50c.; nut is quoted at $1.05@1.10, lump, $1.30 to 1.25 and mine-run, 80@95 cents.

KNOXVILLE, TENN.

There has been a decided improvement in the local market within the past 30 days, due to the favorable weather. This is especially true of the territory north of the Ohio to which considerable domestic coal is now moving. Operators are well satisfied with sales for May and June, quite a number having disposed of their entire output for those months.

While there has been no advance in prices the market is strong, and with continued improvement, quotations are almost certain to advance. Operators are therefore well satisfied, as the demand for domestic after July 1 will naturally be strong. The flooded conditions in the North have caused a car shortage and there has been a strong demand from the flooded district. The steam market is satisfactory.

INDIANAPOLIS, IND.

Retailers in this city are still charging their winter schedule of prices, the highest in the history of the trade. The only exception is a reduction of 50c. in the price of Indiana lump from $3.75 to $3.25. They have not yet received any shipments from the Eastern fields since the reduction of prices at the mines there, so have none of the cheaper coal to offer.

The railroad service has not yet been sufficiently restored to permit of coal shipments. It is possible this has something to do with the running schedule at Indiana mines, which are getting in about four to five days a week, notwithstanding the spring weather which is limiting the demand for domestic grades. Operators report a normal business from steam users which the mines have been readily filling, with the probable exception of screenings. Prices hold steady at the recent level as follows: Mine-run $1 to $1.20; screenings 90c. to $1. Some mines and factories have not yet recovered from the unprecedented flood early in April, but with these exceptions, the industries of the state seem to be well engaged.

CHICAGO

Conditions in the Chicago market are comparatively quiet at present. The warm weather has caused dealers to concentrate their attention on the steam-trade business, and renewals of contracts are being made with evident satisfaction on the part of both the dealer and consumer.

Demand for Eastern coal is reported to be good, although some concern is felt over conditions in the West Virginia strike zone. The screenings situation is normal, and contracts are being generally renewed with Franklin County operators. The demand for Springfield coal is confined to the steam trade exclusively, with mines putting in about half time. Wholesalers are somewhat disappointed in finding that the large demand for anthracite, usually expected at this time when April prices end, failed to materialize.

A great deal of interest is being taken in gas coal. One Western buyer is in the market for 750,000 tons of this product. It is reported that there will be an increase of 10,000,000 tons in the consumption of gas coal in the Western territory this year. The price of Youghiogheny coal has advanced to $1.40 for three-quarter inch lump on contract. Prices for Kanawha have advanced to $1.25@1.30. Byproduct coke is quoted all the way from the circular price of $4.45 up to the premium price of $4.75. The hard cokes are firm.

Prevailing prices in Chicago are:

	Springfield	Franklin Co.	Clinton	W. Va.
Domestic lump	$1.97@2 07	$2 30@2.40	$2.27	
Egg		2.30@2.40		$3.95
Steam lump	$1 82@1 87		2 17	
Mine-run	1.82@1.87	2 20@2.30	1 97	3 30
Screenings		1 62 1.95@2 00	1.62	

Coke—Connellsville and Wise County, $6@6.25; byproduct egg, stove and nut, $4.45@4.75; gas house, $4.65@4.75.

DETROIT, MICH.

Bituminous—There seems to be no inclination on the part of the shippers to cut prices in order to get business, and, generally speaking, the situation at the moment, is materially stronger. More contracts are being closed, there does not seem to be any great amount of track coal, and the movement is quite normal for this period of the year. Consumers are uniformly hesitating at the advanced prices, but after additional inquiry at other points they are usually willing to close. The market in general is showing a strong, healthy tone, and dealers are very much encouraged over the outlook.

The prevailing quotations on soft coal are about as follows:

	W. Va. Splint	Gas	Hocking	Cambridge	No. 8 Ohio	Pocahontas	Jackson Hill
Domestic lump.	$1.50	.	.	.	....	$2 25	$2 00
Egg.....	1.50	.	$1 35	.	. .	2 25	2.00
1¼-in. lump....	1 25					....	. .
3-in. lump.....	1 15	$1.15	$1 15	$1 15	$1 15	....	....
Mine-run.....	1 10	1.10	1 10	1 10	1 10	1.50	....
Slack.....	1 00	1.00	1 00	1 00	Open	Open	....

Anthracite—It is generally conceded that the local hard-coal trade is a trifle disappointing and rather below that of previous years. Shippers generally appear to have sold their April tonnages without any difficulty, but the demand as a whole has fallen below that of previous years. Consumers have grievances against the producers among which are the poor preparation and inadequate shipments last fall.

ST. LOUIS, MO.

Conditions are practically the same in St. Louis and adjacent territory as they have been for the past few weeks. A few steam contracts are being signed up, and as usual the operators are hungry for the business and are not taking into consideration the fact that there is liable to be a suspension on Apr. 1, 1914, with the usual car shortage previous to that time, and the season of high prices.

Aside from the big retail companies, no anthracite is being bought, inasmuch as the price war between the big companies still continues. During the past week there has been an accumulation of No. 1 washed nut, but the price has not dropped off any.

The prevailing circular is:

	Carterville and Franklin Co.	Big Muddy	Mt. Olive	Standard
2-in. lump.....	.....	.....	.....	$0.90
3-in. lump.....	.....	.....	$1.20	.....
6-in. lump.....	$1.15 @ 1.20	.....	1.25	1.05
Lump and egg.....	.....	$2.25	.....	.....
No. 1 nut.....	1.05 @ 1.15	.....	.....	.....
Screenings.....	0.90 @ 0.95	.....	.....	0.85
Mine-run.....	1.00 @ 1.10	.....	.....	0.80
No. 1 washed nut.....	1.35	.....	.....	.....
No. 2 washed nut.....	1.35	.....	.....	.....
No. 3 washed nut.....	1 35	.....	.....	.....
No. 4 washed nut.....	1.35	.....	.....	.....
No. 5 washed nut.....	1.10	.....	.....	.....

The St. Louis circular on hard coal for May is as follows: Chestnut, $7.50; stove and egg, $6.80; grate, $6.55. Smokeless lump and egg is $4.55 with mine-run $4; byproduct coke is $5 and gas house $4.75.

MINNEAPOLIS—ST. PAUL

It is generally thought that the dock men will hold firm this year on prices and some even look for an advance in dock quotations. Prices in cargo lots are higher and then, too, the Eastern offices are demanding more profit from the Northwestern interests and it would seem that the strife for tonnage is due to come to an end. The docks are now all activity as boats are expected at any time.

There was only a scattering buying during the first two weeks of this month by country merchants. This is the time for the visit of the tax assessor and everyone endeavors to bring stocks down to the minimum at this time of the year. Illinois coal is holding very firm for this season of the year and if prices continue firm the rest of the month there is not much chance for coal being sold this summer at the cost of production.

PORTLAND, ORE.

A cargo of coal arrived in the Columbia River this week from Australia. This is the first Australian coal brought to this section for several months or since last fall when a couple of cargoes arrived early in the season. The cargo represented less than 1000 tons, and came over virtually as ballast since the vessel had delivered a cargo of lumber and was booked to return to this coast.

Market conditions here are unchanged, and none are anticipated till summer rates are announced in a month or so.

PRODUCTION AND TRANSPORTATION STATISTICS

VIRGINIAN RAILWAY

Total shipments of coal over this road for March of the current year were 380,091 tons as compared with 303,159 tons for the same month last year. Shipments for the first two months of the year were: 1,233,244 tons for the current period and 914,605 tons in last year.

THE CAR SITUATION

American Ry. Association reports surpluses and shortages of coal equipment for two weeks ended Apr. 15, as follows:

	Surplus	Shortage	Net*
New England Lines.....	167	33	**341**
N. Y.; New Jersey, Del.; Maryland; Eastern Penn...	5,221	0	**5 221**
Ohio; Indiana; Michigan; Western Pennsylvania ..	5,856	434	**5,422**
West Virginia, Virginia, North & South Carolina	776	1,069	293
Kentucky, Tenn.; Miss.; Alabama, Georgia, Florida	132	195	**68**
Iowa, Illinois, Wis., Minn.; North & South Dakota	2,211	71	**2,14**
Montana, Wyoming, Nebraska.....	1,965	5	**1,960**
Kansas, Colorado, Missouri, Arkansas, Oklahoma	2,056	68	**1,880**
Texas, Louisiana, New Mexico.	613	33	**580**
Oregon, Idaho, California, Arizona .	2,721	21	**2,700**
Canadian Lines.....	127	11	**116**
Totals	21,845	2,196	**19,649**
Greatest surplus in 1912 :Apr. 25; .	94,692	2,144	**92,548**
Greatest shortage in 1912 :Oct. 10; .	6,491	14,897	8,406

*Bold face type indicate a surplus.

NORFOLK & WESTERN RY.

The following is a comparative statement of the coal and coke shipments over the lines of the N. & W. Ry. for the months of March and the first three months of 1912 and 1913 in short tons:

	March		3 Months	
Destination	1912	1913	1912	1913
Coal				
Tidewater, foreign.....	146,080	120,288	365,982	387,294
Tidewater, coastwise.....	286,340	327,631	822,283	973,751
Domestic.....	1,353,330	1,303,239	4,069,743	4,333,531
Coke				
Tidewater, foreign.....	8,859	70	17,403	10,034
Domestic.....	140,298	147,660	401,318	438,794
Total..... ..	1,934,916	1,898,888	5,676,729	6,143,404

FOREIGN MARKETS

GREAT BRITAIN

Apr. 18—Prompt supplies are difficult to arrange, while for next month's loading business is not very active at present. There is, however, no weakness in prices.

Quotations are approximately as follows:

Best Welsh steam.....$4 92@5.04	Best Monmouthshires..$4.50@4.62
Best seconds..... 4 74@4.92	Seconds..... 4.26@4.32
Seconds..... 4.62@4.74	Best Cardiff smalls..... 3.72@3.84
Best dry coals..... 4.80@5.04	Seconds..... 3 66@3.72

The prices for Cardiff coals are f.o.b. Cardiff, Penarth or Barry, while those for Monmouthshire descriptions are f.o.b Newport; both exclusive of wharfage, and for cash in 30 days—less 2½%.

COAL SECURITIES

The following table gives the range of various active coal securities and dividends paid during the week ending Apr. 26:

Stocks	Week's Range High	Week's Range Low	Week's Range Last	Year's Range High	Year's Range Low
American Coal Products.....	87	87	87	87	87
American Coal Products Pref.....	109½	109½	109½	109½	109½
Colorado Fuel & Iron.....	34½	32¾	32¾	41¼	31
Colorado Fuel & Iron Pref.....	....	....	155	155	150
Consolidation Coal of Maryland.....	102½	102½	102½	102½	102½
Lehigh Valley Coal sales.....	225	210	215	....	....
Island Creek Coal, com.....	52	51	51	....	....
Island Creek Coal Pref.....	85	84	84	....	....
Pittsburgh Coal.....	20	18	18	24½	19
Pittsburgh Coal Pref	83¾	79¾	80¾	95	79¾
Pond Creek.....	22¼	19¼	19¼	23¾	19¼
Reading.....	165¼	159¼	160	168¾	152¼
Reading 1st Pref.	91	91	91	92¼	89¾
Reading 2nd Pref.. . . .	93	92¼	92¼	95	87¼
Virginia Iron, Coal & Coke....	50	50	50	54	44¼

Bonds	Closing Bid	Closing Asked	Week's Range or Last Sale		Year's Range	
Colo. F. & I. gen. s.f.g. 5s.. ..	96¼	Sale	96¼	96¼	96¼	99¼
Colo. F. & I. gen. 6s ...			107¼	June '12		
Col. Ind. 1st & coll. 5s. gu.	78¼	79	80	80	78¼	85
Cons. Ind. Coal Mc. 1st 5s.....	75	80	85	June '11	..	
Cons. Coal 1st and ref 5s.....	..	94	93	Oct. '12	..	..
Gr. Riv. Coal & C. 1st g 6s	..	100	102¾	April '06	..	
K. & H. C. & C. 1st s f g 5s.....	..	..	98	Jan. '13	98	98
Pocah. Con. Coll. 1st s f 5s.....	..	87¾	87¾	Mar. '13	87¼	87¼
St. L. Rky. Mt. & Pac. 1st 5s.....	78	79	76	Mar. '13	76	80
Tenn. Coal gen. 5s..... ..	100	Sale	100	102¼	100	103
Birm. Div. 1st Consol. 6s.....	102	103¾	101	April '13	101	103
Tenn. Div. 1st g 6s...		103¾	102	Feb. '13	102	102
Cah. C. M. Co. 1st g 6s.....	101¼	101	110	Jan. '09		
Utah Fuel 1st g 5s..... ..	..					
Victor Fuel 1st s f 5s.....		84	79¾	Feb. '13	79¾	79¾
Va. I. Coal & Coke 1st g 5s....	95	97	95	95	94¼	98

No important Dividends were announced during the week.

FINANCIAL DEPARTMENT

Delaware, Lackawanna & Western R. R.

The following are excerpts from President Wm. H. Truesdale's annual report for the year ended Dec. 31, 1912:

Earnings—The gross earnings were substantially larger than for any previous year, notwithstanding that our mining operations were suspended during April and May pending negotiations for a new schedule of wages for mine employees. The earnings from the transportation of coal were thus reduced by $816,421.

Coal Mining—The net income from the operations of this department was $2,111,897, or $427,629 more than in 1911.

From the coal produced there was also realized $1,773,611 ($32,206 less than in 1911), being the estimated value in the ground of such portion of the coal owned in fee as was mined during the year. Further progress has been made in the development of the new colliery, the Loomis, also, work is fairly under way in opening up the "Laurel Run" tract. Shafts are being sunk and other preparations made for mining the coal and preparing it for market through our Pettebone Breaker.

The tonnage produced from our collieries and washeries was 8,166,790 tons, or 278,894 tons less than in 1911, entirely due to the suspension of mining operations during the six weeks in April and May last covered by the negotiations for a new wage scale. The agreement finally reached involved a substantial increase in the wages for nearly all mine employees and covers the four years ending Mar. 31, 1916.

During the past 11 years there has been a continuous increase in the cost of mining coal; for 1912 the cost was 62c. per ton higher than in 1901. The wages of mine employees continue to increase steadily, and more employees are required each year to produce a given quantity of coal. The prices of all classes of material used are higher than ever before. In the older workings the output of coal very largely comes from either the surface veins or the thin ones lying below all those others which in the mining operation require a large amount of rock excavation and dead work. In the deeper and thinner veins the company has introduced a large number of coal-cutting machines, operated by electricity, which enable it to produce coal profitably from these veins, which it could not otherwise do. Regardless of all that is reasonably possible in the future, there is no doubt but that the cost of producing anthracite coal will in the future, as in the past, show a steady increase from year to year. The taxes levied on the coal properties also increased in 1912 more than 24%.

The outlook for the anthracite industry for the coming year seems very favorable, and present indications are that the demand for coal will be equal to the supply. It should be realized, however, that in all probability the maximum annual production of anthracite coal from the Pennsylvania fields has already been reached.

General Remarks—The Syracuse Binghamton & New York R.R. was leased to this company in perpetuity at a rental of 12% on the capital stock, effective Oct. 1, 1912, and has since been operated as a part of our system.

At the close of the year business generally throughout the country was in a highly prosperous condition, and the railway traffic of the country was at its maximum. The promise for 1913 is all that could be desired as respects volume of business and gross earnings, which, if no setback occurs and the crops of the new year are up to the average, should exceed 1912.

There is no cessation in the efforts made in Congrss and the state legislatures to secure the passage of additional laws regulating railway operations, increasing the number of employees, further decreasing their hours of service regardless of the reasonableness of so doing. There is no mistaking the trend of affairs. It is continuous toward the absolute control of all the activities of the railways by Government, national or state, stopping only at responsibility to the owners of them for their financial outcome.

EARNINGS, EXPENSES AND CHARGES

Revenue from—	1912	1911	1910	1909
Coal	$13,280,304	$14,096,725	$14,067,778	$14,464,221
Miscellaneous freight	13,999,359	12,462,679	12,443,473	11,393,860
Passengers	7,722,953	7,696,800	7,290,943	6,825,430
Mail, express and misc.	2,561,895	2,330,359	2,250,738	2,131,500
Total	$37,564,511	$36,586,563	$36,052,932	$34,815,011
Expenses—				
Maint. of way, &c	$4,646,175	$4,144,940	$3,904,931	$3,298,390
Maint. of equipment	6,128,762	5,762,903	5,034,605	4,797,073
Traffic expenses	822,835	779,489	716,347	651,888
Transportation expenses	11,778,982	10,864,107	10,379,455	9,340,845
General	769,668	767,213	688,110	657,314
Total	$24,146,423	$22,318,652	$20,623,448	$18,745,510
Net revenue	$13,418,088	$14,267,911	$15,429,484	$16,069,501
Net. rev. outside oper	561,622	*b*408,705	210,756	364,685
Total net revenue	$13,979,710	$14,676,616	$15,640,240	$16,434,186
Taxes	1,771,980	1,834,640	1,518,925	*p* 1,394,500
Net, after taxes	$12,207,730	$12,841,976	$14,121,315	$15,039,686
Add—				
Interest on investments	$404,743	$446,685	$405,818	$391,030
Dividends on stocks	820,106	226,661	240,165	394,530
Coal department earns.*	3,885,508	3,490,085	3,381,262	4,628,771
Int., disc't & exchange	3,416	*c*7,399	19,756	45,909
Rentals—miscellaneous	179,458	199,509	185,582	154,700
Hire of equipment	199,690	239,014	201,558	175,141
Miscellaneous (net)	125	226	113,855	*c*2,683,829
Total	$17,700,775	$17,437,757	$ 8,669,3 1	$23,513,595
Deduct—				
Interest on bonds	$6,486	$6,486	$6,486	$3,243
Rentals leased lines	5,688,588	5,204,889	5,160,140	5,160,140
Rentals joint facilities	158,690	224,043	238,584	271,563
Renewals and betterments	1,720,698	2,200,628	2,542,117	2,099,454
Miscellaneous	40,307	7,527	.....	.....
Discount on bonds sold	43,935	162,142	.....	.....
Dividends (10%)	3,014,400	*x*3,014,400	3,014,400	*y*2,817,216
Extra dividend (10%)	3,014,400	*x*3,014,400	3,014,400	*y*3,014,370
Total	$13,687,504	$13,834,515	$13,976,127	$13,365,986
Balance, surplus	$4,013,271	$3,603,242	$4,693,184	10,147,609

*Includes value in ground of coal owned in fee and mined during the year in conduct of mining operations; In 1912, $1,773,611; in 1911, $1,805,817

Results of coal department were:

	1912	1911	1910	1909
Earnings	$21,706,755	$22,593,288	$21,786,127	$35,665,865
Expenses	17,821,247	19,103,203	18,404,865	31,037,094
Profit	$3,885,508	$3,490,085	$3,381,262	$4,628,771

b Net revenue from outside operations as above in 1912 was derived as follows: Oper revs., $3,529,131, less exp., $2,967,509, leaving $561,622.

c Includes the special item of profit from sale of 37,000 shares of Lehigh Valley R R stock, $2,622,730.

x Also 35% extra dividend ($10,550,400), paid Dec. 20, 1911 in stock of the Lackawanna R.R. of New Jersey.

y Also 50% extra cash dividend paid July 20, 1909 and 15% stock dividend paid Aug. 2, 1909 from profit and loss.

GENERAL BALANCE SHEET DECEMBER 31

Assets—	1912	1911	Liabilities—	1912	1911
Road and equipment *a*	$41,553,707	$38,960,907	Common stock	$30,277,000	$30,277,000
Securs. of property affil., &c., cos.—unpledged	9,708,281	9,580,963	Premiums realized on capital stock	70,720	70,720
Adv. to affil., cos. for construction, &c	4,954,140	4,005,885	Mortgage bonds	320,000	320,000
Misc. investments (physical prop.)	3,097,849	2,937,472	Loans and bills pay	26,667	26,667
Cash	1,252,755	482,761	Traffic, etc., bals	650,593	524,731
Securs. in treasury	344,900	344,900	Vouchers and wages	3,563,168	3,467,463
Marketable securities	10,458,781	10,783,362	Misc. accts., etc	162,120	803,635
Loans and bills received	17,539	16,518	Matured interest, dividends, etc	1,297,300	1,320,712
Traffic, etc., bals	201,269	165,291	Unmatured interest, divs., etc	1,290,552	1,207,986
Ag'ts. and conductors	948,442	578,277	Taxes accrued	1,738,887	1,839,157
Misc. accts. rec. etc.,	4,226,468	3,990,663	Operating reserves	107,131	61,553
Materials and supplies	2,989,966	3,153,588	Other def'd credit items	279,547	227,738
Advances to leased lines, etc	3,621,208	2,985,181	Appropriated surplus	*b*14,198,218	12,477,520
Prepaid rents, etc	6,901	14,699	Profit and loss	29,515,902	25,502,631
Oth. def. deb. items	115,600	127,046			
Total	$83,497,805	$78,127,513	Total	$83,497,805	$78,127,513

a After deducting reserve for accrued depreciation, $6,711,301 *b* Appropriated surplus represents renewals and betterments to property paid out of income since June 30, 1907.

COAL AGE

Vol. 3 NEW YORK, MAY 10, 1913 No. 19

"TEACH thy tongue to say: I do not know."

Here's a proverb that can be traced back to the Talmud; from which we may infer that the "know it all" type is not a recent creation.

If you believe that there are no "know it alls" traveling with the mining fraternity, just inquire for the date of the next mine foreman's examination in your state and enter your name as a candidate but attend the sessions as a spectator. Allow us to add right here that you won't be bored to death, unless you're suffering from acute dyspepsia; and furthermore you needn't think that all of the fun will be at the expense of ignorant "cusses" who are trying to squeeze through; at any rate such hasn't been our experience.

The room where the oral part of the examination is held should be given the preference. There you'll not only be furnished with amusement but many things that have always appeared mysterious undoubtedly will be explained satisfactorily.

For example: when one of the applicants quotes a rule from a well-known book and innocently asks the examiner to explain something written therein, and the examiner in question suddenly remembers that he is needed in another room, it won't be very hard to imagine why some examiners insist that applicants for certificates leave all textbooks at home. If you read in the papers next day that Mr. So-and-So has declined to serve on the board another term because of business pressure, you can make him "dish" up the treats without half trying.

And don't think for a moment that just because you could have given the applicant a satisfactory answer that the examiner is a "dub." If you feel that way about it, before many moons you may be an examiner and some one else will get the treats.

Mr. Mining Man is there anything relating to the theory of mine ventilation that you do not know?

If you think we are joking, just reverse the question and try again; is there anything relating to the theory of mine ventilation that you *really* do know?

Considering that it is hard to decide which of these questions is ridiculous, it seems as if the average man might muster courage enough to admit, even in the presence of a beginner, that there are some things that cannot be answered off-hand.

Our examiners are not the only men connected with the industry who are ashamed at times to "fess up." Vast mining enterprises have been undertaken that were doomed to failure from the beginning, simply because some engineer ventured a random opinion rather than admit that he required time to investigate.

All of which leads us to believe that a new type of "high brows" is required in the mining industry today. Men who are able to pump information out of fellows who have had experience, and are then willing to pass the same on down the line in a manner that will provoke spontaneous discussion from both "high brows" and "low brows."

IDEAS AND SUGGESTIONS

Progressive Mine Management

By West Virginia Engineer

Coal mining is a business. Conditions must be carefully studied if the operation is to be successful. It is not only the good we do but also the good way in which we do things that brings lasting results.

Coal company officials should all coöperate in much the same way as a big family. There is a personal element in all systems; build it upward and let it be one of construction rather than one of destruction. Men must feel satisfied or they will not put forth their best efforts.

The mine official should instill interest in the work and have it done with the feeling of "all together men." Encourage, educate and train the worker. Bear in mind that selfishness and petty jealousies are often the cause of serious and unnecessary friction.

The handling of men efficiently is what increases production and lowers costs. We are all human and appreciate the good will and favor of friends. A helping hand to show an easier and better way to do some work, or a word of encouragement will surely make friends who in turn will be your well-wishers.

The men in charge must be big enough and broad minded enough to encourage those working under them; they should develop sound judgment, honesty and the spirit of fairness. Aggressiveness and competency in work should be rewarded, while the ones who shirk their duty should suffer.

An incentive for the things worth while must be sought for and encouraged. The times are progressive and successful men must be likewise. Often the experience and ideas of the most ordinary laborer will suggest worthy plans to the officials in charge.

Labor conditions are more varied than they were some years ago and naturally they must be handled differently. How often now do you find father and son working together in the same place, the former an experienced man teaching the latter to be a good miner? Good pick miners, who used to take a personal pride in their working places, are getting scarcer every year and at the present time can command almost anything within reason.

Knowledge is sufficient to correct most evils but the main trouble lies in the application. Have you ever warned a man about dangerous conditions or practices and then have him tell you that he has worked in the mines for 20 years? However, fools often serve as horrible examples.

It pays to lengthen the lives of your men and also to better their living conditions and surroundings. Discipline there must be, but make it of the sane kind. If necessary, discipline of a strict nature need not be feared. When you are in the right and working for the safety and best interests of all concerned the strictest discipline will only react for your advantage. Disrespectful familiarity must not be tolerated.

The great majority of accidents are avoidable, as they are usually the results of carlessness, recklessness or greed. Inspectors would do more good by trying to correct bad practices in the mine, rather than wait until they reach the office and write a report full of recommendations.

Playgrounds, reading clubs, Young Men's Christian Associations, churches, good schools, comfortable homes, with well fenced gardens, all encourage home life and contentment and help keep down the social unrest.

⁂

Coöperation as Related to Scientific Management

By A Colorado Engineer

Coal mining needs a change of attitude both on the part of the management and on the part of the workmen.

About every coal mine, there is, in the minds of men, a general understanding as to what constitutes a day's work; many employees feel that a certain maximum of effort must not be exceeded. Whether a man be track laying, timbering, road cleaning, machine cutting or what not, there is present in his mind a definite concept of what he or some other man has previously done at that particular work and has received a day's pay therefor.

Now this attitude of the workman is prompted not altogether by a desire to get something for nothing; it is partly the result of the attitude of his superiors, who sometimes lie awake nights trying to find a means of increasing that maximum of labor—without correspondingly increasing the rate of pay per day.

Were our workman engaged in marketing eggs instead of labor he would not be expected to deliver more than twelve eggs for the market price of a dozen, and further, did he at some time deliver fifteen eggs for the price of twelve, his purchaser would not get fifteen the next day, for the dozen price, however much he might expect such delivery. Again, were our workman still in the egg business, and at any time, for any reason whatever, whether of his making or not, unable to deliver a full dozen, he would expect pay for only what he was able to deliver.

A Much-Needed Change

The change needed is this: Workmen must be ready and willing at all times to deliver the full dozen and the management must be as willing and as ready to pay for any above the dozen delivered. The need for the change is in the necessity of establishing scientific management in coal mining.

To illustrate this need, let us suppose two mines equipped with the same type of mining machines and working the same seam of coal (this supposition is real with the unimportant exception that some of the details are not quite true). Calling these mines Nos. 1 and 2, let us suppose that at mine No. 1 a competent man is employed to look over every machine after each shift;

that the machines are in perfect running order at the beginning of every shift and that if any trouble arises during any shift, competent help is within telephone call of the machineman. Suppose we also assume that an assistant foreman sees that all working places are in proper condition for cutting; that all tracks are properly laid and kept in repair; that feed wires are always within reach of the machine cables; that bits are delivered to the machine properly sharpened and that at all times there is a complete set in a substantial box. All this and more to enable the machines to cut coal as continuously as possible.

Taking an Actual Assumption

Let us suppose that at mine No. 2 there is no definite system about anything. Bits are sharpened by an incompetent blacksmith. These bits are taken into the mine by the machinemen themselves, in a gunny sack or in an old tomato can. The machinemen must carry their own lubricating oil into the mine and must procure this oil from a material man who has other duties than attending to supplies, and who is often remote from his place of business. The machines are run without repairs until they are completely down and out. The mine tracks are in poor condition and derailments are frequent; the haulage system is inadequate, making delays and layoffs of common occurrence; pumps are often out of order and men must work ankle deep in water. In fact the condition of mine No. 2 is such that no one is working to his capacity.

Now suppose, which is a fact, that the machinemen of No. 1 mine demand the same rate per ton as is paid at No. 2 mine, and further suppose that the management of No. 1 mine demands that machinemen work at a rate per ton which will insure the men about the same return per month as is received by the men at mine No. 2.

Both attitudes are wrong. The condition at mine No. 1 is the result of several years patient work on the part of the management with the assistance of many men who occupy no official position. The fact that machinemen can cut more coal here than at No. 2 mine is not wholly due to the machinemen themselves. It is true that doing more units of useful work, the runners at No. 1 are entitled to a larger money return than those at No. 2; but since the increased efficiency is due to many hands and to many minds, any increase in profit should be distributed among those responsible.

When there is a general willingness to let everyone who contributes to higher efficiency share in the increased profits, scientific management will be well on its road to actual realization.

A Commendable Safety Provision

While the coal miner is slow to concede that his brethren in the metal end of the industry can teach him anything about the mining game, there are, nevertheless, important exceptions to this rule. One of these that has recently been brought to our attention is a provision the Anaconda Copper Mining Co., of Butte, Mont., has made whereby a substantial premium is offered the mine foreman having the least number of accidents during the year. In these days of keen competition, it is highly gratifying to find such a powerful and representative company as the Anaconda, with its 1800 miles of workings and 10,000 underground employees, establishing such a humanitarian precedent.

The new rule of this company provides, in brief, that the mine foreman having the least number of accidents during the year shall receive a prize of $750; there is also a second prize of $250. No doubt the least number of accidents per foreman is computed on the basis of the average number of men they have charge of, so that the man at the large mine has an equal chance. We believe this is offering inducements at the right point.

The Gamblers

By Berton Braley

(Written expressly for "Coal Age.")

We'll take a chance—that roof is loose and flaky,
It really ought to have another prop,
But though it seems to be uncommon shaky
I guess it isn't ready yet to drop.
We'll get another car out if we hurry,
And that means jingling silver in our pants,
The roof may fall and crush us?—We should worry!
We'll take a chance.

We'll take a chance—our holes are drilled for loading
Our tamping stick is missing—use a drill,
Although there's danger of the charge exploding
We'll take a chance, I don't believe it will;
Of course the rules forbid such methods, brother,
But nary sign of tamper meets my glance,
It's too much work to go and get another,
We'll take a chance.

We'll take a chance—there may be firedamp near us,
And if there *is*, it isn't any joke,
But there's no boss around to see or hear us,
So let's light up our pipes and have a smoke.
If there is damp—we'd be *some* smashed and busted
Which wouldn't be a pleasant circumstance,
But we can trust to luck—as we *have* trusted,
We'll take a chance.

We'll take a chance—we're not afraid of dangers,
There's nothing killed us *yet*, so we're all right,
To every sort of worry we are strangers,
And so you see us, always gay and bright;
Maybe some day the roof will fall and get us
The dynamite may go off in advance,
The gas explode, but we won't let it fret us,
We'll take a chance!

Wireless Telephony in Mines

Great interest is being aroused in colliery circles in South Yorkshire, England, by a series of experiments in wireless telephony which is being carried out at the Binnington Main Colliery, and which, it is hoped, will lead to easier and safer communication with the various parts of the mine.

If the system is capable of all that the inventor claims for it, the results will be far reaching, as it is stated that a conversation can be carried on through 1500 yd. of solid rock. Great reticence is being observed concerning this matter, but when the experiments have reached a more advanced stage, it is understood that further details will be available.

Substation Loads in Lackawanna Collieries

By H. M. Warren* and A. S. Biesecker†

SYNOPSIS—Defining the load factor as the ratio between the actual power entering the converter and the rating of the connected units, the authors show that the 24-hr. load factor is 12.5 and for 365 days is only 8.6 per cent. This is not for the central station but for the average of 15 substations in the anthracite region delivering direct-current only.

In view of the fact that practically no data of this nature are available and that the Lackawanna Railroad Co. has a large number of substations of which the rated connected loads widely differ, we were led to conduct a series of tests, the results of which form the basis of this paper.

Tests were made on 15 substations ranging in size from 150 to 700 kw. The apparatus in these stations consist of 60-cycle, six-phase diametrically connected synchronous converters delivering direct current at 275 volts, step-down transformers of either the single or three-phase

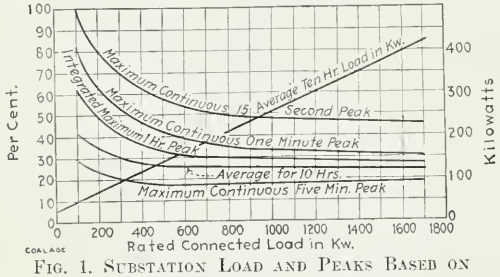

Per Cent.
Kilowatts
Maximum Continuous 15 Average Ten Hr. Load in Kw.
Integrated Maximum 1 Hr. Peak
Maximum Continuous One Minute Peak
Average for 10 Hrs.
Maximum Continuous Five Min. Peak
Second Peak
Rated Connected Load in Kw.
COAL AGE

Fig. 1. Substation Load and Peaks Based on Synchronous Converter Input

type, and the necessary alternating-current and direct-current switching apparatus. These substations are usually located on the surface at the colliery, and the three-phase high-tension power is furnished from central stations.

Loads Comprise Mostly Small Units

The power apparatus driven from the substations consists of locomotives, hoists, pumps, and under-cutting machines. The locomotives vary in size from 7 to 13 tons and are usually geared to operate at a speed of from six to eight miles (9.6 to 12.8 km.) per hour at full load. Although the locomotive weights vary, about 80 per cent. of the total number weigh seven tons or less. All of the locomotives have double motor equipments with series-parallel controllers. The motor equipments average about 10 hp. (railway rating) per ton of locomotive weight The direct-current hoists operate on either slopes or planes and vary in size from 20 to 160 hp. As most of the large pumps are driven by alternating-current motors, the direct-current pumping sets are usually small in size and operate intermittently. The power required for undercutting machines is at present comparatively small. It is therefore, important to note that about 75 per cent. of all direct-current power supplied from these substations is used by locomotives and that 80 per cent. of all locomotives are rated at 70 hp. or less.

How Tests Were Conducted

The tests on these substations were conducted as follows: In order to obtain accurate readings, an alternating-current single-phase watt-hour meter with high-geared dials was obtained. This was connected in one phase of the alternating-current end of the synchronous converter and readings taken every half hour. A record of the peaks was obtained by connecting a graphic ammeter which was geared to give a paper speed of 7½ in. (18.8 cm.) per minute in the direct-current side of the converter. A note was also made of the machines operating in the mine at the time of the tests.

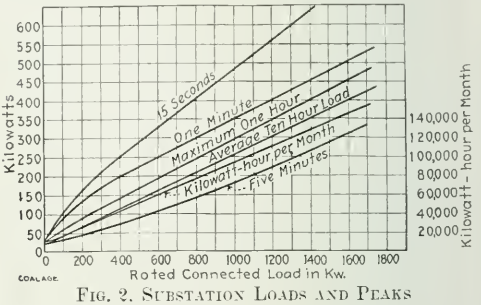


Fig. 2. Substation Loads and Peaks

The rated connected loads were based on the following motor ratings:

Electric locomotive—10 hp. per ton.
Hoist motors (railway type)—one hour rating.
Pumps—Name plate—continuous rating.
Undercutting machines—one hour rating.

The total of these horsepower ratings was reduced to kilowatts in determining the kilowatt rating of the total connected load.

The Factors Determined

After the above test data were obtained, a tabulation was made showing the maximum peaks for 15 sec., one minute, five minutes, and one hour; the average load for a ten-hour day; the kilowatt-hours per month, and the rated connected kilowatt load for each substation.

In working up these data, the 15-sec. and also the one- and five-minute peaks were measured on the graphic ammeter paper as block peaks, while the one-hour peaks were taken from the watt-hour meter readings and are, therefore, the integrated peaks. However, after determining the direct-current peaks, an amount equivalent to the synchronous converter losses was added, so that all tabulations were made on the converter input basis.

From the tabulations, a set of curves was then plotted as shown in Fig. 2. On this chart the abscissa represents the rated connected load in kilowatts. The lower curve

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Note—A paper presented at the Pittsburgh meeting of the American Institute of Electrical Engineers, Pittsburgh, Penn., Apr. 18, 1913, entitled "Characteristics of Substation Loads at the Anthracite Collieries of the Lackawanna R.R. Co."

representing the kilowatt-hours per month is read on the right-hand margin, while other curves are read in kilowatts on the left-hand margin. From this chart other curves and factors were derived which will be discussed later.

The Diversity Factor

From the above, we have been able to make some interesting deductions regarding diversity factors and load factors. Diversity factor has been defined as the ratio of

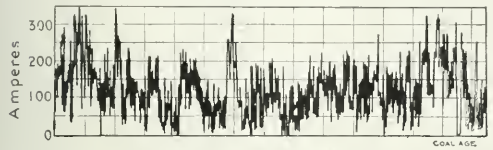


Fig. 3. Direct-Current Chart (Multiply by 4). Rated Connected Load, 465 Kw. Voltage 275

the sum of the maxima of the subdivisions of any part of the system to the coincident maximum demand observed at the point of supply. For the present we will, therefore, consider the subdivisions as loads taken by the individual locomotive, hoist, etc., and the point of supply as the alternating-current side of the converters.

In order to illustrate how the diversity factor increases from unity to higher values as the number of units and consequently the rated connected load is increased, we have shown in Figs. 3 and 4, sections of graphic ammeter charts taken at different substations. Fig. 3 shows the load on a small substation to which the rated connected load was only 465 kw., while Fig. 4 shows a similar curve for a substation to which the rated connected load was 1720 kw. From tests made on a seven-ton locomotive, rated at 70 hp. or 52.5 kw., we find that the maximum continuous peaks in per cent. of its rating for 15 seconds,

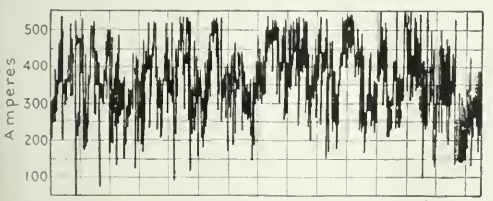


Fig. 4. Direct-Current Chart (Multiply by 4). Rated Connected Load, 1720 Kw. Voltage 275

one minute and five minutes, are 180, 100 and 60 respectively. Based on the above as peaks for a single unit the diversity factor for 15 seconds, one minute, and five minutes for various rated loads, are as shown in Fig. 5.

The Load Factors for Connected Loads

Load factor is usually defined as the ratio of the average load for a certain period to the rating of the substation. However, as the load factors on the substations are not considered in this paper, we have expressed all load factors as the ratio of the average loads on the substations to the *rated connected loads*. By so doing, any data contained in the paper become applicable to other similar installations.

Fig. 6 shows a 10-hour load curve taken on one of the largest substations. This curve was plotted from watt-hour meter readings taken every half hour. It will be noted that it has about the same characteristics as are generally found in shops or factories where the consumption of power depends on the activity of the employes operating the machines.

However, there is a low point in this curve which occurs about nine o'clock. This is due to the fact that there is a certain amount of coal mined and loaded during the night which is ready for the locomotive crews at seven o'clock in the morning. After this night coal is pulled out, the crews ease up for a while and take a morning lunch. During this time, the day miners have been loading coal which keeps the locomotives busy until about 11:30 when the load begins to drop again. The substation on which the above curve was taken had a rated connected load of 1720 kw. which consisted of eight 10-ton, and twenty 7-ton locomotives, and a small hoist.

Annual Connected Load Factor Only 8.6

The average ten-hour load factor was 24.6 per cent. whereas the average for all substations was 24 per cent.

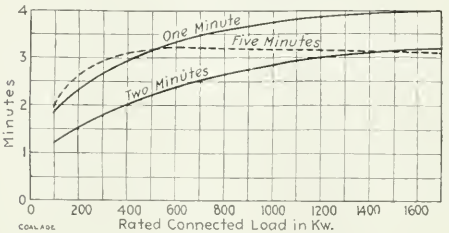


Fig. 5. Diversity Factors

The following tabulations give the load factors for various lengths of time for this largest station and the average of fifteen stations tested:

CONNECTED-LOAD FACTORS AT SUBSTATIONS

Station	Largest Percent	Average Percent
1 hour	32	29
8 hours	26	25 5
10 hours	24 6	24
24 hours	14	12 5
Annual, 365 days	9 6	8 6
Night, 14 hours	6 6	6 2

The 24-hour load factors give the average loads during a twenty-four hour working day and this might be considered as the annual load factor. However, as the average mine is not operated over 250 days during the year, the load factor on this basis for all stations tested is 8.6 per cent. It is interesting to note that the ratio of the power used during the ten-hour working day to the total used during the 24 hours was 73 per cent. on the largest station and 79 per cent. was the average for all stations. The average 14-hour night load is, therefore, 6.2 per cent. of the rated connected load.

In the application of data obtained from these tests, it will be noted that the peaks call for substation apparatus designed to carry and commutate high overloads and that the annual load factors are very low. Regardless of the question of taking care of the peaks, we find that the load increases so rapidly, due to new apparatus being installed, that it does not always pay to figure closely when deciding on the size of a substation. Some of the first stations installed for this work had 150-kw. and 200-kw. converters. These have been transferred

until now it is difficult to find a mine where the load is not too heavy for them.

Converters under 200 Kw. Not Advisable

We would, therefore, not recommend a converter smaller than 200 kw. and in case there is a probability of the load growing rapidly, a 300-kw. unit would be cheaper eventually. There are certain conditions where motor-generator sets work out more advantageously even though the initial cost may be much higher.

Let us assume a condition where the substation is to be located near an alternating-current motor-driven coal breaker, both of which are to be fed from a central station over a transmission line. The breaker motors will pull a load on which the power factor will be poor and this load together with the hoisting and pumping load will be so large in comparison to the substation load that the small amount of leading current obtainable from a converter, will not compensate for the lagging current taken by the induction motors.

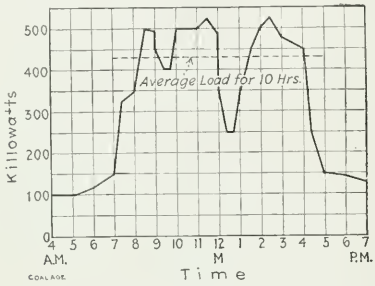


Fig. 6. A Typical Substation Load

The above will result in poor voltage regulation on transformers and transmission line and the attending bad effects due to poor factors on a central station. If instead of using a converter we install a synchronous motor-generator set with interpoles on the generator and a motor having a ratio 30 to 40 per cent. in excess of the generator, we are in a position to correct the power factor, and better both the direct-current and alternating-current voltage regulation.

Where it is necessary to transform to a lower voltage for the synchronous motor, it will often be possible to wind the breaker motors and synchronous motor on the set for the same voltage and feed them from one bank of transformers. By combining the leading current with the lagging on the low-tension side of one bank, the kilowatt-ampere rating is very much reduced from that required for separate transformers. There is also a decrease in the cost per kilowatt-ampere due to the units being larger.

Electric firing in series means that the arrangement of the charges is such as to permit the electric current to pass from the positive wire of the circuit to the fuse of a number of different charges in turn and from the last fuse to the negative wire. The firing of all fuses is simultaneous. Firing in parallel means that each detonator has a direct connection with the positive and negative wires, so that each fuse is supplied with a portion of the total current. The firing is simultaneous. Series firing is easier to arrange than the parallel system. It calls for more wire than parallel firing and takes a big voltage but little current, while the parallel system calls for a big current and a low voltage. For simultaneous firing the series system is the best. Low-tension fuses give better results than high-tension fuses.

Briquette Production in the United States

The output of briquettes in 1912 showed a small increase over that of 1911, and the industry may now be considered as passing out of the experimental stage and assuming a more substantial and permanent character. In 1912, at 19 plants, 220,064 short tons, valued at $952,261, were produced as compared with 218,243 tons, valued at $808,721, in 1911.

Of these plants seven used anthracite culm, nine used bituminous, or semi-bituminous slack, one used residue from gas manufactured from oil, one used mixed anthracite culm and bituminous slack, and one used peat.

The largest producer of briquettes was the Berwind Fuel Co., of Superior, Wis., whose output was a little in excess of 50,000 short tons. This plant has a capacity of between 35 and 40 tons of briquettes per hour.

The quantity of raw material available for the manufacture of briquettes is ample, and may be obtained at slight cost. The most desirable material for a smokeless product is anthracite culm, a large supply of which now exists and more is being produced daily in the anthracite region. It is not too much to believe or to hope that in the near future the small sizes of anthracite, such as buckwheat and smaller, that are now sold for making steam, in competition with bituminous coal, and at prices below the actual cost of production, will become more valuable as a raw material for briquette manufacture.

The output of these small sizes exceeds 20,000,000 tons annually, exclusive of 3,000,000 or 4,000,000 tons which are recovered from the culm banks by washeries. The present revenue from this product will not exceed $30,000,000, such coal being worth from 50 cents to $1.50 a ton, the price depending on the size.

As briquetted fuel, it should be worth as much as stove or egg coal, and the cost of briquetting ranges from $1 to $1.50 a ton. The uniform size of this fuel makes it highly desirable for domestic purposes. Furthermore, if properly handled, this fuel does not produce clinkers. Slack, from non-coking bituminous, sub-bituminous and semi-anthracite coals, is another cheap and abundant raw material. It is obtainable in all the coal-mining regions of the Middle West, where, at many places, it is now wasted or almost given away. Some slack piles have been burned to prevent their cumbering the ground, while others ignite spontaneously.

The vast and almost untouched areas of lignite in North Dakota and Texas contain enormous supplies of fuel that European experience has taught is well adapted to briquetting, and which is much more usable in that form than in the raw state.

The large areas of peat beds in the United States are also available as a source of raw material. They are generally remote from the coalfields and briquetted fuel from peat, when properly prepared, makes an excellent substitute for coal. The peat now produced in this country is used for stable litter, fertilizer, etc.; none is used for fuel.

While the briquet industry in the United States is still in its infancy, the production of this fuel has nearly twice doubled since 1907, the production in that year being 56,524 short tons, while in 1912, as stated above, it was 220,064 tons.

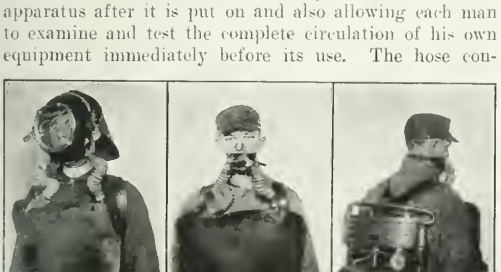
An Improved Breathing Apparatus

SYNOPSIS—A description of the principal changes in and advantages of the Model 12 Westphalia mine-rescue apparatus.

The accompanying illustrations show the new type of Westphalia mine-rescue apparatus, Model 12, being introduced by S. F. Hayward & Co. In this model a number of important improvements have been made, which add to the efficiency, simplicity and ease of operation of the equipment.

This type is made more compact in form and fits the body much closer. There are no projecting parts, making free movement possible under the most severe conditions, thus allowing the wearer to go into low and confined places in the mine and perform whatever work may be necessary with a minimum of effort.

The supply and discharge tubes are both connected at the bottom of the breathing bag on the left side, obviating the necessity of making any connections in the apparatus after it is put on and also allowing each man to examine and test the complete circulation of his own equipment immediately before its use. The hose con-



THREE VIEWS OF THE NEW APPARATUS

necting the breathing bag to the face piece is made extremely flexible and non-collapsing, allowing the unrestrained movement of the head without any possibility of disarranging the connections.

The apparatus can be stored complete with the regenerator ready for immediate service and can be quickly put on as it is only necessary to fit the helmet on the head or properly place the mouth-piece and screw up the nose clips to be ready for instant service.

The automatic reducing valve has been made slightly shorter and more compact, and is so arranged that the injector jet can be inspected without removing the valve from its connections. The reducing valve maintains a circulation in the apparatus of about 2.1 cu.ft. per min., so that the wearer has at his disposal approximately 254 cu.ft. of richly oxygenated and pure air during the working period of two hours.

THE REGENERATOR CONSTRUCTION IS SATISFACTORY

The present construction of the regenerator is most satisfactory, as has been demonstrated during its use for several years past.

The regenerating substance is arranged in several compartments, held in wire cages placed in shelf-like form exposing the entire surface of the material in the circulation of the exhaled air. This system absorbs carbon dioxide to an extent that has never been approached by any other similar apparatus.

In cases where the regenerator has been handled roughly or dispatched by train or motor car without proper packing, it occasionally develops that minute particles of the chemical will sift out of the regenerator. To overcome the possibility of these small grains entering the circulation tubes of the apparatus, a small trap has been fitted to the pipe at the bottom of the regenerator.

The regenerator can be quickly exchanged or refilled, either the interchangeable or refillable type being furnished, as may be desired.

The breathing bags, which are used to equalize the varying demand of the wearer during his labors, are fitted on the chest. They have been increased in size and are now large enough to provide for the demands made upon them even during the greatest exertion of the helmet man. They are protected on the outside from being cut or torn by means of a cover, which is attached with straps and swivels to the shoulder straps and back carriage and is sufficiently free to allow unimpaired expansion.

The supply and discharge tubes connect with and pass through the breathing bag in such a manner that it is possible for one to crawl on his stomach with his weight on the breathing bag, without cutting off the air supply. This is a highly desirable feature when working in small openings and one which we do not think is embodied in other types of apparatus.

It will be noticed that the pressure gage is placed in the back in a protected position, but is supplied for front reading when desired. The same apparatus can be used equally well for either mouth or helmet breathing, as it is only necessary to unscrew the couplings on the hose at the top of breathing bags and attach either device that may be most advantageous.

A feature to be noticed is that there are no valves whatsoever either in the face attachments or the entire circulating system, to become clogged with saliva or disarranged. Notwithstanding the absence of the valves, it is impossible to rebreathe any of the exhaled air until it has passed through the regenerators and been purified.

The helmet is made exceedingly light and strong and has the advantage over other types in having the face washer curved inward, so that it will fit almost any type of face; this also allows an air-tight fit to be made around the face without any uncomfortable pressure against the temples.

When about to install a rope-haulage system, examine the roof of the gangways to be traversed, as this is often the deciding factor. When the roof is bad it is difficult, expensive and impractical to maintain a double track. When the grade is irregular and too low to allow the empty cars to run by gravity, the main and tail-rope haulage give good results. The cost of maintenance of such a system is not high, as there is only one track. This low cost is somewhat overcome by the wear on ropes and cars, due to the high speed needed to handle the output on a single road. There is always apt to be an irregular and intermittent delivery of coal at the shaft as well as a poor supply of cars at the inside parting. Notwithstanding these defects, this system gives the best results under an exceedingly bad roof.

Shrinkage of Carload Lots of Lignite Coal

By J. G. Crawford*

SYNOPSIS—An investigation and compilation of some interesting data on the shrinkage of Western lignites. The tests were made in minute detail and all possible conditions effecting the results carefully considered.

In connection with the weighing of car loads of coal it is desirable to know the amount of natural shrinkage in transit. This shrinkage depends upon the character and grade (size) of the coal, the amount of surface moisture thereon and the kind and size of equipment in which it is loaded. The tests herein referred to were made for determining the probable maximum shrinkage of a certain lignite coal from dry workings, of various grades loaded in both box- and open-cars.

Coal Used

The coal used was from Monarch Vein of Sheridan County, Wyoming, and in order that no appreciable amount of the fuel might be dried slightly in the mine, that used for this test was loaded in railroad cars on the second of two consecutive working days.

The size of each grade of coal used on these tests is shown in the following table:

Size of Openings and Kind of Screen

Grade	Over	Through
Slack		¾-in. square rotary
Pea	¾-in. square rotary	1-in. square rotary
Nut	1-in. square rotary	3-in. stationary bar
Egg	3-in. stationary bar	6-in. stationary bar
Lump	6-in. stationary bar	
Mine-run		
Egg-run		5-in. shaking bar

In order that the size of the coals will be better understood it should be stated that with these arrangements about 10% slack and 30% 5-in. bar-screened lump is obtained.

A proximate analysis of this coal is as follows:

Moisture, 23.14; Volatile matter, 36.63; Fixed carbon, 36.58; Ash, 3.65; Sulphur, 0.49; B.t.u., 10,137.

Loading of Coal—The coal was loaded July 29 and 30, 1909, in cars as shown:

Kind of Coal	Number of Cars Box	Number of Cars Open	Capacity* Box	Capacity* Open
¾-in. slack	0	2		100
¾x1-in. pea	2	2	60	100
1x3-in. nut	3	2	2–60 1–50	100
3x6-in. egg	2	2	70	100
6-in. lump	3	2	60	100
Mine-run	0	4		100
5-in. egg-run	0	3		100
Total	10	17		

*In thousands of pounds.

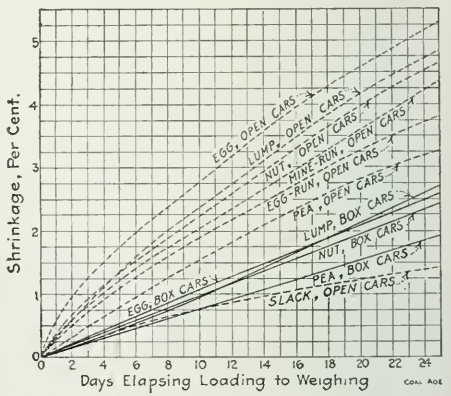
The open cars were, with the exception of those in which the slack was loaded, steel cars 40 ft. long. The two cars used for slack were 40-ft. composite steel and wood but they were light weighed both before and after the series of tests and the weight of these cars was found not to have varied. The box cars were wooden.

The open cars were loaded to full visible capacity and care was taken to provide against falling off in transit. The box-cars were loaded, with one exception, to above noted capacity. All box-car doors were closed. Condition of equipment was such that there was no leakage through doors or drop bottoms.

Weighing of Coal—All empty cars were weighed before loading. The loaded cars were weighed daily at Dietz, Wyoming, in the same position on the same scales about 4 p.m. Cars were watched day and night to prevent stealing.

Weather Conditions

In referring to the days elapsing between loading and weighing, July 29 will be used as the basing point as 24 of the 27 cars were loaded on that day. An open car of slack was left standing on the Dietz scales day and night, which practically covered the bed of the scales. As soon as any rain fell, the observer on duty would visit the scales and find out how much the rain had increased the weight of the car and thus the amount of rainfall per open car was determined.



Shrinkage Curves of Carload Lots of Lignite Coal

The weather conditions including the tenth day were practically ideal and during this time the total amount of rainfall did not exceed 50 lb. per open car which was divided into six light sprinkles on the fourth and ninth days. This weight had to be estimated as each shower was insufficient to "break" the scales. On the eleventh day the rainfall increased the weight of each open car 100 pounds.

From the twelfth to twenty-fourth days, inclusive, there were eight light sprinkles, four on the twelfth day and one each on the thirteenth, fifteenth, eighteenth and twenty-fourth days. The sprinkle on the latter day was the only one which affected the weight of the car on the scales, and this shower amounted to only 20 lb. per open car. The total amount of these eight showers probably did not exceed 50 lb. per open car and as they were divided throughout the thirteen days they would have no appreciable affect on the results. The tests were discontinued on the twenty-fifth day because a rain of 125 lb. per open car occurred.

During the entire 24 days, therefore, the only rain which had an influence on the results was the 100 lb. per open car which fell on the eleventh day. The only effect that this 100 lb. of rain had was to retard the shrinkage so that the actual shrinkage obtained from

*547 N. Jackson Boulevard, Chicago, Ill.

the twelfth to the twenty-fourth days was *about* two days behind what it would have been providing no rain had fallen on the eleventh day. It was possible to eliminate the affect of this rain by plotting for each kind of coal and class of car, the observed weighings as ordinates and the days between loading and weighing as abscissa. A smooth curve was then drawn through the weights of the first ten days and then another through the weights for the twelfth to twenty-fourth days inclusive. The curve through the first ten-day readings was then extended parallel to the curve through the readings from the twelfth to twenty-fourth days.

TEMPERATURE—The temperature readings were taken every hour and the average of these for the entire series of tests was 74.2 which is high for this locality as the temperature at nights is low. The more important temperature results are as follows:

	Deg. F.
Highest individual reading	106
Lowest individual reading	43
Highest daily average	80 0
Lowest daily average	62 2
Average entire series	74 2

RESULTS OF TESTS—Under "Weather Conditions" was described the method of deriving a curve to show the net weight for each day after loading of each grade of coal in each class of equipment, had no rain fallen. The accompanying figure gives similar curves to show the per cent. shrinkage for each grade of coal loaded in each class of equipment had no rain fallen on the eleventh day. The results of these tests are also given in tabular form herewith.

CONCLUSIONS

The results show in detail the shrinkage under various conditions and it is interesting to note that in open cars for the same grades of coal, is about twice that of coal loaded in box-cars. As shrinkage is accompanied by deterioration the advisability of using box-cars, where possible, is emphasized. The shrinkage takes place mainly on or near the top of the coal in open cars, this portion soon slacking and thus protecting the rest. The deterioration in open cars, therefore, is greater near the top of the cars and not only is the coal in box-cars in uniformly better condition at the end of a given time but it does not contain as much of the badly slacked product.

The results show, as would be expected, that the shrinkage is dependent on the size of the coal and the amount of slack contained, both of these factors influencing the freedom with which the air can circulate and the size also determining the amount of exposed surface per unit volume of coal. The curves and the accompanying table probably show the maximum shrinkage which will be obtained under the temperature conditions specified and in hot, dry and clear weather. A greater shrinkage would be obtained on coal of this character from a wet mine, that used being from dry workings as noted.

The additional shrinkage which would have occurred had the cars been hauled in freight trains during the 25 days, instead of being held on track at one point, would not have been great. One open car of pea coal was weighed at Sheridan and then hauled to Edgemont 223 miles east, back-hauled to Sheridan and reweighed, the two weighings at Sheridan being made within 60 hr. of each other. The difference between the two, after a haulage of 446 miles was only 100 lb. and had the car have been standing, a greater shrinkage than this would have been expected. That a greater shrinkage did not take place was probably due to the fact that the coal had been rained on slightly, although on arrival at Sheridan for reweighing the coal did not show any traces of this.

TABLE SHOWING PERCENT. SHRINKAGE OF VARIOUS GRADES MONARCH VEIN COAL, FOR ONE TO TWENTY-FIVE DAYS ELAPSING BETWEEN LOADING AND WEIGHING, LOADED IN BOTH BOX AND OPEN CARS

Days between Loading to Weighing	Box Cars				Open Cars					
	Pea	Nut	Egg	Lump	Slack	Pea	Nut	Egg	Lump	Mine-run	Egg-run
0	0 00	0 00	0 00	0 00	0 00	0 00	0 00	0 00	0 00	0 00	0 00
1	0 08	0 10	0 11	0 09	0 09	0 16	0 40	0 59	0 29	0 32	0 30
2	0 15	0 20	0 22	0 18	0 18	0 32	0 69	0 96	0 58	0 58	0 53
3	0 23	0 30	0 33	0 26	0 26	0 48	0 93	1 24	0 85	0 80	0 73
4	0 31	0 40	0 44	0 35	0 35	0 63	1 14	1 51	1 12	1 02	0 92
5	0 39	0 50	0 55	0 45	0 42	0 79	1 34	1 76	1 37	1 23	1 10
6	0 47	0 60	0 66	0 55	0 51	0 94	1 54	1 97	1 60	1 41	1 27
7	0 54	0 70	0 77	0 65	0 58	1 10	1 73	2 18	1 80	1 57	1 44
8	0 62	0 80	0 88	0 76	0 63	1 25	1 89	2 38	1 99	1 73	1 60
9	0 69	0 90	0 99	0 87	0 71	1 40	2 08	2 58	2 17	1 89	1 75
10	0 77	1 00	1 09	0 98	0 77	1 54	2 26	2 78	2 35	2 04	1 09
11	0 85	1 10	1 19	1 09	0 83	1 68	2 44	2 97	2 53	2 19	2 10
12	0 92	1 19	1 30	1 20	0 88	1 82	2 61	3 17	2 71	2 34	2 18
13	1 00	1 28	1 40	1 32	0 93	1 96	2 79	3 36	2 90	2 50	2 31
14	1 07	1 38	1 50	1 43	0 98	2 09	2 96	3 55	3 09	2 65	2 45
15	1 14	1 47	1 60	1 55	1 03	2 22	3 13	3 74	3 28	2 81	2 59
16	1 22	1 57	1 70	1 66	1 08	2 36	3 30	3 93	3 47	2 96	2 73
17	1 30	1 66	1 80	1 77	1 12	2 48	3 47	4 10	3 65	3 12	2 86
18	1 37	1 75	1 90	1 89	1 17	2 59	3 63	4 26	3 82	3 28	3 00
19	1 45	1 85	2 00	2 00	1 21	2 70	3 79	4 41	3 98	3 43	3 12
20	1 52	1 94	2 10	2 11	1 25	2 80	3 94	4 56	4 14	3 59	3 24
21	1 60	2 04	2 20	2 23	1 28	2 89	4 10	4 71	4 29	3 74	3 36
22	1 67	2 13	2 30	2 35	1 13	2 99	4 25	4 86	4 44	3 89	3 48
23	1 75	2 22	2 40	2 46	1 35	3 08	4 39	5 00	4 58	4 05	3 59
24	1 82	2 31	2 50	2 58	1 38	3 16	4 53	5 14	4 72	4 20	3 70
25	1 90	2 41	2 60	2 70	1 41	3 25	4 68	5 28	4 85	4 35	3 81
No. of cars	2	3	2	3	2	2	2	2	2	2	3
Capacity	60M	2-60M 1-50M	60M	60M	100M	100M	100M	100M	100M	100M	100M

Note—Coal loaded July 29 and 30, 1909 Tests completed Aug. 23, 1909 Table represents shrinkage with no rain.

Antartic Coal Fields

Prof. D. W. Edgeworth David is quoted in the Australian press as saying:

In reference to the scientific discoveries of Scott's party there can be no doubt they will prove of immense interest and importance. In the first place, it is stated that a good collection has been obtained of fossil plants associated with the seams of coal discovered by Shackleton at Buckley's Island, at the head of the Beardmore Glacier. Frank Wild, of Shackleton's party, was the actual discoverer of seven seams of coal outcropping in a great cliff face of sandstone and shale. Thickness of these seams was 7 ft., inclusive of a few clay bands, and Wild chopped small specimens of the coal out with his ice ax. These have been analyzed in Sydney, and show the coal to be of workable quality. It is almost certain that this coal field will prove to be perhaps one of the largest of the unworked coal fields of the world, as it has been traced about 650 miles north of the Beardmore Glacier.

Our British Coal-Mining Letter

Special Correspondence

SYNOPSIS—Modern machinery being hard to maintain in maximum efficiency, cards of instruction should be issued to those operating it especially where untrained men are employed in charge of complex apparatus. It is shown that pneumatophores need to be aided in operation by an injector but the suction action should be corrected by an equalizer. Turbines are gaining rapidly in popularity especially as supplementary to such engines as are wasteful of steam.

In a paper read before the Association of Mining Electrical Engineers in East Scotland, a suggestion, not without value in other directions, was made by H. J. Humphreys. He directed attention to the prevailing ignorance of those who have the oversight and working of electrical apparatus, apart, of course, from the trained electrician. The proposal of Mr. Humphreys is that the colliery manager and the electrical engineer of the colliery should collaborate in preparing a card of instructions for each class of men having to operate the electrical plant. The card should bear a number of instructions in terse simple language, printed in bold type, and each instruction should be followed by a short explanatory note, giving the reason for the instruction. Each card should also contain an admonition requiring the recipient to study the existing "Special Rules" relating to electricity, also requesting him to ask for further information on any points which he may not understand. In addition, there should be a note of warning of the serious dangers of disregarding rules.

Mr. Humphreys considers that cards of instruction would be useful for the following classes of men: (1) Authorized persons operating switches at the upper landing; (2) authorized persons operating switches below ground; (3) motor drivers; (4) coal-cutters; (5) firebosses; (6) "brushers" and repairers and (7) roadmen.

Other instructions may be drawn up to meet individual requirements, and, of course, it is recognized that it is impossible to draw up a set of rules applicable to all collieries. The actual form must depend on the needs of the particular place and the character of the plant.

Dangers of Injectors in Rescue Apparatus

John Cadman has directed attention to a danger in the use of such mine-rescue apparatus as depends on the successful action of an injector. In a discussion by G. Blake Walker before the South Staffordshire and Warwickshire Institute of Mining Engineers, he said that when he first purchased two pneumatophores, similar in general principle, they were both far inferior to any kind of rescue-apparatus manufactured today, and the whole of the circulation of the respirable air was dependent on the efforts of the lungs of the wearer. The apparatus became foul in about half an hour, due partly to difficulty in the absorption of the CO_2 and to the intermittent supply of oxygen.

To overcome this the injector was introduced, resulting in (1) the oxygen supply being definitely regulated; (2) the flow of oxygenated air being maintained at a constant volume throughout the apparatus and so regulated as to meet exactly the needs of the wearer. With the apparatus not fitted with an injector, it was necessary to adopt a bypass to give the man sufficient oxygen when doing strenuous work.

The Injector Sucks Air

With the early non-injector type, it was found that the regenerative system was inefficient; often the percentage of carbon dioxide rose to 3 and 4 per cent., while the heating of the exhaled air was excessive. These troubles were removed with the introduction of the injector. Mr. Walker referred to the special point raised in Dr. Cadman's paper; namely, the danger that, while the object for which the injector was introduced was to force air through one part of the apparatus; the reflex action given by suction in the other part of the appliance was not sufficiently considered.

Now that attention has been drawn to its liability to cause trouble, Mr. Walker says it appears to admit of a simple and obvious remedy, and by fitting an equalizing receptacle to the pneumatophore, constant pressure can be maintained, as can easily be seen by applying a water-gage. With the apparatus not fitted with this receptacle, the inhalation shows a minus pressure and the exhalation a plus pressure. With the equalizing bag, when the equalizing receptacle is inflated, the pressure in that receptacle comes to the assistance of the breather and maintains the pressure throughout the apparatus at the plus value, while again the effect of breathing restores to the equalizing receptacle the amount of air which is extracted from it.

Turbines at Mines

C. H. Bailey and R. H. N. Vaudrey addressing the Association of Birmingham Students of the Institute of Civil Engineers, stated that many mines are being equipped with turbines, mostly of the mixed-pressure type. A large number of mines, otherwise efficiently and economically operated exhaust large quantities of steam into the air throughout the year.

The turbine has to compete successfully against gas engines, Diesel and other heavy-oil engines and steam engines, and has to justify its introduction by superior economy and by freedom from stoppages either of short or long duration. When steam is used for hoisting engines, the turbine will almost certainly be an economical factor at a large colliery plant, as there will be in all probability much steam which will be exhausted at a pressure several pounds higher than that of the atmosphere.

The authors summarized the economy resulting from turbines as follows: Above 200 kw. the steam turbine is more efficient than the reciprocating engine. The first cost of small turbines is about the same as for reciprocating engines; but for large units the prime cost is only about half the cost of the reciprocating-engine set, including condensing plant. The steam consumption of a turbine of 2000-kw. output may be about 15 per cent. less than that of a quadruple-expansion engine, and the maintenance is considerably less. Buildings and foundations for a turbine are less costly and depreciation and repairs are also less.

Coal Preparation in Franklin Co., Illinois

By R. Dawson Hall

SYNOPSIS—The coal of Franklin County, Illinois, is of superior quality, containing less sulphur than that mined in the northern portion of the state. The coal, passing through the shaker screens on the tipple, is rescreened at all the mines before shipment. In one mine the coal is cleaned in spirals and 4 per cent. of ash is removed.

The coal of Franklin County is the best in the state of Illinois, and there has been, therefore, little need to clean it. The retail coal dealers frequently advertise the coal as a washed fuel, but there are no washeries in the county. The coal has the general appearance of a fuel which has been improved by washing and readily sells as if so prepared.

Dry Cleaning at a Bituminous Colliery

There is now one plant, the Wilmington Star Mining Co.'s mine, at West Frankfort, where dry cleaning has been introduced, and the pressure on the other companies to meet competition will doubtless result in many others being built. There is a tendency to wait and find out whether the Wilmington Star Mining Co. is satisfied with its investment before other companies follow suit.

All the evidence points, however, to the fact that the dry cleaning process is more than justified and that the Wilmington Star Mining Co. does not regret its action. Consequently it is to be anticipated that before long all the plants in the county will not only rescreen, but clean their coal.

The coal of Franklin County, on an average, contains 11 per cent. of ash. Dry cleaning reduces this percentage to 7 per cent. The waste or bone from the cleaning plant is taken to the boilers and is consumed to make power for the colliery. This waste is 26 per cent. ash.

It is surprising that a seam so clean as this at West Frankfort should show such improvement under mechanical preparation. It would be easy to understand it if the coal were full of slate partings. But, in the whole 9 ft. 3 in. to 12 ft. 6 in. of coal, there is but one small parting, known as the "blue band," which varies from a mere trace up to one inch in thickness.

Where Dirt Often Enters Clean Coal

In every mine, however, a certain amount of rock falls either in first mining or in pulling back the pillars. It is usual in the Franklin County field to leave coal in the roof until returning with the ribs, when all the roof coal which can be recovered is secured. Sometimes, and in fact quite usually, the pillar is lost and all that is obtained is that part of the coal in the roof between the room pillars.

This roof rubbish and the unimportant parting in the coal, furnishes the opportunity to the Wilmington Star Mining Co. to better their ash percentage 4 per cent. They cannot fail to have an advantage over those companies which are cleaning solely by an inspection of the coal as it enters the car. In most mines two men attend to the "placing" of the car and the loading. Both of these men at intervals watch for the few pieces of pyrite or bone as they fall from the chute or roll over in the "gondola."

Ziegler District Colliery Co., Christopher, Ill. Rescreen in Rearground on Right

Pyrite and Calcite

The pyrite in the Franklin County coals is of bright metallic luster. It seems to appear in small bodies rather than disseminated in partings. It does not, however, disintegrate and destroy the integrity of the coal, nor does it whiten on weathering like much of the bisulphide of iron in the coal of central Pennsylvania. Inconsiderable veins of calcite may be found, mere flakes of mineral on the dividing planes of the coal. To show that the appearances of pyrite have largely a scientific interest and little ef-

PLANT OF HART-WILLIAMS COAL CO. RESCREENER IN REAR

VIEW OF ZIEGLER COLLIERY, SHOWING RESCREENER WITH CONNECTING CONVEYOR

feet on the value of the coal, I give the following analysis of coal from Ziegler, Ill., quoted from "The effect of Oxygen in Coal."*

ANALYSES OF ZIEGLER COAL ON AIR-DRIED BASIS

Ultimate Analysis	Screened Coal	Run of Mine	Sized Coal	Lump	Lump
Carbon	67.48	67.91	69.05	70.55	70.70
Oxygen	14.99	13.53	14.23	13.11	11.98
Hydrogen	4.54	5.10	4.85	4.51	4.96
Nitrogen	1.53	1.49	1.48	1.56	1.48
Sulphur	0.54	0.54	0.57	0.64	0.96
Ash	10.92	11.43	9.82	9.63	9.92
	100.00	100.00	100.00	100.00	100.00
Proximate Analysis					
Fixed Carbon	52.58	52.23	54.46	55.19	53.03
Volatile matter	31.23	30.33	29.33	31.31	31.63
Moisture	5.27	6.01	6.39	3.87	5.42
Ash	10.92	11.43	9.82	9.63	9.92
	100.00	100.00	100.00	100.00	100.00

It is interesting to compare the sulphur in the Franklin County coal with that in other parts of the state using for that purpose the same report.

SULPHUR IN ILLINOIS COALS

Maryville	5.68	Lump	O'Fallon	4.25	Screened
New Badeo	5.33	Screenings	Wordeo	4.05	Screenings
Germantown	5.06	Lump	Centralia	4.04	Coarse coal
Donkville	4.98	Slack	Bush	3.61	Run of mine
Maryville	4.90	Screenings	Harrisburg	2.96	Run of mine
Shiloh station	4.80		Bush	2.70	
Livingston	4.71		Bush	2.65	Run of mine
Collinsville	4.69		Bush	2.60	Run of mine
Paisley	4.68		Harrisburg	2.51	Screenings
Livingston	4.68	Run of mine	Carterville	2.07	
Coffeen	4.67	Run of mine	Marion	1.77	Run of mine
Collinsville	4.63	Slack	Carterville	1.76	
Donkville	4.58	Lump	Benton	1.62	Egg coal
Livingston	4.56	Screenings	West Frankfort	1.56	Slack
Springfield	4.52	Lump	Troy	1.55	Lump
Auburn	4.50	Run of mine	Carterville	1.37	Mixed
Coffeen	4.45	Run of mine	Herrin	1.36	Lump
Staunton	4.43	Run of mine	Troy	1.34	Lump
Staunton	4.39		Herrin	1.19	Lump
O'Fallon	4.30	Slack	Troy	1.17	
La Salle	4.28	Lump			

It will be noted that all the fuels from the Centralia coal onwards have less than 4 per cent. of sulphur and all these are in the Franklin and Williamson fields except Harrisburg and Troy. Benton, West Frankfort and Zeigler are in Franklin County, and Herrin, Bush, Car-

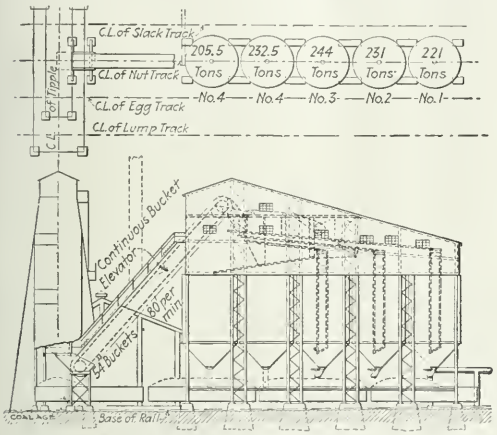
*David White, Bull 29, Bureau of Mines.

THE NEW RESCREENER AT THE MINE OF THE UNITED COAL CO., BUCKNER, ILL.

terville and Marion are all in the adjoining county of Williamson, which is regarded as part of the same field.

Spiralizing and Dry Cleaning

It is significant that the cleaning of coal by the dry process has started at a point where the coal is of unusually high grade. The superintendant, Mr. Buchanan, has



Side View and Plan of the Buckner Rescreener

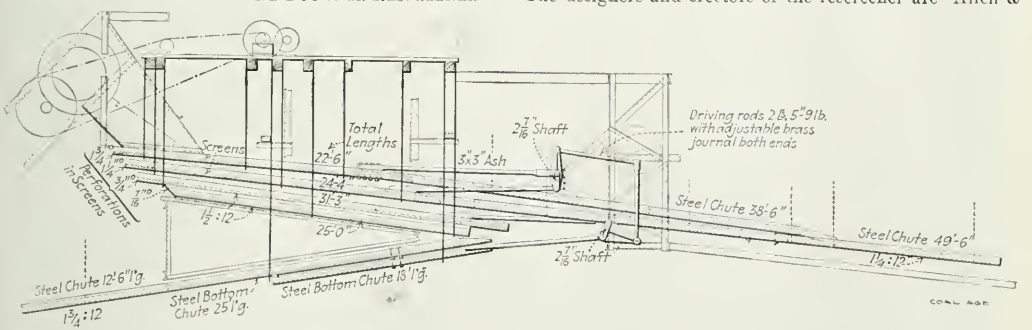
conveyed to the boiler room. The slate passes toward the center and thus is collected separately from the impure coal.

The bins beneath this rescreening and cleaning plant will hold 1200 tons of coal and 300 tons of bone. The plant is now being arranged to store egg coal also. This is transferred to the rescreener by a separate conveyor and goes directly to a bin without any rescreening, the purpose being simply to stock the coal at times when the loading of egg coal would interfere with operation.

The Buckner Rescreener

All the mines of Franklin County have their rescreener. The degree to which the rescreening has been carried varies considerably from plant to plant. That at the Buckner mine, near Christopher, is perhaps as complete as any. Certain recent additions are not shown in the plans and elevations. The wrought-iron posts between the bins have been stiffened by a filling of concrete and a conveyor to carry the fine coal or "duff" to the boilers is being installed.

There are four water-tube boilers in two batteries, built by the Model Automatic Smokeless Model Stoker Co., of Dayton, Ohio. At present these are being stoked with screenings by hand, but when the conveyor is completed, the fuel used will be duff and the stoking will be automatic. The storage capacity of the tipple is 1134 tons. The designers and erectors of the rescreener are Allen &



Elevation of Shaker Screens in Buckner Rescreener, Showing Mode of Actuation

traveled in every coal-producing state in the Union, and in several foreign countries, and he is not disposed to follow the lead of others, but to introduce commendable innovations. The coal is screened at the tipple into three sizes; lump, that which passes over a screen having circular openings 6 in. in diameter; egg, that which passes through the lump screen and is held by a screen which has 3-in. openings, and smaller sizes which pass through both screens.

The coal is then carried by a large 36-in. 7-ply conveyor belt, manufactured by B. F. Goodrich, having a capacity of 2000 tons per day, to shaker screens supported from below by Parrish arms. Here it is sized into 5 sizes, known on the market as Nos. 1, 2, 3, 4 and 5. These screens are driven by a 75-hp., 220-volt, 4-pole motor, having a speed of 500 revolutions per minute.

The cleaning of the coal is provided by 28 spirals. The clean coal in passing down the spiral falls off to one side and is carried downward by the outer spiral casing. The bone coal remaining on the inner spiral is carried down to a gate at its foot, and thence to a bin, from which it is

Garcia, of Chicago, and the mine is owned by the United Coal Mining Co.

Roller Screens in Preparation Plants

It should be noted that both the screeners described, screen the coal through shaker screens, but this is not the general practice. They are generally used on the tipple, but roller screens are usually installed in the rescreener. In the Ziegler District Colliery, the coal larger than 2 in. in diameter is conveyed to the rescreener. It passes in this building into a roller screen 20 ft. long, with 1¼-in. circular openings. So only two sizes of coal are made in this rescreening plant; coal between 1¼ in. and 2 in., and coal under 1¼ in.

Coal of a uniform size can be burned with less smoke and waste than a fuel of mixed sizes. The commercial demand for careful rescreening is not unreasonable, as the consumer gets a real benefit and is willing to pay an increased price. It is likely that in a few years, the operators of many districts will introduce improved methods of sizing coal.

Geology of the Panther Creek Valley, Penn.

By W. B. Richards*

SYNOPSIS—An interesting description of the geology in one of the important anthracite fields. A detailed study of all the measures in the coal horizon is given, with special reference to those which are coal-bearing. The customary complexities, common to the anthracite district as a whole, are well shown.

The Panther Creek Valley is, roughly, 12 miles long, averaging two miles wide, and contains 8000 acres or 12½ sq.mi., about one thirty-eighth of the entire anthracite coal lands in Pennsylvania. It is located at the extreme eastern end of the Southern Anthracite Coal Field, between Mauch Chunk on the Lehigh River, in Carbon County, and Tamaqua on the Little Schuylkill River, in Schuylkill County. It narrows to a sharp point at the spoon end of the basin, a mile east of Mauch Chunk, or at the top of the Mt. Pisgah Plane, the elevation of which is 1375 ft. or 843 ft. above the Lehigh River.

Stripping Operation on the Mammoth Vein at the Greenwood Colliery

The conglomerate rocks which form the rim of the valley in the Sharp Mountain on the south, and the Locust Mountain on the north, belong to the Carboniferous, which era is subdivided, geologically, in three periods as follows:

First—The Subcarboniferous, consisting of the Pocono sandstone and Mauch Chunk Red Shale.

Second—The Pottsville conglomerate and the coal measures.

Third—The Permian.

The coal measures, designated by the State Geologist as Formation No. XIII, are the thirteenth distinct formation in Pennsylvania. In 1837, Henry D. and William B. Rodgers, State Geologists of Pennsylvania and Virginia, adopted a plan of numbering the formations beginning at the bottom.

As shown on the accompanying columnar section, historical geology has been divided into four time periods:

1. *Cenezoic Time*—The age of man and mammals; the glacial period was in the first half of this time.

2. *Mesozoic Time*—Age of reptiles, amphibia, birds, land plants and insects of high type.

3. *Paleozoic Time*—Age of invertebrates, which is divided into the following eras:

Cambrian—No form higher than invertebrates.
Silurian—Invertebrates predominate.
Devonian—Fishes are abundant.
Carboniferous—Land plants assume great importance.

4. *Azoic Time*—No fossils known. This is the Archean era. Mostly metamorphic or changed rocks. Perhaps, in part, original crust of the earth.

*Engineer, L. C. & N. Co., Lansford, Penn.
Note—Abstract of paper read before the Panther Valley Mining Institute.

The Archean rocks, which are named from the Greek for beginning, underly all the formations in which appear traces of vegetable or animal life. Therefore, they constitute the base of all countries, wherever life rocks occupy the surface; this is the copper- and iron-bearing strata of Lake Superior.

Paleozoic Time

Paleozoic rocks (named from the Greek for ancient life) are the prevailing kind exposed to view over the eastern half of the North American Continent; they extend from the northern boundary of New York, southward to the coal regions of Pennsylvania. A brief *résumé* of the 13 formations of the Paleozoic Time will now be given.

Formation No. 1—Chiques sandstone (not ordinary sandstone but a quartzite) is the oldest of our fossiliferous rocks. The finest exposure is a great rock mass which towers above the east bank of the Susquehanna for a mile above Columbia, in Lancaster County, where Chiquesalunga Creek enters the river. At the White Spot on the mountain behind Reading, it has been famous since the early settlement of that great valley.

Formation No. 2—The Great Valley limestone; this is noted for the superior fertility of limestone land, and derives its name, not only for its unusual width, but for its extraordinary length, being quite persistent over a course of 1000 miles from Canada to Alabama. It occurs in Pennsylvania over a distance of 150 miles, in some places 20 miles wide, and is bounded by mountain ranges 1000 ft. high. In it we have cement rock in Lehigh County; limestone quarries in Berks and Lebanon Counties; magnetic ore mines at Cornwall, Lebanon County; and zinc mines in Lehigh County.

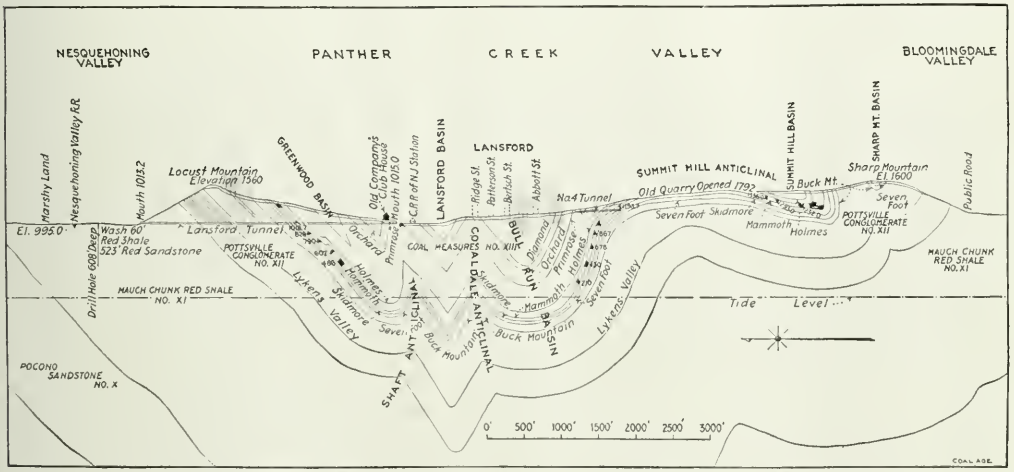
Formation No. 3—This is the Utica and Hudson River Slate, exposed in Northampton and Lehigh Counties, in which are found the roofing slates of Slatington.

Formation No. 4—This is the Oneida conglomerate (named after Oneida County, N. Y.), and the Medina Red and White sandstone (named after Medina in Western New York) exposed at Delaware, Lehigh and Schuylkill Water Gaps.

The Medina White sandstone is not only characterized by its purer color, but by its massiveness. It constitutes the real backbone of the mountains, cropping out along their crests. There is not a known valuable mineral of any kind in either of these formations.

Formation No. 5—This is the Clinton, Niagara and Salina rocks, which are noted for their red color, particularly prominent in the Bloomsburg red shale.

The Clinton deposits (named after town of Clinton, N. Y.) are olive-green slates, calcareous gray and red shales, with several sandstones of a peculiar character and numerous thin strata of limestone; these latter are filled with small shells which were converted by the chemical action of the rainfall, for variable distances beneath the surface, into beds of fossil iron-ore, some of which is mined at Danville, Penn. The formation is exposed at the Delaware, Lehigh and Schuylkill Water Gaps, at Danville and Bloomsburg, in Montour County, and also in Fulton, Bedford, Huntington and Blair Counties. Not a single fossil of any description has been found in these rocks; red beds are usually nonfossiliferous.



Cross-Section of the Panther Creek Valley on the Line of the Lansford Tunnel

Formation No. 6—This is the Lower Helderberg (named after a range of mountains in New York State) and it is mainly a limestone formation. Many of its beds are covered with coral.

Formation No. 7—This is the Oriskany shale and sandstone, and Candagalli grit. Oriskany takes its name from the Oriskany Falls, a few miles west of Utica, N. Y. It

The Niagara formation of New York cannot be recognized in this district as a distinct formation. The lower portion is shale and the upper limestone, which latter is largely of coral origin, indicating clear seas during the time of its formation. This limestone comprises the upper 85 ft. and the shale the lower 80 ft. of the Niagara Falls; the recession of the falls is slowly going on due to the undermining of the limestone by the erosion of the shale.

The Lower Salina (named from the town of Salina, N. Y.) is the Bloomsburg red shale in Pennsylvania, exposed in the cap at Fort Clinton, Penn. At Salina, N. Y., it contains gypsum and rock salt; wells 70 to 75 ft. deep are sunk and salt obtained by evaporation.

is made up of grains of sharp quartz fragments, so loosely cemented as to readily disintegrate, under the action of air, into heaps of glass sand. Glass factories have hitherto relied upon this material for the principal part of their stock in New York State.

In Pennsylvania, the outcrop of the Oriskany extends in straight, curved and zigzag lines, through nineteen counties, varying in character from sandy shale to massive flint; in some places it is crowded with shells and at others almost entirely free from them; it is also sometimes highly ferruginous, even containing iron enough to furnish furnace ore. Its outcrop in the Steinberg Ridge, 17 miles through Carbon County and 15 miles further in Schuylkill County.

The Candagalli grit is the upper part of the Oriskany sandstone and it is almost a nonfossiliferous rock. It is usually a sandy shale, dark or nearly black, weathering from grayish to brownish gray.

Formation No. S-A (Upper Helderberg)—This is composed of Onondaga and corniferous limestone. The Onondaga limestone (named after Onondaga County, New York) is a deposit of fine, groundup corals and crinoids. The corniferous limestone, so called from the flint or hornstone, is often imbedded in it. The paint mines of Lehigh County are in this formation.

Formation No. S-B—The Marcellus Black Slate outcrops on the Lehigh River a mile below Bowmans, Penn., and through Carbon and Schuylkill Counties to an anticlinal point several miles west of Schuylkill Haven.

Formation No. S-C—The Hamilton sandstone and shale is named after the town of Hamilton, N. Y.

Formation No. S-D—The Tully limestone is named from the village of Tully, Onondaga County, N. Y.

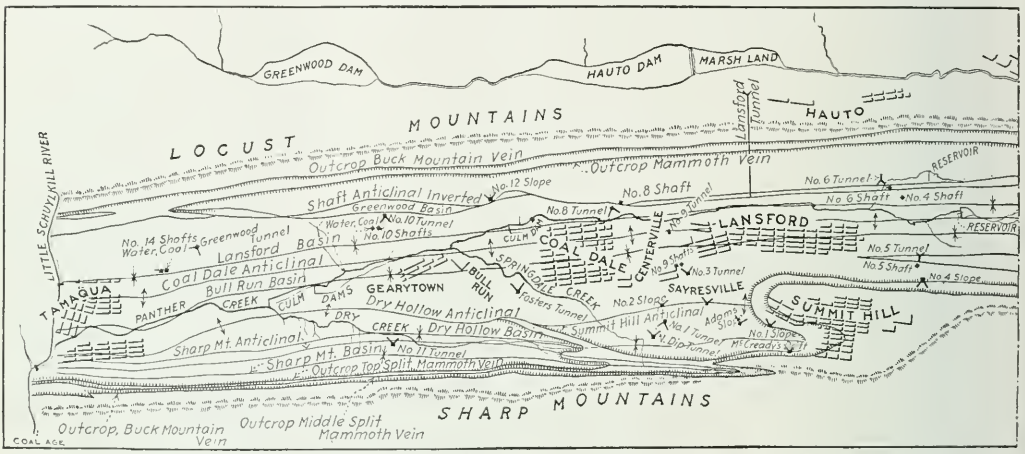
Formation No. S-E—The Genesee slate (named after the Genesee River) outcrops in Carbon County one-half mile north of Kregesville and at Lehighton, Carbon County, just above the Lehighton Railroad station.

Formation No. S-F—The Portage formation, named after three high falls on the Genesee River, in Western New York, is composed of shales and flaggy sandstones.

Formation No. S-F. G.—The Girard shale of Erie County is ashen gray in color.

Formation No. S-G—The Chemung outcrops in Erie County. It is composed of olive and green shales, sandstones and conglomerate. It also outcrops at Stroudsburg and runs from the Lehigh to the Schuylkill and Susquehanna Rivers. Oil and gas are found in this formation.

Formation No. 9—The Catskill formation is the uppermost of the Devonian. It was named after the lofty mass of mountain sandstone on the Hudson River, near Poughkeepsie, N. Y. Coal seams of from one-half to one inch are sometimes found in this formation which consists of sandstones, often passing into conglomerates, with some shale. The beds are usually red, but greenish and other shades occur. The Catskill formation is carried forward under the Broad Mountain from a point two miles below Mauch Chunk to the Little Schuylkill River. The second mountain south of Lansford carries forward the Catskill outcrop in a straight course, S. 62° W., to the Schuylkill River, three miles below Pottsville.



GEOLOGICAL MAP OF THE PANTHER CREEK VALLEY, SHOWING THE OUTCROPS

Formation No. 10—The Pocono formation (named after the Pocono Mountains in Monroe County) is the first or oldest subdivision of that great carboniferous system which has furnished most of the mineral coal in our day. The coal beds of the Pocono formation are thin and local, some of them mere collections of leaves and twigs floated into small lakes or ponds. A few were genuine peat bogs of limited extent, and soon buried under the inflowing sand. Even the earlier beds of the productive coal measures were irregular in size and area, by which it can be easily inferred that the great vegetation of the coal age had not yet spread itself.

Pocono coal has been found within the limits of Pennsylvania, in the Cove and Buffalo Mountains, on the Susquehanna, in Sidelong Hill, in Huntingdon County, on Tipton Run in Blair County, and in many other ravines descending the escarpment of the Allegheny Mountains; but at every attempt to work it profitably it has been a failure, except at the Tipton mines, a few miles northeast of Altoona. Here actual mining operations have been carried on. A branch road has been laid from the Pennsylvania R.R. at Tipton, and thousands of tons of good coal have been sent to the market.

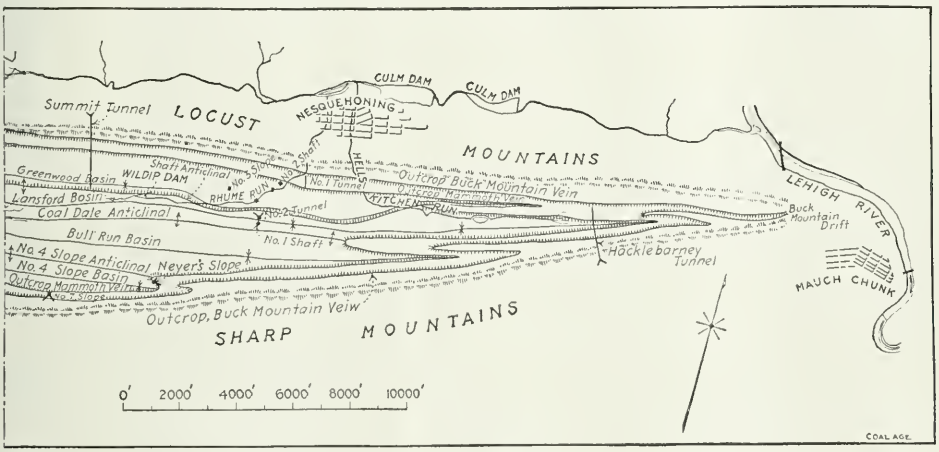
The Pocono sandstones, which rest on the Catskill formation, form the sharp crests or flat tops of most of the mountain ranges in Carbon County. The Nesquehoning, or Broad Mountain, west of the Lehigh River, is a triangular flat compound arch of Pocono, covered with a sea sand much like that spread over the Broad Mountain of the Pottsville conglomerate north of Pottsville. North of Glen Onoko it is composed of hard gray and greenish-gray sandstone and hard gray sandstone with dark gray shale. It is 1235 ft. thick north and south of Lansford, Pennsylvania.

Formation No. 11—The Mauch Chunk red shale, 2168 ft. thick at Mauch Chunk, is certainly one of the most remarkable formations in Pennsylvania, or indeed in any part of the world. Its color, its immense thickness to the southeast and its gradual thinning out to the northwest and west and the paucity of animal or vegetable life, are among its characteristics.

Beginning at Mauch Chunk the red shale valley, walled in between the straight Pocono Second Mountain and the Pottsville Sharp Mountain, runs with a depth of about 800 ft. and a width of about three-quarters of a mile, perfectly smooth and straight, from the Lehigh to the Little Schuylkill River. The red shale turns the eastern end of the basin of the Panther Creek Valley at the sharp-pointed cliff, known as Mt. Pisgah and runs west between the Locust and the Nesquehoning Mountains to the Little Schuylkill River.

The Pocono sandstone held its own against the denuding agencies but the overlying Mauch Creek red shale is a fragile rock and was nearly eroded off the Pocono floor, thus forming the Nesquehoning, Bloomingdale and Owl Creek Valleys.

Formation No. 12—The Pottsville conglomerate is the twelfth distinct formation of the Paleozoic time and forms the basal member of the true carboniferous series everywhere in Pennsylvania. Mining men frequently refer to it as the "farewell rock" because usually no true workable coal beds are found within it. The Pottsville conglomerate is so called from its magnificent and characteristic developments near the Schuylkill countyseat where it exhibits a massive structure of conglomerate and sandstone 1200 ft. thick, making a distinct break in the lithology of that locality between the underlying Mauch Chunk red shale and the overlying coal beds, sandstones, shales, etc., of the anthracite basin. The Pottsville conglomerate is 800 ft. thick through the Lansford Tunnel. By its resistance to erosion, it has been an important factor in preserving the small part of the original anthracite field which now remains. Geologists generally estimate that for every ton of coal remaining in the hard-coal region, 98 tons have been swept away by erosion, into the Atlantic Ocean. This conglomerate is the floor on which the coal measures rest and its outcrops form a protecting and inclosing mountainous rim to the softer coal measures. It is composed of beds of gray conglomerate, white-gray and brownish sandstone, usually coarse and hard, some thin beds of carbonaceous slate and generally one or more thin seams of coal, while in the southern part of the state, as at Lykens, Penn., it contains large and valuable coal seams.



OF THE PRINCIPAL SEAMS AND THE MAIN ANTICLINALS AND BASINS

Limits of the Pottsville Conglomerate—The bottom of the Buck Mountain bed, the first bed overlying the conglomerate, has been taken as the upper limit. It is, as a rule, a well defined horizon and there is rarely any difficulty in fixing its position. The placing of the bottom is much more difficult, as the transition from the red shales of No. 11 to the conglomerates of No. 12 is not often abrupt.

Thickness of the Pottsville Conglomerate—The formation shows a marked decrease in thickness and in the coarseness of the materials composing it, from the southwest to the northeast, the maximum being apparently reached in the southwestern part of this field. Measure-

ments at the Lincoln and Kalmia Collieries, where there are extensive tunnels to tap the Lykens Valley coal beds, furnish a complete section of about 1475 ft. Its thickness in the Broad Mountain is about 1200 ft., which is about the average throughout this field. In the Northern field it averages about 225 feet.

The Coal Measures (Formation No. 13)

The coal measures consist of beds of sandstone, shale, fireclay, black carbonaceous slate or shale, and beds of coal from a few inches in thickness up to the great Mammoth which, over large areas, is from 50 to 60 ft. thick. The prevailing color of the sandstone and shale is brown or gray. Beds of fine conglomerate occur within the coal measures and in some instances they are so coarse and massive as to have been mistaken for the Pottsville conglomerate. The coal seams are fairly well distributed throughout the whole of the measures, the formations separating them varying from a few feet to a couple of hundred, but it is seldom that a barren interval of more than 200 ft. occurs. The distance between the same coal beds vary somewhat, and at times decidedly, in the different basins as well as in different parts of the same basin. The lower 300 to 500 ft. of the measures, from the No. 12 to the top of the Mammoth seam, as a rule, contains the thickest coal and are more productive than those higher in the series.

Thickness of the Coal Measures—The greatest thickness is found in the deep basin of the Southern field where the total aggregates more than 2500 ft. Workable coal beds extend to the very top of the column and perhaps still others may have been originally deposited, of which every trace has been removed by erosion.

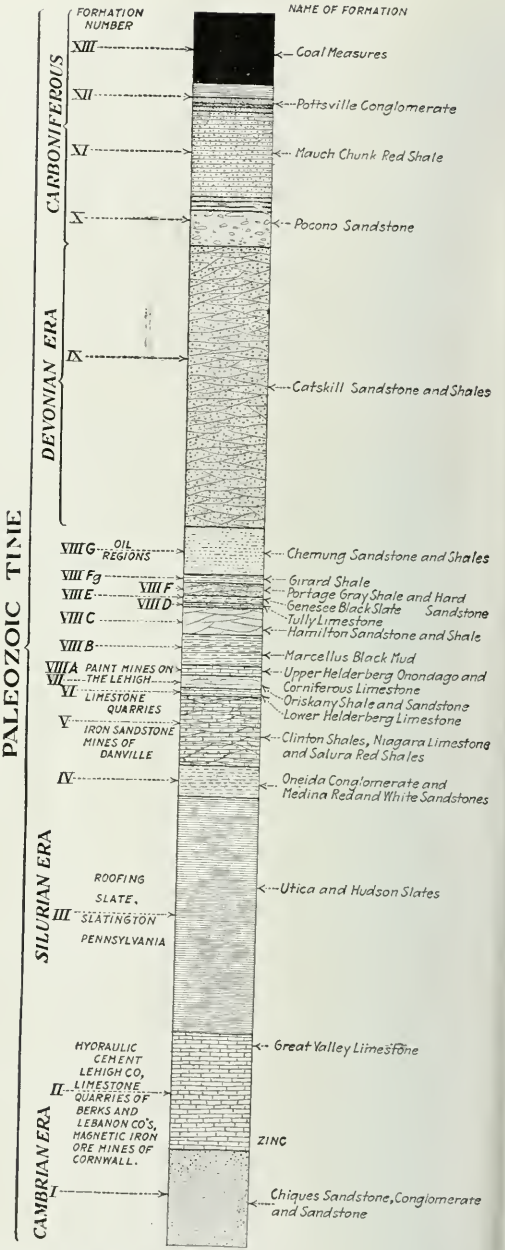
The successive deposits, from the Archean rocks to the top of the coal measures aggregate 31,500 ft., and were originally deposited in succession as shown on the accompanying columnar section, in a great water basin which, in early times, occupied the area which is now the Appalachian Mountains. Some of these measures were found in deep sea water, some in water so shallow that they exhibit mud cracks, ripple marks and foot prints and hold both shore living shells and coral reefs. These facts force us to believe that the bottom of the Pennsylvania sea continued sinking through all the ages during which these deposits were made. The rate of their deposition has been estimated at 5 ft. in a century, approximately 630,000 years to deposit the 13 formations described.

The thoughts that must be kept in mind in Pennsylvania Geology during the Paleozoic time are:

First—That which was the continental area of crystalline rocks became, by a downward movement of the earth's crust, an Appalachian sea basin of unknown depth and was in the course of the Cambrian, Silurian, Devonian and Carboniferous ages, so completely filled up as to become at last a great marsh or archipelago of marshes bearing the coal vegetation.

Secondly—That this whole area was then lifted high in the air and that a corresponding contemporaneous movement established the Atlantic Ocean, or parts of it, as the thrust that elevated the Sharp, Locust and Appalachian Mountains came from that direction.

In the accompanying illustrations there is a vertical section on line with, and through the Lansford Tunnel, showing the relative positions of the coal measures, the



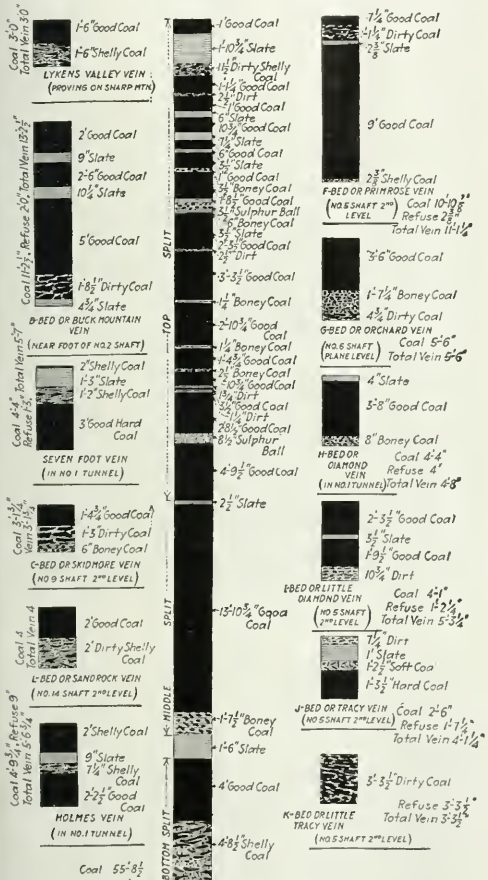
Columnar Section of the Pennsylvania Formations

Pottsville conglomerate, the Mauch Chunk red shale, and the Pocono sandstone, of the Carboniferous.

Flexures are generally parallel to the axis of the mountain range, but they are not so in this valley where they have a tendency to approach the southern rim of the valley, from the north to the south, and have the steepest

side generally facing the northwest, away from the Atlantic Ocean.

Measuring the Buck Mountain vein on this section, along its dips from outcrop to outcrop, you will find it to measure 10,400 ft., while, if we measure horizontally on the surface between the outcrops, we will find it to measure 7900 ft. This means that the vein, when horizontal, spread over the surface 2500 ft. more, or has been shortened 2500 ft. in consequence of its flexures.


LYKENS VALLEY VEIN (PROVING ON SHARP MTN.)
B-BED OR BUCK MOUNTAIN VEIN (NEAR FOOT OF NO.2 SHAFT)
SEVEN FOOT VEIN (IN NO.1 TUNNEL)
C-BED OR SKIDMORE VEIN (NO.9 SHAFT 2ND LEVEL)
L-BED OR SANDROCK VEIN (NO.14 SHAFT 2ND LEVEL)
HOLMES VEIN (IN NO.1 TUNNEL)
TOP SPLIT
MIDDLE SPLIT
BOTTOM SPLIT
F-BED OR PRIMROSE VEIN (NO.5 SHAFT 2ND LEVEL)
G-BED OR ORCHARD VEIN (NO.6 SHAFT PLANE LEVEL)
H-BED OR DIAMOND VEIN (IN NO.1 TUNNEL)
I-BED OR LITTLE DIAMOND VEIN (NO.5 SHAFT 2ND LEVEL)
J-BED OR TRACY VEIN (NO.5 SHAFT 2ND LEVEL)
K-BED OR LITTLE TRACY VEIN (NO.5 SHAFT 2ND LEVEL)
E-BED OR MAMMOTH VEIN (TAKEN IN STIPPINGS 1200 FOOT WEST OF NO.10 SLOPE)

SECTIONS OF THE COAL SEAMS IN THE PANTHER CREEK VALLEY

The coal measures (9 seams) as shown on the section in the Bull Run Basin are 1600 ft. thick. The lowest vein, the Lykens Valley, is in the Pottsville conglomerate and, in the Lansford Tunel, it is only a streak.

The Buck Mountain, or "B" Vein, has a specific gravity of 1.62 and is only 1.6 ft. thick in the Lansford Tunnel.

The Seven Foot Vein is 12 ft. 4 in. thick and averages 11 ft. 3 in. of coal.

The Skidmore, or *"C" Vein,* has a specific gravity of 1.64, is 3 ft. thick of good coal.

The Mammoth, or *"E" Vein,* has a specific gravity of 1.61, is 40 ft. thick and averages 30 ft. 8 in. of coal.

The Primrose, or *"F" Vein,* has a specific gravity of 1.60, is 19 ft. thick, nearly all good coal. It will be noted on the section that the Primrose Vein is shown at the mouth of the tunnel which cuts in two places. This is due to an overthrust of the strata.

The Orchard, or *"D" Vein,* has a specific gravity of 1.59, is 3 ft. 3 in. thick and contains 2 ft. 9 in. of coal.

The Diamond, or *"H" Vein,* has a specific gravity of 1.59, and was not cut in the tunnel, but is nevertheless in the Lansford and Bull Run Basins. It is about three feet thick, with 2 ft. 9 in. of good coal.

The Buck Mountain, or *"B" Vein,* is not workable at this point, but at Nesquehoning and Rahn Collieries, it it a very good seam, averaging 12 ft. thick with 10 ft. of coal.

The Holmes Vein, shown on the section, has a specific gravity of 1.58. It is only about one foot thick at this point, but is being worked at the Nesquehoning Colliery where it averages five feet thick, with four feet of coal.

The analysis of coal in this valley is as follows:

	Per Cent.
Moisture	3
Volatile	4
Fixed carbon	88
Ash	5

The total distance from the Lykens Valley to the Buck Mountain seam measured at right angles to the measures is about 515 ft., subdivided as follows:

From	To	Feet
Buck Mountain	Seven Foot Vein	90
Seven Foot	Skidmore Vein	40
Skidmore	Mammoth Vein	40
Mammoth	Holmes Vein	100
Holmes	Primrose Vein	325
Primrose	Orchard Vein	160
Orchard	Diamond Vein	75

The total thickness of the coal measures is 1600 ft. The gross thickness of the coal aggregates 71.5 ft., thus averaging 22 ft. of rock for every foot of coal. The Pottsville conglomerate is 800 ft. thick, the Mauch Chunk red shale is 2168 ft., and the Pocono sandstone is 1256 ft. thick, showing a total deposit of the Carboniferous of 5824 feet.

The Lansford Tunnel was opened originally as a mine tunnel, but in 1870 the tunnel was driven through to Hauto and the Nesquehoning Valley Railroad ran through to the Panther Creek Basin.

On the section at Summit Hill Anticlinal, I call your attention to the old quarry, which was opened in 1792. The first discovery of coal in this region was made during 1791 by the famous Phillip Ginther.

There has been sent to market and used for fuel, from the Panther Creek Valley, from 1820 to 1911 inclusive, 80,000,000 tons. The estimated life from provings so far made would indicate that the coal goes to a greater depth than has yet been reached, so that there should be a good production from this valley one hundred years hence.

The lignite beds of Alabama, Mississippi and Tennessee have been developed but slightly or not at all, while the lignites of Texas, Arkansas, the Dakotas and eastern Montana have a limited development. Lignites from Montana sometimes contain from 20 to 40 per cent. of moisture, which causes them to deteriorate rapidly on exposure to the air, thus rendering them of little value as fuel.

Phenomenal Outburst of Water at Equality.

By Lucien W. Gordon*

SYNOPSIS—The mine of the Gallatin Coal and Coke Co. was submerged and in the wreck accompanying the flow of water into the mine, the tipple and surface works were all wrecked and drawn toward a crater at the mouth of the shaft. Suddenly the mine ejected water, cars and tipple wreckage; there were several such expulsions before the phenomenon ceased.

On Sunday, Apr. 6, 1913, the 600-ton shipping mine of the Gallatin Coal & Coke Co., at Equality, Illinois, was totally destroyed in rather a unique manner, namely, by rapidly filling with back water from the Ohio River flood and by resultant outbursts of the air compressed by the inflow of water into the mine.

The entrance to the mine is an 80-ft. shaft which was sunk in 1882 by the late Broughton Temple. It was the first shipping mine developed in the southeastern Illinois field. It is located about five miles from the now well known Saline County district. The coal is extracted from seam No. 5, the number being reckoned according to the well recognized Illinois usage. Its thickness is five feet.

About 150 acres have been mined out. The main entries run to the dip and most of the rooms are driven to the rise. The roof is unusually strong and it has never broken except in about two places where the coal has been worked to the crop. The roof consists of a hard black slate with about 4 ft. of hard schist and 30 ft. of heavy bedded sandstone.

The Efforts to Protect the Mine

The mine was opened at a level above any previous high-water mark, but the exceptional flood of 1884 caused a small "cave" at the crop. Pumping was necessary while this flood continued and after this the mine mouth and buildings were raised above the flood level of that year and a large mound was built around the plant.

About the last of March in this present year, it was seen that all previous records for high-water would be broken. All mining operations were stopped, the mules brought to the surface and all available men were put to work at raising the mouth of the shaft with sandbags and clay.

About Mar. 31, it was found that the shaft cribbing had given way just above the rock and much water and débris were falling down the shaft. This was checked by placing further sandbags and clay to resist the action. Conditions seemed to improve till Apr. 5, when the caving again commenced, the backwater steadily rising.

The Second Outburst from the Gallatin Coal & Coke Co.'s Mine

The Mine of Gallatin Coal & Coke Co. before the Flood

All That Remains of What Was the Equality Mine

On the morning of Apr. 6, the tipple was found to be undermined and extensive caving commenced at the power house about 50 ft. away. For this reason, people were ordered away from the buildings. At 10 a.m., the tipple sank out of sight, without, however, toppling over. With the buildings sank mine cars, barrels of oil, the shaker and fan engines, concrete piers and tons of rubbish. The rush broke down the greater part of the

*Equality, Ill.

power house, the blacksmith shop and one of the elevated storage bins.

The Outbursts of Water

At 3:25 p.m. the mine had apparently nearly filled with water and the surface of the flood was almost quiet. The demolished plant was surrounded by sightseers, who observed the ravages of the flood from boats, the gob-pile, and high ground around. Suddenly a tremendous "explosion" occurred sending the water, dirt, rock, broken timbers and machinery about 600 ft. in the air. Twelve minutes later a second "explosion" occurred and of this I made the appended snapshot picture. Comparing the water column with known objects, I estimate its height as 260 ft. A number of gradually diminishing "explosions" took place till about 5 o'clock.

The weight of the water ejected, crushed in the roofs of the neighboring buildings; one of the cages known to have sunk in the mine was blown 300 ft. away, over the gob-pile, and the fan engine located at the foot of the tipple and known to have sunk with it, with its attached concrete base, estimated to weigh five tons, is now lying 60 ft. away. The 12-in. built-up posts of the tipple were broken into pieces and hurled hundreds of feet, and mine cars were seen at a height of 60 ft. above the shaft mouth. Draw slate, rock and fire clay were scattered over more than an acre and the 4-ft. sheaves at the top of the framework were sunk to their hubs on falling, an evidence of the height to which they were thrown.

The mine was sunk at the southern crop of the coal field and this caused the workings to be directed wholly to the north. In a measure, this probably explains the "explosions." The main entry ran N 22° W for 1200 ft. with a dip of 2 ft., then it turned to the right and went N 24° E 4600 ft. having a dip of 38 ft. in the first 1200 ft., the other 3400 ft. being flat. The east entries were driven S 66° E for 1200 ft. with a dip of 8 ft. The west entries ran N 66° W for 1600 ft. and rose 30 ft.

While some think that the compression of the air in the high levels caused the "explosions" it is more probable that previous caving had partially closed the foot of the shaft and that the rush of water completed the closure, thereby compressing the air in the main entries until the air pressure became greater than that of water. Many believe that the first water entered the shaft through rat burrows.

A group of men standing on the gob-pile at the time of the outburst was deluged with water and some were slightly bruised, but fortunately there was no loss of life. The mine mouth is now caved in, leaving an opening about 40 ft. across. The loss, including the expense of pumping is about $30,000.

The Shaft Buildings Sink As the Water Pours into the Mine

After the Tipple Had Sunk Out of Sight by Undermining

Meeting of Institute of Mining Engineers

By R. Dawson Hall

SYNOPSIS—On a per-diem basis, the coal miner is declared to have a greater death rate from accidents than the metal miner, though there is much reason to doubt the parallelism of the data on which the calculation is based. Precautions taken in aqueduct tunnels under New York City and a sizer for coal and other materials which does not depend on screenings and promises to show remarkable sizing powers and a minimum of breakage and attrition, formed the subjects of two other interesting papers.

A regular meeting of the New York Section of the American Institute of Mining Engineers was held on Friday, May 2, at the Engineering Societies' Building, 29 W. 39th St., New York City.

The chair was occupied by G. F. Kunz, retiring Chairman of the Executive Committee of the New York Section. The following officers were elected for the insuing year: Chairman, L. D. Huntoon; Vice-Chairman, A. S. Dwight; Secretary, T. T. Read; Treasurer, E. M. Shipp.

After a short discussion on ways and means, M. Below-sky, custodian of the Mineralogical and Petrographical Institute and Museum, at Berlin, made a speech in German, requesting the aid of the members in his work.

Albert H. Fay read his paper on "Metal-Mine Accidents in the United States." Mr. Fay, of course, in introducing his original remarks had to cover much of the

ground of his technical paper No. 40. In the latter part of the paper he did much to modify and correct the position which had been taken that today metal mines are more dangerous than coal mines.

He pointed out that the latter mines worked only 220 days, according to the report of the Geological Survey, whereas the mineral mines worked 300 days, according to his count.

The following table is compiled to show what the death rate would probably be per thousand men employed if the number of men killed were proportioned to the days worked and the time was in each case equated to 300 days per year.

LOSS OF LIFE PER THOUSAND EMPLOYEES BASED ON A 300-DAY YEAR IN VARIOUS MINES

Class of Mines	Actual days worked	Deaths per thousand employes	Deaths per thousand calculated on 300-day basis
Copper	308	5.33	5 19
Iron	277	4 29	4 65
Lead and zinc (Mississippi Valley)	256	3.43	4 02
Gold and miscellaneous metals	276	3.95	4 30
Non-metal except coal	258	1.73	2.01
All mines except coal	282	4.19	4 45
Coal mines	220	3 73	5.09
Quarries	228	1.69	2 22

Mr. Fay defined a quarry as a place where building material is obtained. Cement rock and broken stone, as well as dressed rock, is regarded as being the product of a quarry.

Other figures given by Mr. Fay are interesting:

LOSS OF LIFE PER MILLION TONS OF MATERIAL PRODUCED

Mines	Lives lost per million tons extracted	Lives lost per million dollars worth of product
Copper	7 96	1 74
Iron	4 29	0 60
Lead and zinc (Missippi Valley)	2 99	1.18
Miscellaneous mines (Gold and silver and others)	12 58	1 12
Other non-metal except coal	3 53	0.60
All mines except coal	6 16	0 97
Coal	5 48	4.37

Mr. Fay presented the following figures which err, we believe, in the direction of liberality. Every life lost is figured as worth $5000. The time lost is calculated on a 30-day basis and the wage of the miner at $3 per day.

LOSS IN MINING FROM ACCIDENT AND DEATH PER ANNUM

Death of metal miners	$3,000,000
Accidents of metal miners	1,000,000
Total	$4,000,000
Deaths and accidents of coal miners	$14,000,000
Deaths and accidents to quarry men	1,000,000
Grand total	$20,000,000

Taking the grand aggregate of men employed as one million, the loss is $20 per employee.

The speaker laid much stress on the number of blasting accidents and said that regulation by inspectors would largely reduce them as it had such accidents in coal mines. The blasts in metal mines are, however, much larger and more severe than in coal mines. Certainly, except where shotfirers are employed, the men who fire shots in coal mines are not superior to those who fire them in metal mines.

Moreover, even where shotfirers are engaged, the holes are usually loaded by the rank and file of operatives and not by expert men. The difference in death rate is largely due to the fact that coal-mine shots are small and single, whereas metal mines more usually explode larger shots and several at a single time.

Precautions in New York Aqueducts

John R. Healy, assistant engineer of the Board of Water Supply of the City of New York, described some precautions taken to prevent accidents in the tunnel work. All the men who load and fire shot holes have been examined and certified by the Bureau of Combustibles. All explosives used are non-freezing and the amount needed for each day's work (about half a ton)is stored underground in a magazine connected by a z-shaped passage 40 ft. long closed by a heavy door. The caps are kept apart from the explosives in a recess in the passage.

Where 20 to 25 holes are exploded in three rounds, only those holes which are exploded in one round are loaded at any one time. All firing is by electricity and the switch box controlling the ignition is kept locked, the foreman keeping the key. The field force of the Board of Water Supply examines the roof, the work not being left solely to the contractor's vigilance.

Care is taken to make the shafts larger near the surface so as to avoid material falling at the sides. Doors are placed in the shaft to prevent concrete falling down on the men below. Some contractors have put life nets below the men who were engaged in concreting. Others tried to hold them by life-lines and had a strike on their hands.

It is rumored that despite all the precautions, the death rate on the aqueduct is extremely high, but Mr. Healy gave no statistics on this subject. As usual, several men have died from shear foolishness. One man ran his motor into the shaft. The cager instead of stopping the cage jumped into the shaft to save him and was killed. Many men too eager to get home left the air locks before the required time and thus died of the "bends."

A Competitor of the Mine Screen

A paper was read by Thomas B. Stearns, of Denver, Colo., on the "McKesson-Rice Screenless Sizer. This machine operates on the following principles: (1) The largest particles roll furthest down an inclined plane; (2) if a sidewise reciprocating motion is given such a plane, the particles follow paths diverging like a fan. The smaller particles are carried further across the plane than the larger and may leave it on the side. (3) Particles on a plane broken into steps can be made to move across that plane opposite the direction of motion. (4) Particles will move with facility down a series of corrugations if the perpendiculars from their centers of gravity clear their summits. By arranging the corrugations on any one of a series of steps, it can be provided that particles of a certain size cannot travel down a plane but must travel in the direction of corrugation, whereas large particles will run quite freely, passing over the summits of the roughnesses.

As a result without the use of screens, as many as 15 different sizes have been obtained in the preparation of abrasive material for the manufacture of sand-paper, the material being taken from the bottom and side of the stepped plane. These sizings were on exhibit and photos of coal preparation were also shown. The method is of value because there are no screens to wear out, the power required is small, but little space is required, the abrasion of the material is reduced, owing to the shortness of the reciprocation of the table and to reduced travel of the coal as compared with those motions on a screen. Moreover, the coal is not in so deep a bed nor is it tossed as in a screen. Hence the abrasion is reduced to a minimum. It is hoped that the soft coal can be prepared more cheaply, less wastefully, in smaller space and more acceptably than by the present screening methods. At the same time the inventors do not wish to place the machine on the market till further experiments have been made.

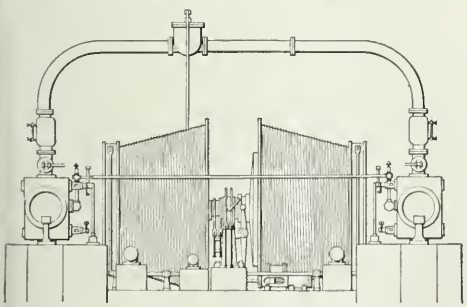
Solving the Hoisting Problem

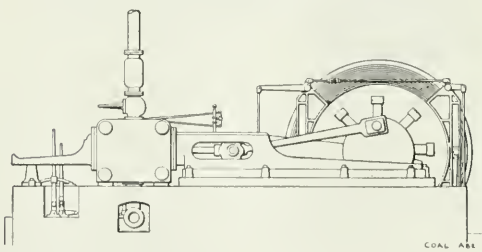
By L. F. Mitten*

SYNOPSIS—Description of a Corliss valve hoisting engine of large size. The first few revolutions are made with a late cutoff and the Corliss gear disconnected. When full speed has been attained, a complete advance of the throttle throws the trip motion into gear and steam is used expansively throughout the balance of the hoist.

One of the evidences of the changing conditions in the coal fields as regards economy and efficiency of equipment is shown by the steady increase in the demand for hoisting engines of low steam consumption. The accompanying illustration shows a 34x48-in. first-motion, link-reversing, heavy-duty, Corliss type of hoisting engine

The Conical Drums on the Erecting Floor. Note Comparative Size of Man





Rear and Side View of Corliss Hoisting Engine

built by the Vulcan Iron Works, of Wilkes-Barre, Penn., for installation by the Coal Mining Department of the Delaware, Lackawanna & Western R.R. Co.

A few years ago hoisting engines of this type were exceedingly rare in the coal regions. Fuel was, or was thought to be, cheap, ranging in estimated value from 75c. to $1 per ton, and economy of operation was therefore given practically no consideration. Operators could not see the wisdom of investing any considerable amount of money in expensive machinery merely for the sake of saving a few tons of cheap fuel when they could secure less expensive equipment that would do the work for the time being and which could be easily and cheaply replaced when necessary.

These were the conditions that manufacturers of high-grade machinery had to face, and the fact that the older types of extravagant hoisting engines are being replaced by equipment which is thoroughly modern and efficient, shows clearly the trend of the times and makes a description of the hoist mentioned above of interest to all mine owners and managers.

These engines are equipped with two conical drums, each tapering from 14 to 10 ft. in diameter and spirally grooved for 1½-in. rope. One drum is securely keyed to the engine shaft, while the other is brass bushed and driven by a toothed clutch wheel to allow for changing for different levels. The engines are reversed by an independent steam cylinder and the brakes on each drum are operated by this same means. Auxiliary hand brakes are also provided.

The engines are equipped with tail crossheads which take the weight of the pistons off from the inner surface of the cylinder and prevent the ordinary elliptical wear. Sheet steel crank and splash guards are furnished which cover entirely the crank disks. Guards are also provided for the tail crossheads.

The arrangement of throttles differs from the general practice followed in the coal regions. On top of each cylinder is mounted a vertical throttle valve. These are operated simultaneously through a crossshaft. Surmounting each throttle is a steam separator and an auxiliary throttle, which is used in case of emergency, is mounted in the overhead pipe line.

The valve motion is of the full Corliss type provided with dash pots. The cylinders are fitted with Vulcan improved releasing valve gears and the actuating catches are a combination of the hand adjusted spring and gravity types. The trip or releasing motion instead of being controlled by the ordinary type of Corliss governor is operated from the throttle lever.

The first two or three revolutions of the engine are made with a late cutoff, the throttle being only partially open. A complete advance of the hand lever after full speed has been attained throws into gear the trip motion and the engine then uses steam expansively for the balance of the hoist. The cylinders are also fitted with a by-pass arrangement allowing the engineer to lower a load

*Wilkes-Barre, Penn.

under compression, a foot pedal being conveniently located for this service.

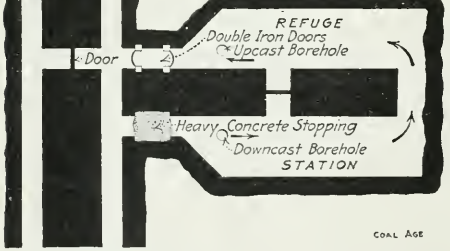
The engines are designed to handle 100 cars per hour in a vertical shaft having a present depth of 900 ft. but which will ultimately be increased to approximately 1575 ft. Cars will be hoisted from the lower level to the top of the tower in self-dumping cages. These will weigh approximately 13,000 lb. The empty cars will wiegh 5000 lb. and the coal 8000 lb.

Some idea of the size of this installation is to be gained from reference to the photograph of two of the conical drums taken while in the erecting shop. Each section of thes drums together with the drum siders weighs approximately 40 tons.

Refuge Stations in Mines

By James E. Smith*

There are too many lives destroyed in mines by explosions and otherwise and I feel satisfied that sixty per cent. of these lives could and would be saved if they only had some place of safety where they could retreat. As is well known, an explosion destroys everything in its path and its path is towards the shafts which is the only relief for the blast. Invariably there are miners who are not injured and knowing there is no escape they have to wait for the consequences, which is death from afterdamp.



Plan of Proposed Refuge Station in a Mine

I claim that these miners' lives can be saved if suitable refuge stations were installed in the mines. The nearer to the working faces these stations are located, the better chance the miners will have to reach them. These stations should be ventilated by one, or better two, boreholes, say eight, ten, or twelve inches in diameter. If but one borehole is used it will be necessary to insert a four-, five- or six-inch pipe inside of the larger casing, and connect this pipe with a small air compressor or blower on the surface to ventilate the chamber, the air returning up the larger casing.

Such safety stations may be made by driving a pair of rooms, as shown in the accompanying figure, off the inside cross entries, or at any suitable place in the mine; the width of the rooms to be determined by the character of the roof and floor. The necks of the rooms should be driven in narrow, about twenty feet, and then widened. Two boiler-iron doors are to be placed in one of the room necks, about ten feet apart, a strip of asbestos being attached to the door where it meets the frame. The other neck is closed by a heavy concrete stopping, as shown in the figure.

The door frames are to be constructed of concrete, cut in the bottom 6 in. and showing a face of 4 in. above the floor; the top frame cut in the roof 6 in. and showing a face of 4 in. below the roof; the side frames to be cut in the pillars 18 in., showing a face of 4 in. outside of the pillar; the whole frame to be at least two feet thick.

A drill hole is sunk from the surface to each of the two rooms; all surface water is shut off. A common blower placed on the surface can be attached to the pipe at a moment's notice so as to furnish sufficient air to sustain life for a large body of men, until they can be reached with safety from the surface. This pipe can also be used for the purpose of furnishing the men with food and water and sending messages back and forth. A telephone can be placed in the chamber so as to communicate with the office on the surface.

The doors of said chamber should be semi-circular in shape and open in opposite directions, one to resist pressure and the other to resist any suction that may occur and both to be air-tight. Everything being fireproof, if there is any danger of fire in the mine you may at once cover up the shafts. There is no need of men going in search of life and losing their own lives in the effort, as was done at Cherry and other places. If this device had been used in the Cherry mine before the fire, not a man of the four hundred would have been lost; or the same in the mine at Delagua, Colo., where but one man was mutilated and twenty-nine men were found dead in one chamber from the effects of afterdamp.

*Peoria, Ill.

Revision of Mining Laws in Washington State*

The legislature of 1911 provided for the appointment of a commission to revise the law regulating the operation of coal mines, the commission to consist of, one coal-mine operator, one mining engineer, two practical coal miners and the state coal-mine inspector. The first four named above were to be appointed by the governor and the fifth was a member *ex-officio*.

The following persons were appointed by Gov. M. E. Hay: Coal-mine operator, F. A. Hill, Seattle; mining engineer, J. B. Warriner, Tacoma; miners, George Temperly, Roslyn, and Peter McLean, Wilkeson; and state mine inspector, D. C. Botting, Seattle.

After the commission had held two meetings, Mr. McLean was taken seriously ill and at his request further meetings were postponed. He finally resigned and Frank Bennett, of Roslyn, was appointed to fill the vacancy. Mr. Warriner resigned, October, 1912, to accept a position with a mining company in Pennsylvania; and C. R. Claghorn, E. M., was appointed in his place.

This commission has endeavored to compile a code that will work out along practical lines, and it is to be hoped that the members of the 1913 legislature will include it among the laws passed. It has been prepared after careful study and the members of the commission are certain that in placing it on the statutes, the safety to life, limb, health and property of men engaged in this industry will be greatly enhanced.

*From the advance sheets of the Report of the State Inspector of Mines, for 1912.

EDITORIALS

The Anthracite Mining Code

Mining men throughout the State of Pennsylvania are watching with much anxiety the doings of the legislature now in session in that state. The commission to revise and codify the anthracite mining laws of Pennsylvania, appointed by Governor Tener, under the Act of June 14, 1911, which act directed the commission to report its deliberations and recommendations to the next General Assembly (session of 1913), submitted two reports, differing from each other in important points. The majority report was signed by six members of the commission; the remaining three members submitting a minority report, which was seemingly inspired, in some of its provisions at least, by influences emanating from the United Mine Workers' organization.

Both of these reports were referred promptly to the Committee on Mines and Mining. The majority report received the first attention of the committee, and after prolonged consideration was reported out, having been amended by the committee in a few unimportant matters that were agreed to by those who signed the report. Later, Apr. 22, the minority report was reported favorably to the House, by the committee. It is understood that this minority report was signed by the three members of the commission chosen from the mine workers of the anthracite region.

One of the prominent features of the minority report, in which it differs from the majority report, is the provision made in Article 15, that the mine inspectors of the anthracite region shall be elected by "the qualified electors of the several inspection districts."

The law under which the anthracite mine inspectors of Pennsylvania have been elected by popular vote in their several districts, has been clearly proven to be one of the most pernicious features of the state mining law, during the decade in which it has been in force. The majority report of the commission seeks, in Article 9, Section 6, to change this condition by providing that all anthracite mine inspectors shall be commissioned by the governor from the certified list furnished him by the examining board, in the order of the percentage mark received by the candidate in the examination. So much has been written in regard to the relative advantages of the appointed and elective systems in the choice of mine inspectors, that nothing is to be gained by further comment, but the hope is expressed that the present legislative session will mark a change in the present law, in this respect.

We will mention briefly one other feature of the minority report that in itself should be sufficient to kill the bill. We refer to the provision made in Article 15, Section 8, that "All persons holding mine foremen certificates shall be eligible to run for the office of mine inspector." According to this section, all that is required of the candidate for the office of mine inspector is that "he shall file his mine-foreman certificate with the county commissioners in the county in which he resides. After the filing of such certificate with the county commissioners, his name shall be placed on the official ballot." Such a wild and random provision as this needs no comment. Its enactment as law would overthrow the work of a quarter of a century in the effort to secure greater safety in coal mining in Pennsylvania.

Failure To Put On Breathing Apparatus

A warning example of the danger that may be present to rescue parties equipped with breathing apparatus in perfectly good condition, if the same be not properly employed, may be found in a fatal accident which occurred last November at the Möller mine in the Gladbeck inspection district, Germany. It is the subject of a leading article by Dr. Forstmann in Glückauf, April 6, 1913.

Hearing there was a fire in the mine, a party of subofficials started toward the affected region with breathing apparatus. Three of them, while passing along galleries but faintly permeated by gases from the fire, neglected to use the apparatus, and after awhile sickened, one of them collapsing so as to prevent his going farther. The other two put on breathing apparatus and proceeded. In about an hour they became exhausted and, although a retreat was attempted, they were unable to reach a place of safety.

Their death was shown to be caused by poisoning with carbon monoxide. The effect of the gas which they inhaled at first had apparently been aggravated by their subsequent exertions. It is thought also that one of them neglected to use his second oxygen flask. Neither of the victims belonged to a regular rescue team.

This accident teaches that gases of combustion which are so attenuated as to seem negligible may nevertheless be poisonous and should not be entered without wearing a breathing apparatus.

Coming Substitute for Natural Gas

Modern development of almost every type of mechanical apparatus is along lines of simplicity and economy. With proper design, simplicity means durability; durability means low maintenance and low maintenance means cheaper cost of operation.

The tendency toward simplicity in design is well illustrated in the improvement of the internal-combustion engine. Many of us can well recall the first of these machines to be placed upon the market. But our memories of these engines are that they were a mass of cams, springs, valve rods, etc.; that they were extremely heavy for their horsepower and noisy in almost a like proportion.

After a period of development that has been comparatively short, they are now one of the simplest, most elastic and most responsive machines known, as well as being the lightest of all prime movers for their power. For this reason perhaps more than any other, they have been

the most highly developed in the smaller horsepowers and have served man rather as a plaything and a toy—driving his motor boats, his automobiles and aëroplanes with equal facility—than finding any conspicuous place in industrial or manufacturing institutions.

Although at the present time stationary gas engines are made in 5000-hp. sizes, yet the development of this type of machine is still in its infancy, perhaps not so much in the mechanical construction of the mechanism itself as in the perfection of the means and methods of preparing the engine fuel.

In thermodynamic efficiency, the internal combustion engine is at least the equal, if not the superior, of steam-actuated power-generating apparatus. In the light of our present experience and achievement, it is not too much to hope that at no remote date, means will be developed for successfully producing high-grade engine fuel from inferior and inexpensive coal or lignite. When this result is commercially accomplished, we need have no fear of embarrassment or inconvenience on account of our steadily failing supply of natural gas.

The Load Factor

The paper of H. M. Warren and A. S. Biesecker before the American Institute of Electrical Engineers, published in this issue, was met with no little criticism largely because the authors defined the "load factor" for the purpose of the paper as the average load on the converter increased by the converter losses divided by the rating of the connected units whether idle or working.

The argument of the objectors was that the load factor should have no relation to the possible bad judgment which any operator had exercised in buying machinery which either he did not need or which was too powerful for his purpose.

It was pointed out that the factor, as defined by the authors, rested on the balance which machine purchase and mine development had struck between facilities needed and machinery supplied. The equipment might be excessive or might be inadequate, but the "power factor" should only express the relation between the average energy needs of the equipment with the energy needed at moments of excessive demand.

A furniture maker was instanced whose construction engineer had a contract based on the total cost of installation. In order to swell his percentage return, the consulting engineer bought equipment which greatly exceeded all the legitimate needs of a plant employing a given number of employees. Consequently had one diligently totaled the ratings on the name plates, the denominator of the ratio would have been high and the power factor correspondingly low. Such a factory would appear to be undesirable as a power customer, whereas the fact that it used almost equal quantities of power throughout the day made it a client to be sought.

The public central-station authorities favored comparing the greatest momentary demands of the station, that is the peak of the load with the average needs of the same period. This is a good method when, having built a central station of a certain size, arrangements are made to supply a number of independent concerns. But where a central station, private or public, is started to accommodate a definite number of companies, the problem is different.

It is presumable that the requirements of the various operators will be better known to them than to the power seller. On the strength of the knowledge which they should be presumed to have, they bought machinery of certain ratings. Because the central-station authorities do not know more and may actually know less than the mine-operating department regarding the mine's needs, the equipment purchased for the central station will be based inevitably on a certain function of the installed load, whether the power house is public or private.

Consequently the station equipment is bought for certain anticipated demands and the cost of construction is based on the mine machinery bought by the power-purchasing concerns, who may be independent or the owners of the station. Hence the relation of the load borne to the load expected is a ratio of no little commercial importance. A certain percentage of variation between provision and use has been expected and allowance has doubtless been made for it, but every further variation means a decrease in the expected income.

This then is the value of the Warren-Bieseker figures, They supply the basis which will make the probable factor apparent, whether it be termed load, use or service factor or what not. Clearly the operator is going to put in so many units to perform the colliery work and obviously he desires to know how large must be the units by which they are to be supplied with energy. If he does not know what the average load will be, how can he discover what is the peak load which must be met even if he has the relating factor. He might have a factor connecting average load with rating units and then a factor connecting that average with the peak load, but the Warren-Bieseker factor, to give it a title which no caviler can condemn, combines both these requirements in a single figure.

It is an uncertain factor, and to be used with caution as indeed are many others. But the authors have found it checks remarkably well in their Lackawanna practice, so closely indeed as to occasion surprise. Not how close the factor of the largest station is to the average. In fact mining practice is stereotyped, especially in any one region, and the needs are much alike. This keeps the Warren-Bieseker factors from excessive variation when taken for equal durations of time. As a rule, mine installations are rather inadequate than excessive and machinery is rarely bought before it is needed.

It would have been equally justifiable to attack the paper on the grounds that the coal mines on which the inquiry was based might be so different from others as to furnish no criterion. Clearly if the installation is not to be declared non-typical because it might be found too large or too small for the work required of it, it might also be objected to as abnormal because used in a manner not typical and then if the load factor demanded by the critics were obtained the result would not be of any value in professional practice. In short the objections to either kind of factor on the ground of uncertainty are at least equal and in addition the factor which the central-station agents demand will not serve the purpose which the authors of the paper were seeking.

The electrical experts may bicker on definitions, but the conclusions reached in the paper are valuable, despite the verbal criticisms of detractors. The authors were not trying to explain the fairest way in which to sell power from a plant already purchased in Chicago, Ill.

DISCUSSION BY READERS

Letter No. 11—The training and education of mining men for the different positions they desire to hold in the mine, must always be adapted to their particular line of work. Drivers, motormen, miners, trackmen, timbermen, electricians, firebosses, steam engineers, surveyors, mine foremen and superintendents should undoubtedly each be trained and educated in their own line of work; but the more information each is able to gain of the other man's work, the more liable he is to advance to a higher position. All mine foremen are on the lookout for bright young men, whom they are pretty sure to advance, provided the man keeps sober and is willing to study.

Training for the position a man occupies is absolutely necessary, and, in my opinion, the greater a man's theoretical knowledge, the more efficient workman he will become. I believe this is true of all grades of mining work, from driver to superintendent. Any miner who has learned to cut coal to the cleavage, one cleat at a time; the trackman who understands curves and gradients, and knows the proper radius for certain mine curves; electricians who know the value of insulation; firemen who know how to keep a thin fire; and mine foremen who can control the ventilation and drainage of a mine and adopt a successful method of working the coal, are the men who are the most valuable, because of the knowledge they possess. Although there are many good men who know little of these things and yet do good work, I am convinced they would do better work if they had a technical knowledge and training.

The position of mine foreman or underground manager requires, perhaps, the broadest information and the best skill and training of any position in the mine, because of the numerous conditions met underground and the difficult problems that must be solved. The mine foreman must understand the constitution and behavior of mine gases; nature of roofs and bottom; the peculiarity of cleavages in the roof and coal. He must possess a knowledge of the flow of fluids; steam, compressed air and electricity; and the application of each of these forms of power to pumping, drainage, ventilation and haulage. He must understand the mining of coal by hand and machine. He must be able to study carefully and successfully the problem of transporting the coal from the face to the tipple. He must be able to handle his men so as to produce dividends.

Hundreds of good men have qualified for these positions in Pennsylvania, Illinois, West Virginia and other states, thus far, without carrying textbooks to the examinations. I can see no reason why this should be done. In my opinion, it is easy to master any of the subjects in mining without the use of any difficult formula or theory. Why then "lower the bars" to admit men who will not study or try to educate themselves.

I remember when first married I could not work a long-division problem. I worked eight hours each day in the mine and studied a like time at night to pass the examination, and I feel I know the value of study. I have never since given up the study of mining subjects or laid my books aside, and I believe there are not 10 per cent. of the mine foremen in Pennsylvania and West Virginia who cannot say the same thing.

However, I do believe that mining examinations should be conducted along practical lines. I do not think it is necessary for examiners to ask how air would split itself up in five splits of given dimensions, from the same fan. In the mine, the foreman makes these splits and divides the air according to the conditions, using the anemometer for this purpose.

If a formula is needed to answer a question, in examination, I think the formula should be given with the question. I believe the introduction of textbooks in examinations would hurt the very persons they were intended to help. In any examination, there is always those who would take advantage of being allowed the use of textbooks and would pass a good examination but have little practical knowledge and less practical ability.

JOSEPH VIRGIN, Supt.

Baneroft, W. Va.

Letter No. 12—The discussion of this question by the readers of COAL AGE leads me to offer the following remarks: The most pressing need of the practical coal miner who is ambitious to acquire an education in his line, is the possession of mining books and papers that will give him the information he wants, in the plainest manner and the simplest language possible. The time a miner can devote to study is limited, and it is important that he should reap the largest returns from his reading and study.

The object of textbooks and mining journals is largely educational and while it may be necessary that in order to meet the requirements of a certain class of technical and scientific readers the writer should express himself in language suitable to that class, it is equally if not more necessary that articles written for the common reader should be expressed in words that he can understand with the least possible effort. In reading many of the articles and books on mining it is necessary for a reader of limited knowledge to refer constantly to a dictionary of scientific terms, in order to understand what he reads. Again, some sentences must be read over several times before one can fully comprehend their real meaning. The result is that the ordinary reader becomes wearied with the effort and the book or journal is thrown aside in disgust.

Without questioning the fact that the writers of most of the articles in our mining journals and of mining textbooks are practical mining men, it may be stated that the language they often use is more characteristic of their scientific than of their practical training. It is this feature that makes their writings so obscure and difficult for the average practical mining man to comprehend.

The majority of the readers of our mining journals and textbooks are men engaged in the actual operation of producing coal. Their daily labor is arduous and dangerous. The conditions under which they work are not such as to train the mind. In many cases, their early edu-

cation has been neglected. If such men can realize the need and importance of education and come to know that "knowledge is power," and that the possession of it will benefit both themselves and their fellow workers, it is only right and just to give them the fullest possible returns for the time and money they expend.

I have reached this conclusion, after conversation with miners and practical mining men in every official capacity and as a result of my own personal experience. The reason that so many mining journals and textbooks fail to interest practical men is because they fail to educate in a way that is easily understood. The principles of mining expressed in simple terms would be of untold value to practical mining men; and authors and writers should realize, when writing, that there are thousands of eager hungry minds waiting and anxious to absorb this mental food.

I. C. Parfitt.

Jerome, Penn.

Letter No. 13—The average mining man who takes up the study of coal mining today is burdened with masses of figures and formulas that look like Greek or Hebrew to his untrained mind. The course of study usually laid out for his guidance commences with the rudiments of arithmetic. If the man is possessed of extraordinary will power, he continues to study arithmetic (the hardest and driest of all studies) until he has mastered fractions, percentage, extraction of roots, the use of sines, cosines, etc., and algebraic formulas. It usually takes the average mining man from one to two years to master these rudiments, which must be done before he can take up the study of gases, pumping, track laying, haulage, ventilation, safety lamps, etc. As a result, he often becomes disgusted before completing mathematics.

I believe it is as important to make the line of study in mining interesting, as to make it instructive. To do this, it is necessary to inject into the course some elementary information on gases, air, steam, electricity, first-aid and drawing. This would rob study of much of its terror, because such information would hold the interest of the student while it broadens his conception.

I do not favor the use of textbooks in examinations. I believe in a high educational standard for mining examinations. Raise the standard of mining up to that of the most modern practice and bring the examination to that standard. Require that all applicants pass this test, but do not lower the examinations to a level where no study, sacrifice or effort is needed, except a few days' or a few weeks' study before the examination.

Much can be said, by way of criticism, of the character of the questions asked at many mining examinations. These questions often fail to state definitely the conditions, and therefore admit of different answers, according to the conditions assumed by the candidate. In such cases, the solution given by the candidate will often be different from that required by the board. If the board has the time, it may be considerate enough to give the candidate credit for his work, as far as that shows he had the right idea. The candidate may have used a different coefficient of friction, or a different constant for the flow of water through pipes, or a different rule for calculating the size of the shaft pillar at a certain depth below the surface. Again, the answer obtained will differ with the number of decimal places to which the work is carried.

Many questions asked depend solely upon the judgment of the person and, as men differ widely in their judgment, the answers to such questions will rarely prove satisfactory to the members of the board. Questions that pertain to particularly local conditions should be carefully stated; because conditions differ widely in different mining districts, and practice in one district would not be successful in another district.

I am in favor of rating each question by stating the percentage or number of points allowed for the correct answer. I believe the board ought always to state the coefficient of friction that should be used or the constant that will be accepted where different constants are used; also the number of decimal places the solution should be carried.

It is quite generally true that many successful candidates in mining examinations, lay by their studies when the examination is over, intending to renew them after a brief rest. Their inclination to study, however, grows less and less as time goes on. Such men will fall behind and give place to more ambitious men.

At the present time, there are many good schools and other means of obtaining a technical education at low cost, either by studying or reading. These give the ambitious worker every advantage and he has no excuse if he fails to avail himself of the privileges they extend. The mine worker who continues to study and read will soon be fitted for a higher position in the mining field, where many conditions will consume his attention, such as profit and loss in business, division of costs, the upkeep of property, taxes, sanitary, social and labor conditions. All of these will form an interesting study as the man advances and his fund of knowledge increases.

It is common to find many persons holding high positions, by personal favor rather than by merit. The number of these, I am glad to say, is rapidly decreasing. There is no better means for protecting these positions or preventing men who are incapable from holding them, than to require a test of competency as determined by an examination.

I believe these examinations should be periodic, and that they should be required for the renewal of certificates for mine foremen and firebosses. I also believe that all mine superintendents should undergo a more severe examination than the mine foreman and be certified by law for the position he holds.

R. Z. Virgin, Supt.,
West Virginia-Pittsburgh Coal Co.

Colliers, W. Va.

Letter No. 14—I have been much interested in reading the letters on the subject of Education In Coal Mining, particularly those portions relating to the use of textbooks in examination. I am one of the great number who did not acquire a good, common-school education, in my younger days; but have since educated myself by correspondence and now hold a fireboss certificate and a first-grade mine-foreman certificate, for the bituminous mines of Pennsylvania.

Mining is a very extensive study, which we can never hope to master completely; for there is always something new to learn in the way of improved methods, machinery, etc. The best mining men today are those who keep themselves posted by reading uptodate mining literature. It is by such constant study we become familiar with the

principles and formulas relating to the science of mining. A man's knowledge of the mine law and his practical experience in the mine should give him a good idea of the kind of questions that ought to be asked at the different examinations. This makes it possible for good mining men to qualify, in a short period of time, for any examination.

It is not necessary for a person to remember all the formulas, but he should remember the principal ones and learn how to transpose those formulas so as to find the value of any of the quantities required. In my opinion, no first-class mining man would ever require a textbook in an examination. If he has the proper qualifications for the position, he should have no trouble in passing the examination without the aid of a textbook. I cannot understand how good mining men would advocate the use of textbooks in examinations; as, in my opinion, this would tend to lower the standard of examinations. But, if we are to economize in the production of coal and reduce the number of accidents in the mine, we must increase the standard.

I think that all firebosses, mine foremen and superintendents should be examined at least every four years, in order to bring the standard up to a maximum; because the lives of the miners depend, to a large extent, upon these officials and the knowledge they possess of mining. In my opinion, it would be a good investment for every large coal-mining company, operating several mines in the same town, or a number of small companies operating mines in the same community, to open and maintain a room for the purpose of educating their employees.

It often happens that miners are more or less prejudiced in their minds against their employers and think that many things that they do are done for the sole purpose of robbing them. It is a hard matter to get men who have only a limited education to take up the study of mining, but this can be accomplished if night schools were opened and maintained by the corporations operating in a community, provided that the mine officials themselves attended the meetings and did all in their power to instruct and interest the miners. This work should be followed up by the practice of selecting the most capable men among the miners to fill the different positions.

BENJAMIN HARTILL.

Johnstown, Penn.

Note—In response to many repeated requests, we have given a few pages of purely elementary matter in the Pocket Book section. The greatest care has been devoted to the work to make it simple and clear. The purpose is to provide a handbook that will contain all and only such matter as is necessary for practical mining men to know and to use. Such elementary matter, while familiar to many, is not without value to all. In order, however, to give more advanced work, for students of higher grade, and to publish, at frequent intervals, lessons, formulas and data suitable to all, the pocketbook pages will follow no regular order at present. Later, the same pages will be arranged, and, together with many tables and other matter that obviously could not appear here, will be published as one of the most valuable mining handbooks yet produced. We cordially invite criticism and suggestions.

Study Course in Coal Mining

BY J. T. BEARD

The Coal Age Pocket Book

The order of notation is important. Beginning with units on the right the numerical value of each succeeding place to the left increases in the ratio of ten. For example, any digit, 1, 2, 3, etc., standing in the first place on the right, means 1, 2, 3, etc., units. The same digit standing in the second place means ten 10, twenty 20, thirty 30, etc., units. In other words, the value of the digit has increased ten times. If the same digit stands in the third place, counting from the right, its value is increased ten times again or one hundred times that number of units.

The order of notation is given below and should be carefully studied. In ordinary computations it is seldom necessary to go higher than millions or billions, at the most.

Hundreds of billions	Tens of billions	Billions	Hundreds of millions	Tens of millions	Millions	Hundreds of thousands	Tens of thousands	Thousands	Hundreds	Tens	Units	
1	0	0,	0	0	0,	0	0	0,	0	0	0	One hundred billion
	1	0,	0	0	0,	0	0	0,	0	0	0	Ten billion
		1,	0	0	0,	0	0	0,	0	0	0	One billion
			1	0	0,	0	0	0,	0	0	0	One hundred million
				1	0,	0	0	0,	0	0	0	Ten million
					1,	0	0	0,	0	0	0	One million
						1	0	0,	0	0	0	One hundred thousand
							1	0,	0	0	0	Ten thousand
								1,	0	0	0	One thousand
									1	0	0	One hundred
										1	0	Ten
											1	One

These four periods of three figures each are, counting from right to left, hundreds, thousands, millions, billions.

In writing large numbers composed of several figures, it is necessary to fill all void places with ciphers, as the following examples will show.

EXAMPLES TO ILLUSTRATE

1	Write twenty-five, which is two tens and five units	25
2	Write three hundred and twenty	320
3.	Write seven thousand and twenty-five	7,025
4	Write seven thousand and five	7,005
5.	Write seven thousand and fifty	7,050
6	Write ninty-six thousand, eight hundred and ten	96,810
7	Write two hundred and sixty thousand, one hundred	260,100
8	Write twenty-one million, three hundred and two	21,000,302
9.	Write four billion, sixty-one million, two thousand and nine	4,061,002,009
10.	Write one hundred and fifty billion, sixty million, and four.	150,060,000,004

The Coal Age Pocket Book

ADDITION

The operation of finding the sum of two or more numbers is called "addition," and the numbers are said to be added together. The sign of addition (+) is called "plus," and when written between two numbers indicates they are to be added together.

Sign of Equality—The sign of equality (=) written between quantities indicates that their values are equal.

To Add Numbers—Numbers are often added by counting on the ten fingers of the two hands. It was probably this early custom that originated the decimal system and gave us the ten characters—nine digits and cipher. The word "digit" means a finger; hence, the name, as applied to the nine digits, while the cipher served as a tally of the count.

To illustrate, add together two fingers and four fingers by counting as shown in Fig. 1. This is written 2 + 4 = 6

Fig. 1

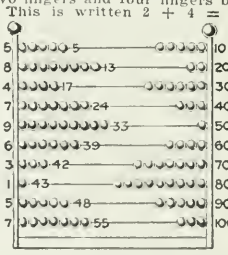


Fig. 2

fingers. When a number of figures are to be added together, a counting rack is sometimes used, similar to that shown in Fig. 2, which consists of a frame supporting ten wires on each of which are strung ten beads. The number of beads, corresponding to each figure to be added, is slid to the left side of the rack, on each wire in succession, after which the total number of beads on that side is counted. The final count gives the required sum. In Fig. 2, the figures to be added are

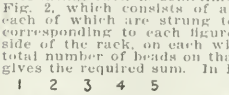


Fig. 3

written on the left and the count of each line is tallied on the wire, the final tally being 55, which is the sum required.

In the same manner, as illustrated in Fig. 3, five apples and eight apples make thirteen apples; thus, 5 + 8 = 13.

EXAMINATION QUESTIONS

Ventilation

(*Answered by Request*)

Ques.—A 7x10-ft. airway is passing 35,000 cu.ft. of air per minute, and it is desired to reduce this quantity to 21,000 cu.ft. per min., by means of a regulator. The water-gage reading taken on the regulator being three-fourths inch, what must be the area of the opening in the regulator?

Ans.—Assuming that the given water gage (0.75 in.) is obtained at the regulator, after the volume of air has been reduced to 21,000 cu.ft. per min., the area of opening in the regulator is calculated as follows:

$$a = \frac{0.0004\,q}{\sqrt{w.g.}} = \frac{0.0004 \times 21{,}000}{\sqrt{0.75}} = \frac{8.4}{0.866} = 9.7\ sq.ft.$$

Ques.—If two airways in a mine are increased to double their length, other conditions remaining the same, in what proportion must the ventilating pressure be increased to maintain the same velocity of the air current?

Ans.—The cross-section of these airways (area and perimeter) remaining unchanged, for a constant velocity, the pressure will vary as the length of the airway. Or, in this case, the pressure must be doubled to maintain the same velocity of the air current.

Ques.—If two ventilators producing the same power are used on the same airway, will they produce twice as much air as one ventilator? If not, how much more than one ventilator will the two ventilators produce?

Ans.—If the ventilators consume an equal power, and have the same efficiency, the power on the air when both are running will be double that when one ventilator is running alone. For the same conditions in the airways, the quantity of air in circulation varies as the cube root of the power; or, in this case, the quantity will vary as the cube root of two. Or, since $\sqrt[3]{2} = 1.26$, when these two ventilators are running the volume of air produced will be 1.26 times that produced by one ventilator alone. In other words, if one of the ventilators produces 10,000 cu.ft. of air, the two ventilators running together will produce 12,600 cu.ft. per minute.

Ques.—If the pressure required to pass 12,000 cu.ft. of air per min. through an open airway produces a water gage of 0.8 in., what will be the pressure required to blow 4000 cu.ft. of air per min. through a regulator fixed in what was previously the open airway?

Ans.—The first step is to find the natural water gage, or the water gage due to friction, when the air is reduced from 12,000 to 4000 cu.ft. per min. Since the pressure varies as the square of the quantity, the pressure ratio is equal to the square of the quantity ratio; hence,

$$\frac{w.g.}{0.8} = \left(\frac{4000}{12{,}000}\right)^2 = \left(\frac{1}{3}\right)^2 = \frac{1}{9}$$

$$w.g. = \frac{0.8}{9} = 0.09\ in.,\ nearly$$

The question does not state whether the pressure or the power producing circulation remains unchanged. If the pressure producing the circulation remains constant, the water gage due to the regulator, in this case, is 0.8 — 0.09 = 0.71 in. Therefore, the pressure required to blow the air through the regulator is 5.2 × 0.71 = 3.69 lb. per sq.ft.

Assuming the power remains unchanged, the pressure varies inversely as the quantity of air in circulation; and when the air is reduced from 12,000 to 4000 cu.ft. per min., the pressure, or water gage, will be increased three times, making the water gage 3 × 0.8 = 2.4 in. In that case, the water gage due to the regulator is 2.4 — 0.09 = 2.31 in. Therefore, the pressure absorbed by the regulator, when the power remains constant and 4000 cu.ft. of air is passing is 2.31 × 5.2 = say 12 lb. per sq.ft.

Ques.—The area and length of an airway remaining unchanged, in what proportion must the power be increased in order to double the quantity of air?

Ans.—The formula for power, expressed in terms of the quantity of air in circulation, is

$$u = \frac{k\,l\,o\,q^3}{a^3}$$

For the same airway, the area (a), perimeter (o) and length (l) of the airway are unchanged; and, k being constant, the power (u) varies as the cube of the quantity (q^3). Therefore, to double the quantity will require $2^3 = 8$ times the power, provided the perimeter is constant. It is possible to change the form of an airway so as to have a different perimeter but the same area.

Ques.—For the same length of airway and quantity of air in circulation, if the area of the airway is doubled, how will this affect the power on the air?

Ans.—Writing the formula for the power in terms of the quantity of air in circulation,

$$u = \frac{k\,l\,o\,q^3}{a^3}$$

In this case, the length (l) and the quantity (q) being unchanged and k being constant, the power (u) varies as the expression a^3/o.

Any change in area will generally produce a change in perimeter of the airway. It is possible to assume two separate airways having the same perimeter and different areas; as, for example, an 8x8-ft. airway, 7x9-ft. airway, or a 6x10-ft. airway—all have the same perimeter but different areas; the perimeters in each case being 32 ft. and the areas 64, 63 and 60 sq.ft., respectively. Such a change can only be accomplished, in practice, by "ripping" the roof or "lifting" bottom and building the waste material at the side of the entry. For example, if 2 ft. of roof be taken down in a 6x10-ft. entry and a 2-ft. "building" be carried on one side of the roadway, the cross-section of the entry would be changed to 8x8 ft. The entry would then have the same perimeter, but the area would change from 60 to 64 sq.ft. It would be difficult to double the area and still keep the same perimeter, in practice.

However, assuming a constant perimeter, the power varies inversely as the cube of the area. Therefore, if the area is doubled, without changing the perimeter, there will be required only $1/2^3 = \frac{1}{8}$ of the original power.

COAL AND COKE NEWS

Washington, D. C.

The Interstate Commerce Commission has just decided the case of the Sheridan Chamber of Commerce vs. the Chicago, Burlington & Quincy Ry. Co., et al. in which complaint was made of the rates on coal from Sheridan, Wyo., to points in Nebraska and South Dakota on the line of the Chicago & North Western and the Chicago, Milwaukee & St. Paul R.R., and to points east and west of Billings, Mont., on the line of the Northern Pacific.

Comparisons were made of distances and rates from Sheridan, Hudson, and from Illinois and Indiana coal fields to points of destination on the Chicago & North Western herein involved. Similar comparisons were made of distances and rates from Sheridan and Roundup, Mont., and from Illinois coal fields to points of destination on the Chicago, Milwaukee & St. Paul herein involved. Sheridan mines were found to be at a disadvantage of from 85 cents to $1 in competing at points on the Northern Pacific with the mines located on that railroad. It was held that:

1. The great screpancy between the rates from Sheridan and from Hudson to the same points of destination on the Chicago, Milwaukee & St. Paul and from Hudson to the same points of destination on the Chicago & North Western and between rates from Sheridan and Roundup to the same points of destination on the Chicago, Milwaukee & St. Paul cannot be justified on the ground that the movement from Sheridan involves a two-line haul.

2. Where the physical connection between connecting carriers is as simple as in these small western towns, involving no expensive terminal service, the additional cost due to the switching movement is small, so small in fact that it may not properly be made the basis of an additional charge for a two-line haul of substantial length.

3. The facts in these cases demonstrate the necessity of promulgating rates which will allow this coal to find a market in the territory described. In order to accomplish this result there must be a free interchange of traffic at reasonable joint rates.

4. Joint rates should be established from the mines at Sheridan to the points on the Chicago & North Western which have been specified in the complaint which should in no case exceed the rate from Hudson, Wyo., to the same points of destination, except that the rate to common points of the Chicago, Burlington & Quincy and the Chicago & North Western need not be changed.

5. A joint rate should be established from Sheridan to Chamberlain, S. D., not to exceed that from Roundup to Chamberlain and this rate should be carried back as far as Okaton, S. D.

6. A differential of 25 cents is a reasonable allowance for the difference in the distance from Sheridan and from the Northern Pacific mines to points of destination involved within 500 miles of Sheridan. As the distance to points of destination increases, the differential between the rates from Sheridan and from Red Lodge should be further contracted, so as not to exceed 15 cents to points between 500 and 600 miles distant and not to exceed 5 cents to points between 600 and 700 miles distant. To points over 700 miles distant the rate from Sheridan should be the same as the rate from Red Lodge.

Senator Kern's Resolutions

Senator Kern on April 12 offered a resolution regarding the West Virginia coal strike which has now been reported by Senator Williams from the Committee on Contingent Expenses in a completely amended form reading as follows:

Resolved, that the Senate Committee on Education and Labor is hereby authorized and directed to make a thorough and complete investigation of the conditions existing in the Paint Creek coal fields of West Virginia for the purpose of ascertaining:

First. Whether or not any system of peonage is maintained in said coal fields.

Second. Whether or not access to post offices is prevented; and if so, by whom.

Third. Whether or not the immigration laws of this country are being violated in the West Virginia coal fields; and if so, by whom.

Fourth. If any or all of those conditions exist, the causes leading up to such conditions.

Fifth. Whether or not the Commissioner of Labor or any other official or officials of the Government can be of service in adjusting such strike.

Sixth. Whether or not parties are being convicted and punished in violation of the laws of the United States.

Said committee or any subcommittee thereof is hereby empowered to sit and act during the session or recess of Congress or of either House thereof at such time and place as it may deem necessary; to require by subpoena or otherwise the attendance of witnesses and the production of papers, books, and documents; to employ stenographers, at a cost not exceeding $1 per printed page, to take and make a record of all evidence taken and received by the committee and keep a record of its proceedings; to have such evidence, record, and other matter required by the committee printed. The chairman of the committee or any member thereof may administer oaths to witnesses. Subpoenas for witnesses shall be issued under the signature of the chairman of the committee or subcommittee thereof. Every person who, having been summoned as a witness by authority of said committee or any subcommittee thereof, willfully makes default or who, having appeared, refuses to answer any questions pertinent to the investigation herein authorized shall be held to the penalties provided by section one hundred and two of the Revised Statutes of the United States.

The expenses thereof shall be paid from the contingent fund of the Senate on vouchers ordered by said committee, signed by the chairman thereof and approved by the Committee on Contingent Expenses.

Debate on Coal Tariff

During the debate on the tariff bill in the course of the past week under the five-minute rule, considerable attention was given to the section dealing with coal and an effort was made to secure the amendment of the tariff act relating to that subject. The idea of those who urged a change was expressed in the following paragraph which was offered as a substitute for the new tariff provision as contained in the Underwood bill.

Bituminous coal and shale, 40 cents per ton of 28 bushels, 80 lb. to the bushel; coal slack or culm, such as will pass through a half-inch screen, 15 cents per ton of 28 bushels, 80 lb. to the bushel: Provided, that the rate of 15 cents per ton herein designated for "coal slack or culm" shall be held to apply to importations of coal slack or culm produced and screened in the ordinary way, as such, and so shipped from the mine; coke, 20 per cent. ad valorem; compositions used for fuel in which coal or coal dust is the component material of chief value, whether in briquettes or other form, 20 per cent. ad valorem: Provided further, that on all coal imported into the United States, which is afterward used for fuel on board vessels propelled by steam and engaged in trade with foreign countries, or in trade between the Atlantic and Pacific ports of the United States, and which are registered under the laws of the United States, a drawback shall be allowed equal to the duty imposed by law upon such coal, and shall be paid under such regulations as the Secretary of the Treasury shall prescribe."

PENNSYLVANIA

Anthracite

Pottsville—Fifteen hundred men and boys struck at the Vulcan and Buck Mountain collieries of the Lehigh Valley Coal Co., Apr. 26. The cause of the strike was the refusal of the officials to grant the inside men an increase in wages for work where a safety lamp was demanded.

Wilkes-Barre—The mess house opened by the Lehigh Valley Coal Co. at its Prospect Colliery, on Jan. 16 of this year, has proved so great a success that applications have already been received by the company to establish such houses at three of its other collieries. Officials of the company report that from 75 to 100 men use the house regularly, and a number of them have formed a "Coffee Club," the members of which take turns in heating coffee for the crowd on the appliances provided for that purpose.

Shamokin—A tieup of collieries in this region, chiefly six operations controlled by the Mineral R.R. & Mining Co., laying between 7000 and 8000 men and boys idle, has been officially declared off, and the strikers are satisfied with results. The strike started on Apr. 22, at several collieries, and two days afterward all the mines along the Pennsylvania R.R., between Shamokin and Mt. Carmel, were tied up, excepting the Greenough colliery, controlled by individual operators. At that mine almost all the employees were union men with dues paid up.

Over 4 in. of rain has fallen in this section and a number of the collieries are in danger of being flooded by swollen mountain streams. It is said that if the rain continues the mules will be hoisted to the surface. All the company's pumps are in operation.

One thousand men in arrears at the collieries paid up their assessments, $1000 being collected by the secretaries of locals. The Green Ridge and Richards Collieries, owned by the Mineral Company, are now "closed shops," acording to the United Mine Workers.

Shenandoah—Seventy-five employees at strippings in this city have gone on strike because five of the employees failed to wear the union button.

The Susquehanna Coal Co. has recently equipped its William Penn colliery with the latest and most modern type of Draeger helmets and rescue apparatus.

Employees of the Sterrick Creek Colliery of the Temple Coal & Iron Co. in Jessup, are on strike because the engineers employed in and about the operation have refused to join the miners' union. Strikes of this kind are not sanctioned by the union, and the strikers do not receive union support. The agreement under which the miners are working provides that no men be forced into the union, and it provides also that all grievances between the employees and operators be adjusted by a colliery grievance committee and the colliery officials. In the event of such a conference failing to bring about an adjustment, the grievances, under the contract, go to the conciliation board for settlement.

Bituminous

Courtney—Ninety-six bodies have been taken from the Cincinnati mine of the Monongahela River Consolidated Coal & Coke Co., which was wrecked by an explosion Apr. 23. All but two have been identified. Officials of the company will make no statement. The work of cleaning up the mine and putting it in condition for reopening is progressing rapidly.

Punxsutawney—The powder house of the Rochester & Pittsburgh Coal & Iron Co., at Lucerne, narrowly escaped destruction recently as the result of a forest fire. The flames worked up within a few hundred yards of the building and it was only with the united efforts of the farmers and a few volunteers that it was saved.

Somerset—The store and a part of the tipple of the Bando Coal Co., three miles south of Somerset, were destroyed by fire recently. It is thought that the fire was caused by sparks from a passing B. & O. locomotive. The Bando mines have been idle for a year and the store building was empty. The loss is estimated at from $1800 to $2000 and is partly covered by insurance.

OHIO

Ulrichsville—The fan house at the Hiawatha Coal Co.'s mine near "52" cut, has been completely destroyed by fire. The origin is not known. The building was a frame structure, 24x14 ft., and contained valuable machinery. The mines had just resumed operations under a receiver after an idleness since Feb. 22. Forty men are out of employment. There was no insurance.

Columbus—John B. Moore, president of the United Mine Workers of the Ohio district, and Duncan McDonald, of Springfield, Ill., have been selected to represent the miners of the United States at the International congress at Karlsbad, Bohemia, July 21 to 24. The congress will be presided over by Robert Smillie, the British president.

Coal operators and jobbers throughout Ohio are very much interested in the coming appointments of Governor Cox on the commission authorized by the Ohio General Assembly to investigate the rate of payment for coal mining in the state. The authorization is contained in the Thomas resolution adopted by both houses of the legislature and was intended to forestall action on the Green antiscreen bill. While the governor has not given any intimation of the men who are to constitute the commission, he has publicly announced that that body is to have its report ready for consideration by the extraordinary session of the general assembly to be convened during the coming winter.

St. Clairsville—Two thousand five hundred miners in the various mines of the Lorain Coal & Dock Co. in Belmont County struck recently because of the refusal of the company to pay the men extra for work in cutting soapstone and slate out of the mines.

Bridgeport—Two thousand miners who went on strike May 1, still refuse to return to work. It is reported that delegations representing the men will try to induce the miners throughout eastern Ohio to enlist. The strike was caused by the refusal of the various coal companies to pay the men for roll cutting, or the removal of slate from the mine.

Logan—Work in the mines about Nelsonville and New Straightsville, is picking up rapidly. Orders from the lake ports are stimulating the shipments. The local freight crews are working full capacity to take care of the trains going north on the Hocking Valley. Pomeroy and the southern mines are not working yet. A large number of them are badly damaged by the flood.

INDIANA

Indianapolis—Indiana coal operators are not excited by the proposed abolishment, at Washington, of the tariff on coal. The state is too far inland to be more than indirectly affected. Coal men see the possibility that Welsh coal might interfere with the coast trade, say, in Pocahontas and any abbreviation in the amount of the Virginia product that goes to steamships and other consumers east might throw a larger amount into Indiana and cut down to that extent the consumption of Indiana domestic.

Indiana domestic has not been cutting a large figure, however, even though efforts have been made to make consumers better acquainted with this Indiana coal. When natural gas failed in Indiana, a board of coal dealers was created who did not know one grade of coal from another. There were operators who took advantage of this ignorance to market some inferior so called Indiana domestic coal. The result was that this low grade of fuel has given Indiana coal a blow from which it has been difficult to recover. Notwithstanding the really good domestic grades are being worked into consumers' bins again.

The executive board of the U. M. W. A. has passed a resolution endorsing the action of Senator John W. Kern, of Indiana, in trying to get a committee appointed to conduct a federal investigation into conditions in the Cabin Creek and Paint Creek fields. A copy of the resolution was mailed to all the U. S. Senators.

ILLINOIS

Royalton—The strike at the two Royalton mines still continues. It seems to be a case of where the miners insist that the new company, which bought the property of the South Mine after it had gone through the bankruptcy act, pay the miners for the labors performed under the former owners. The present operators are in no way connected with the former owners of the mine, and for that reason contend that the miners should not look to them for their wages, but should have secured same while the property was in the hands of the bankruptcy court. The miners contend differently, and won't work until they get their back wages.

KENTUCKY

Earlington—It is reported that organizers representing the United Mine Workers of America have been at work in this vicinity for some time, in an effort to unionize the mines in this section. It is asserted by some of the interested operators that the movement is due to the influence of Indiana operators, who complain because of the fact that western Kentucky mines can undersell them.

PERSONALS

W. F. Murray has been appointed assistant general superintendent of all the Colorado mines of the Victor-American Fuel Co.

Col. J. C. Maben, of New York, president of the Sloss-Sheffield Steel & Iron Co., is spending several days in Birmingham, Ala., inspecting the properties of his company in that district.

P. F. O'Neill has been appointed assistant general counsel for the Lehigh Valley Coal Co., and will have full charge of the legal affairs of Coxe Bros. & Co., Inc., operating in the Hazleton region.

R. E. Howe, former traffic manager of the Knoxville, Sevierville & Eastern Ry., has accepted a position as secretary of the Climax Coal Co., at Middleboro, Ky. Mr. Howe has been succeeded by J. M. Starrett.

P. J. Rogers, superintendent of the Tennessee Coal, Iron & R.R. Co., has been selected by Governor O'Neal, of Alabama, as the third member of a commission which will soon inspect the scales at the Banner mine.

Thomas Smith, formerly superintendent of the Consolidation Coal Co.'s mines at Two Lick and West Fork, has been transferred to Montana where he succeeds Harley W. Smith, who has asked for a leave of absence on account of illness in his family

J. Albert Cook, who for a number of years has been a member of the engineering department of the West Virginia division of the Consolidation Coal Co., has become superintendent and has been assigned to the mines at Beechwood and Murray to succeed W. H. Hess, who has been transferred to the mine at Gipsy. Mr. Hess takes the place of A. V. Morgan, who has resigned from the service.

Thomas H. Hayden, for a number of years operating superintendent of the Kentucky & Indiana Terminal R.R. Co., at Louisville, who resigned that position recently, has been appointed general manager of the Cumberland R.R., in southeastern Kentucky, with general charge of the extensive coal holdings of the company, which has five mines in active operation at this time. Mr. Hayden's experience has been entirely with railroads, having been actively engaged in almost every line of service in that connection since 1876. In his new position he succeeds E. C. Milliner, who resigned to look after private interests.

CONSTRUCTION NEWS

Natrona, Penn.—Important contracts were let at Kelly Station Saturday when officials of the Providence Coal & Coke Co. met at that company's plant. Estimates approximating $25,000 were made on a new tipple.

McDonald, Penn.—It is reported that the Peoples' Natural Gas Co. is drilling a well in this vicinity, which is already the deepest in the world. The present depth of the well is said to be over 6200 ft. and there are more than 60 tons of pipe in the hole.

Pottsville, Penn.—The extent of the Locust Mountain Coal Co.'s operations is illustrated by the recent increase in the amount of capital to $550,000. Pres. Baird Snyder states that the work of boring the tunnel through the rock and the erection of the breaker will be pushed.

Birmingham, England—A new colliery has been opened up at Birmingham and is fitted with every modern appliance to operate a coal seam 24 to 28 ft. in thickness. It is calculated that with a force of from 500 to 600 men the output will be from 300,000 to 350,000 long tons per annum.

Pittsburg, Kan.—The Central Coal & Coke Co. has started sinking a shaft one mile northwest of Edison. The top house at the mine is nearly completed. When the mine opens it will be one of the largest in the district and will employ from 200 to 300 men. It will be known as mine No. 48.

Bluefield, W. Va.—R. W. Stone, who has recently accepted the position of superintendent of construction for the Pond Creek Coal Co., states that the company is preparing to erect about 400 homes at the various operations along the new line. Several large stores will also be built. The work is to begin at an early date.

Prairie du Chieu, Wis.—The Roberts & Schaefer Co. of Chicago have been awarded the contract for a large coaling plant for the Chicago, Burlington & Quincy R.R. to be built here immediately. The same firm recently secured a contract from the Chicago & North Western Ry. for the construction of a Holman locomotive coaling plant to be erected at Green Bay, Wis.

Whitesburg, Ky.—It is reported that the work of ballasting the upper extension of the Lexington & Eastern is being rushed to completion, and two months more is expected to see the work finished. This part of the road connects Hazard and McBoberts, and will bear an important part in the freight and passenger traffic when completed. It is now handling trains, but when fully ballasted can accommodate more and heavier traffic.

Bluefield, W. Va.—The U. S. Coal & Coke Co. has conditionally awarded contracts to Rufus J. Bird & Co. for the building of 125 company houses for the concern's operations at Nos. 3 to 11, inclusive. The total cost will be approximately $130,000. A contract, involving the sum of $120,000, has also been awarded to John Doss, of Welch, W. Va. It is the intention of the company to make the appropriation and start the construction work by May 15.

Pottsville, Penn.—Large steam shovels have been shipped to Locust Mountain and it is expected that operations will soon be started to take off the entire top of the mountain to get at the coal. The seams near the surface will be stripped in time to take out the coal to operate the new breaker, now in the course of construction. Pending the construction of an extensive system of tunneling, the coal will be carried from the distant points of the strippings by a tramway.

Beaver Creek, Ky.—The construction of the new Beaver Creek branch of the Chesapeake & Ohio Ry., from the mouth of Beaver Creek to Steele's Creek, a distance of twenty miles, has recently been started, a large force of men and teams being actively engaged in the work. It is expected that the road will be completed within a year, and it is assured of heavy traffic from the start, in view of the richness of the coal and timber lands which it will open up.

Huntington, W. Va.—The Chesapeake & Ohio is opening up a vast territory rich in coal and oil in the Beaver Creek district in Kentucky. Several operations are to start there within the next four months and the railroad officials expect to handle a big output of coal. Contracts for the work of building a line to Beaver Creek from the main line have already been let. Twenty-one miles of track are now being laid, but it may be decided to extend the line later on. The spur connects with the main line of the road near Allen, Ky.

Scranton, Penn.—Contractors have broken ground for a model village that is to be built around the Underwood colliery of the Pennsylvania Coal Co. The village is to consist of 28 double houses, of timber construction, 28x40 ft. Several frame buildings are also being built for the colliery bosses and their families. The Underwood colliery is to be one of the most modern in this part of the state. It will open up large tracts of hitherto untouched coal and will give employment to a large number of men for many years. It is expected that the colliery will be ready for operation within a few weeks. Hower & Stender are in charge of the construction work.

NEW INCORPORATIONS

Pittsburgh, Penn.—The Bruin Coal Co.; capital stock, $10,000. Incorporators: A. M. Thompson, J. H. Thompson and Ray Rose.

Rock Island, Ill.—The City Coal Co.; capital stock, $5000; to deal in fuel. Incorporators: W. J. Lacey, W. F. Zibell and A. R. Gates.

Rock Island, Ill.—The Spoon River Coal Co.; capital stock, $6000; to mine coal. Incorporators: W. A. Schaeffer, C. A. Schoessel and W. D. Godfrey.

Sparta, Tenn.—The Young Coal & Coke Co.; to develop and operate a coal mine at Obey City. Incorporators: E. C. Young, W. B. Goodwin and John McDaid.

Nashville, Tenn.—The Old Virginia Coal Co.; capital stock, $25,000. Incorporators: W. F. Hutcheson, H. B. Bonney, J. R. Barnes, W. W. V. Mullan and W. B. Miller.

Sharpsville, Penn.—The Pierce Coal Co.; capital stock, $150,000; chief works in Parton County, Mo., and offices at Sharpsville. Incorporators: A. M. Imbrie, Frank Pierce, M. L. Pierce, T. A. Pierce and A. C. Andrews.

Columbus, Ohio—The Chaparal Mining Co. has been incorporated with a capital stock of $125,000 to mine and deal in coal. The incorporators are P. L. Tanzey, E. C. Paine, W. G. Bossman, C. H. Blacker and R. S. Barbee.

Dover, Del.—A certificate of increase of capital stock of the American Coal & Byproducts Coke Co. was filed at the State Department Apr. 30. The increase is from $500,000 to $5,000,000. The company was chartered in 1912.

Salem, Ohio—The Salem Mining Co. has been incorporated with a capital stock of $75,000 to mine and deal in coal and clay. The incorporators are Charles Estep, John E. Reese, J. E. Morgret, W. W. Weaver and R. D. Anderson.

Knoxville, Tenn.—The Vaspar Coal Mining Co.; capital stock, $100,000. Incorporators: G. C. Bell, E. Carson, E. C. Stookesberry, W. J. Donaldson and Robert Young. The property of the company is located at Vaspar, in Campbell County.

INDUSTRIAL NEWS

Cincinnati, Ohio—Judge A. M. J. Cochran has confirmed the sale of the Covington Coal & Sand Co. The purchaser was Theodore Kirk.

Chicago, Ill.—The Dominion Coal Co., Ltd., has given notice that $110,000 of its first mortgage 5 per cent. bonds were to be retired May 1 at 105 and interest.

Bridgeport, Tex.—Recent rains have visibly increased the city's industrial activity. The coal mines are running on full time and the working forces will be increased.

Dresden, Ohio—A recent shipment of coal to Dresden has enabled the water-works plant to resume operations. The electric lights, however, have not yet been placed in operation.

Knoxville, Iowa—Coal prospectors are now working in a newly discovered field in this vicinity. According to reports received the drillers have struck at least four workable seams of coal.

Birmingham, Ala.—At a coming meeting of the directors of the Alabama Co., formerly the Alabama Consolidated Coal & Iron Co., permanent officers will be elected. The meeting will be held in Baltimore.

Duluth, Minn.—It is estimated that over 150,000 tons of coal have reached the harbor at Duluth since the first boat arrived a little over a week ago. This has been principally in the nut and stove sizes.

Rock Island, Ill.—A theoretical merger of the Union Ice & Coal Co., the Spoon River Coal Co. and the Spoon River Colliery Co. has been effected through the efforts of Willard A. Schaeffer, president and general manager of the latter concern.

Pittsburgh, Penn.—The Pittsburgh Coal Co. has leased a strip of land from the estates of Alexander and Thomas Jones. The tract of land in question lies along the Monongahela River wharf and extends for 500 ft. above the Point bridge.

Birmingham, Ala.—A meeting of prominent Alabama citizens was held in the Morris Hotel, Birmingham, for the purpose of discussing the advisability of taking convicts out of the Alabama mines and away from the control of private corporations.

Connellsville, Penn.—The Marion plant of the Southern Connellsville Coke Co., near Cheat Haven, has been forced to bank its ovens for a week, owing to the installation of a cable across the river. Until now the plant has been making full time.

Rural, Penn.—Five diamond drills are busy testing 18,000 acres of coal lands located in Indiana County, near the Cambria County line, the holdings of the Greenwich Coal Co. It is understood that the Manor Real Estate Co., of Philadelphia, will acquire the property and commence coal operations on a large scale.

Washington, Ind.—The Riverside Coal Co.'s mine has been sold at a receiver's sale to W. B. Catching, of London, Ky. The consideration was $4000. This same property was recently appraised at $15,000. It is said that the mine will resume operations.

Johnstown, Penn.—Engineers employed by the Cambria County commissioners have just finished the task of assessing the minerals of the county at what they believe to be the full value. The coal in Cambria County is said to be valued at $25,000,000.

Denver, Colo.—The Colorado Fuel & Iron Co. has rendered 3400 acres of coal land, valued at $1,000,000, to the United States government in consideration of the dismissal of a suit involving 5800 acres owned by the company The land is located in southern Colorado.

Louisville, Ky.—It has been learned that J. C. C. Mayo, vice-president of the Elkhorn Fuel Co., has received, in consideration for the transfer of certain of his coal lands to the new corporation, $600,000 in cash, $2,000,000 in preferred stock and $2,000,000 in common stock.

Columbus, Ohio—Reports received by Columbus operators state that practically all vessels on the lake were expected to be in commission by Apr. 30. Crippled conditions of the railroads and shortage of available cars is making the movement of coal from the mines to the lake slow.

Shelburn, Ind.—The Klondyke mine, southwest of Shelburn, has been closed for some time because of burning gas in the mine. Operations will be resumed, however, as soon as the aircourses have been opened up. The work required to do this will cost in the neighborhood of $500.

Cincinnati, Ohio—On Apr. 28 the Queen & Crescent R.R. started operations with its new $15,000, 500-ton capacity coal chute at Ludlow. This is the first to be completed of the $150,000 improvements, which were authorized last Fall. The other improvements include a roundhouse and yard facilities.

Prairie Hunter, Ga.—Chauncey M. Weeks, a farmer in Prairie [illegible] Wrights, has given a two-year option to Richards & Sons, of [illegible] The tract consists of 92 acres and the option price [illegible] acre. The company may use five acres for buildings, [illegible] lines and switches; $150 an acre to be paid for the site.

Charleston, W. Va.—Clark & Krebs, civil and mining engineers of Charleston, W. Va., have recently completed a map showing the property lines, location and car allotment of the mines in the New River, Kanawha River, Coal River and Guyan River coalfields, in West Virginia. This map will be of great use for reference.

Chicago, Ill.—Officials of the Consumer's Co., which is a consolidation of the City Fuel Co. and the Knickerbocker Ice Co., report that they will soon be ready to prepare a statement of the company's financial position. This will be submitted with the applications to list the shares on the Chicago and New York stock exchanges.

Chattanooga, Tenn.—Chattanooga capitalists have recently purchased the Monarch coal mines at St. Charles, Va. Application has been made for a charter for the new company, changing the name to the Old Virginia Coal Co. The original capital stock is set at $25,000. This will probably be increased after the concern has begun operations.

New Orleans, La.—A New Orleans company has built steel barges, bought tugboats and established a depot for handling large quantities of Alabama coal for export and to supply ships' bunkers. The company will take advantage of the completion of the government locks on the Warrior and Tombigbee Rivers to barge coal past Mobile and into New Orleans.

Little Rock, Ark.—The coal tests which have been recently conducted by the Rock Island road to determine the efficiency of several grades of coal have been concluded. It is expected that a decision will be reached soon as to the grade of coal to be used on the Rock Island. Samples of Arkansas, Oklahoma and other grades of soft coal were used in these tests.

Salt Lake City, Utah—The Jesse Knight interests in Carbon County are operating a coal property located on the Denver & Rio Grande R.R. at the new town of Storrs. The machinery is up to date, and the company plans to furnish a quality of coal which is unsurpassed by any in that locality. The coal is mined from beds averaging 8 ft. in thickness, over which is 1000 ft. of solid sandstone capping. The capacity will be from 1500 to 2000 tons per day.

Brownsville, Penn.—Bids have been received for the driving of the slope entrance at the new plant of the Lilly Coal & Coke Co. This work will be hurried as much as possible. The tipple has been under construction for some time. Some alterations were made, however, due to the change of the P. V. & C. tracks in the vicinity of the new plant. It is the intention of the officials to operate the plant at the earliest possible moment. Thomas Elliott is general manager.

Pittsburgh, Penn.—A deal involving 223 acres of coal land in Allegheny Township has recently been consummated by J. F. Steele, executor of the Miriam S. Steele estate. The Lucesko Coal Co. bought the tract for a consideration of $28,500, a little more than $125 an acre. The coal is the upper and lower Freeport and Kittanning seams. The especial value of this piece of land lies in the fact that it is the key to many acres of coal behind it which cannot well be operated without the Steele holdings.

Du Bois, Penn.—Options which were recently taken on 6000 acres of coal land in Green Township by E. E. Davis, of Johnstown, were ordered lifted May 1. The land owners were notified that payment would be made within a few days. Between $50 and $70 an acre was paid for the land, and the entire deal means a transfer of about $360,000. The tract is mixed up with a field of about 15,000 acres owned by the Greenwich Coal & Coke Co., and it is the general opinion that this company is the purchaser. The field is already tapped by the Cherrytree & Dixonville R.R., which is jointly owned by the New York Central and the Pennsylvania.

Louisville, Ky.—Three Louisville coal concerns, handling Pittsburgh coal from the mines of the consolidated interests, have been combined under one management, to be known hereafter simply at the Pittsburgh Coal Co. The companies included are the O'Nell Coal & Coke Co., Joseph Walton & Co., and O'Donnell & Co. The consolidation was announced to take effect May 1. The new company is to be managed by Charles J. O'Conner, formerly president of the O'Nell Coal & Coke Co., who will be assisted by W. S. Montz, formerly of Joseph Walton & Co. Rumors of such a move have been current for some time, but it was not definitely decided upon until very recently.

Fossil, Ore.—Property owners and business men of Fossil, have organized for the purpose of developing the coal fields in this vicinity and in connection therewith the building of a railroad from Condon to Fossil and the coal deposits, about ten miles from the town. The project is headed by Joseph J. Henry, of Chicago, Anthony Mohr and J. E. Reed, of Portland, and Dr. A. Ives, of Chicago. A meeting was held this week in Fossil and committees were appointed to solicit the necessary funds for preliminary work. Vice-president J. P. O'Brien of the O.-W. R. & N. Company, which operates a branch line to Condon, has been interviewed in regard to the extension of this line from Condon to Fossil, and it is said this will be done providing evidence can be shown that the mine will have a daily output of at least 300 tons from the start. In view of the encouraging preliminary reports, it is regarded as certain that the railroad will be built as soon as the proper arrangements can be completed.

COAL TRADE REVIEWS

GENERAL REVIEW

The regular monthly advance in prices on the domestic grades of hard coal has not caused any decrease in the demand, which continues as insistent as ever. Mines are working up to full capacity and the only difficulty before the operators is providing an equable distribution of the production. In previous years at this time, the companies have usually had substantial surpluses on hand with which to meet the excessive demand, but, owing to the restricted production last year, such is not the case now and the freshly mined product has to be relied upon entirely. The loading at the New York piers for the coastwise trade is slow, and consumers are finding it difficult to obtain their required tonnages, especially when they are particular about sizes.

Now that the West Virginia labor situation has been partially cleared up for the moment at least, consumers are waiting for some response in the market before undertaking any extensive buying. The indications are that they are not without justification in their position as it is difficult to see how the new high prices at Hampton Roads can hold unless a rigid restriction is put upon the production. There is a free movement on contract in the coastwise bituminous trade, consumers taking their full allottment, and there are indications of some improvement in prices, particularly on certain grades which are developing unusual strength.

The Pittsburgh market is becoming more and more active, due to the exceedingly heavy demand in the Lake trade stocks are low at the head of the Lakes, and jobbers at that point are anxious to lay in the maximum supplies because of the possibility of labor troubles when the agreements expire next April before navigation is again open. The labor unrest, so general throughout the country, seems to indicate that there may be serious trouble between the operators and miners before the next agreement is reached. It is difficult for consumers to obtain coal at the regular Pittsburgh circular now, a contract for a million tons having been recently refused. Bituminous and anthracite operators are showing a determination to put enough coal beyond Lake Michigan to supply any reasonable demand. Both Lake and steam business in Ohio has been heavy, and the general tone is good.

There have been heavy shipments in both the foreign and coastwise trade out of Hampton Roads, but the congestion at the piers continues unrelieved; producers are showing every indication of holding firm on prices, while buyers are slow about closing, evidently believing that a sharp decline is inevitable. In the Southern pig-iron market the depression is being more keenly felt and the effects are now spreading to the coal industry; steam coals are as yet the only sufferers, but some new low prices have been touched by these.

Mines in the Middle West are working about normal, and the domestic demand is light; some summer retail prices are going into effect. Domestic consumption is much curtailed and there is a tendency on the part of dealers to reduce stocks. Contracting is more active. The customary freight discounts in the Rocky Mountain region were not made this year, and shipments are confined entirely to the current demand, with the result that operations will be somewhat restricted.

BOSTON, MASS.

Bituminous—With any possibility of serious trouble in the New River field now pretty generally minimized, buyers will wait for the market to steady up before making any comprehensive purchases. There is a good deal of opinion here that the $2.85 price on Pocahontas and New River f.o.b. Hampton Roads will be too high for summer deliveries, and that in the absence of a drastic curtailment, figures will have to be modified in order to move coal. On the other hand prices on Georges Creek and on the better Pennsylvania coals are firm in response to an improved demand. This is especially true of certain of the Cambria and Clearfield grades and quotations are from 5@10c. higher than prevailed during April. Improvement also continues in the all-rail territory and most of the shippers report a comfortable volume of business in hand.

For inland delivery, prices in general are about 15c. up from last year but orders that are competitive are also slow in being closed. Rail coals of good quality are making inroads on tonnage that is ordinarily reserved to tidewater grades. A large volume of Georges Creek is finding a ready market here. The shippers have ample business in hand and 1913 bids fair to be a record year for this popular grade. A large fleet of steamers and barges, the latter suitable for medium draft points, has an important bearing on the large tonnage placed in New England every year.

Water freights are easy at 70@75c. for large vessels, Hampton Roads to Boston, with only a moderate inquiry. The bulk of the bituminous tonnage is brought in steamers, almost all chartered on government form rather than at a rate per ton, and that has its effects on the freight market. The steamers "Kennebec" and "Kanawha" for some years in the coastwise coal trade are understood to have been sold for the lumber trade.

Anthracite—Another sign of the strong demand for hard coal appears in a disposition on the part of the companies to restrict the proportion of stove size in any one cargo. The slow loading at some of the New York piers is already causing anxiety to some of the New England dealers. Many of the latter are surprised to find that hard coal is just at this present moment rather hard to get, especially if they are fussy about the proportion of sizes.

Current bituminous quotations at wholesale are about as follows:

	Clearfields	Cambria Somersets	Georges Creek	Pocahontas New River
Mines*.....	$1 00@1.35	$1.25@1 45	$1.67@1.77	
Philadelphia*...	2.25@2 60	2.50@2.70	2.92@3.02	
New York*....	2 55@2.90	2 80@3 00	3.22@3.32	
Baltimore*.....			2.85@2.95	
Hampton Roads*				$2 75@2.85
Providence†.....				3 73@3.78
Boston†.....				3 73@3 90

*F.o.b. †On cars.

NEW YORK

Anthracite—The strong and insistent demand for hard-coal continues unabated, with no indications in sight of any immediate letup. In the steam grades, buckwheat and barley are still the easiest sizes, while rice continues as short as ever. In the domestic fuels, stove, of course, still continues to lead in demand, with egg second and also very short in supply. As a matter of fact, nearly all sizes are in heavy demand, and it is simply a question with the companies of getting a maximum production and making an equable distribution of same.

There is some uncertainty as to the amount of surplus coal in stock at the present time. Ordinarily, at this season of the year, the companies have some surplus stocks to draw upon, but such is not the case now because of the shortage in production last year. On the other hand, the exceptionally mild winter resulted in a materially reduced consumption so that, in all probability, many consumers carried over unusually large surpluses.

We quote the New York market on the following basis:

		Individual	
	Circular	Lehigh	Scranton
Broken	$4 60	$4 45	$4 60
Egg	4.85	4.70	4.85
Stove	4.85	4 70	4.85
Chestnut	5.10	4 95	5 10
Pea	3 50	3.35@3 45	3 10@3 20
Buckwheat	2.75	2 25@2.45	2 50@2 75
Rice	2 25	1.90@2.00	2 25@2.35
Barley	1.75	1.45@1 70	1 60@1.75

Bituminous—With the exception of the all-rail business, there is a noticeably better tone in the local trade. There are persistent inquiries for odd tonnages in the spot market and unexpectedly good figures are being obtained in some instances. The orders are from local brokers who are very probably acting for large producers that are falling behind on their contracts and also for water shipments into the New England trade. These conditions indicate an improved tone that is gratifying to the operators and makes the outlook for the future decidedly better.

The improved tone is naturally reflected in quotations, although the market is not quotably changed from the prices that have been prevailing over the last month and a half or two months. Quotations are being more firmly held, however, the off qualities becoming somewhat tighter and the good grades noticeably short. We continue last week's quo-

tations as follows: West Virginia steam, $2.55@2.60; fair grades, Pennsylvania, $2.65@2.70; good grades of Pennsylvanias, $2.75@2.80; best Miller, Pennsylvania, $3.05@3.15; Georges Creek, $3.25@3.30.

PHILADELPHIA, PENN.

The first week of the ten-cent increase in anthracite over April figures has passed, and the trade apparently has renewed all the unfilled orders of the previous month, as the companies still continue operating their mines to the fullest capacity and outside of some of the steam coals, there is little or none of the output going into stock. Retail dealers report that trade is fairly good ,although not as strong as it might be; the demand centering on the stove and chestnut sizes, with egg only fair. Pea coal is quiet, although some is moving into the cellars of the consumers; during the late spring and summer months this grade is not usually in particularly active demand.

Most domestic consumers of pea coal buy it from hand to mouth, and as the price does not usually vary from the basis established at the inception of the spring season, there is no particular advantage to the consumer in storing it; the stocks accumulated by the large companies finds a ready market during the winter. As a matter of fact, pea coal during the winter season is invariably short so that it is wise to provide against this call, when the demand is light.

The tidewater business continues to be heavy. Water transportation is able to find a ready market, and the current freight rates are quoted anywhere from 90c. to $1 from this port. The output at the mines was not as great as April, 1911, due in a measure to the friction between the operators and miners, and while the loss in tonnage was small, compared with the aggregate, each suspension had its effect on the total.

In regard to the bituminous market, there seems to be a tendency towards increased business, at better prices. This improvement is more in the nature of stable quotations for the present offerings, rather than in any marked increase; the numerous fluctuations in prices that have characterized this branch of the trade for many weeks past have disappeared.

PITTSBURGH, PENN.

Bituminous—It is difficult to place new business with operators at the regular season prices, so many having withdrawn. Within the past few days the leading interest here turned down an offer of a million tons of lake coal at the regular figure of $1.40. As noted last week operators controlling the major part of the production have advanced prices on all new business by 10c. and it is quite possible that the whole market may work up by this amount or even more. The demand from the Northwest is particularly heavy, both because of the short supplies at the close of last season and because of the general expectation that there will be a suspension of mining at the time of the next wage adjustment, Apr. 1, 1914, necessitating provision this season for a longer period than usual.

While it is customary to speak of the Pittsburgh district coal operators having the best season in many years, with the much higher prices ruling this year, attention should be directed to the fact that their financial results have as a rule been decidedly poor in recent years, and it is only by comparison that present results are good. The unrest among miners will undoubtedly crystallize into an unusually strong demand for advanced wages upon the expiration of the present scale. While plans are altogether inchoative at present it is well understood that this will be met by a specific demand for a reduction and a contest of no mean proportions is promised.

We quote prices at a range on some descriptions, the higher figures representing the advance asked by many operators on new business: Slack, 90c.; nut and slack, $1.05; nut, $1.25; mine-run, $1.30@1.40; ¾-in., $1.55@1.65, per ton at mine, Pittsburgh district.

Connellsville Coke—Demand for prompt furnace coke continues very light, and no interest is shown in contract coke. Furnaces are well supplied by contracts, against which full deliveries are being made, and those which must purchase for second half are biding their time, awaiting a more settled pig iron market, and seeing no occasion to ask quotations when the nominal asking price on contract is 25 to 50c. higher than prices ruling for spot. Operators generally ask $2.25 on prompt furnace coke, but odd lots are picked up without much difficulty at $2.10 to $2.20, and $2 can probably be done sometimes. On contracts $2.50 is asked but buyers do not take the figure seriously. Foundry coke is somewhat easier. We quote: Prompt furnace, $2@2.25; contract furnace (nominal) $2.25@2.50; prompt foundry, $3@3.25; contract foundry, $3@3.25 per ton at ovens.

BUFFALO, N. Y.

The bituminous market is very steady and becoming more so every week. There is a decided scarcity developing, due to a shortage of miners and to an indifferent car supply that appears steadily worse. Members of the trade are saying that they would not know which way to turn if the demand should suddenly increase. There are operators in this market who have been putting out all the coal they could for sometime and now they are not keeping up well on their contracts. There is no surplus coal whatever on track and if a jobber runs short of a certain variety he often finds it hard to buy in the open market.

The coal shortage is due to most of the mines in the Pittsburgh district declining to accept further orders from new customers at present. The Pittsburgh district used to furnish more than one-third the coal in this market, so that the mines in the Allegheny Valley had to depend on their advantage of 15c. in freight to sell their output but it is quite different now as the latter coal often has to take the leading part. The lake trade, of course, has much to do with the present situation, but it must be remembered that it was found impossible last season to satisfy the lake demand and it may turn out so again. Shippers both bituminous and anthracite are showing a determination to put coal enough beyound Lake Michigan this season to meet the demand there, for the rail lines are not able to make up much of a shortage that may exist when the lakes close.

Bituminous prices are firm at $2.80 for Pittsburgh lump, $2.65 for three-quarter, $2.55 for mine-run and $2.15 for slack. Coke continues quiet at former prices, on the basis of $5 for best Connellsville foundry. Coal now sells so readily that it is quite possible for operators to prefer that market and let coke wait till it is stronger.

The Anthracite Trade is quiet. Shippers say there is a decided hesitancy on the part of jobbers and consumers, which is quite easily explained by letters from certain dealers, declaring that their purchases are all on hand and they cannot pay their bills, all of which means that the consumers are also overstocked. Lake shipments for April foot up 505,000 tons.

BALTIMORE, MD.

There has been a slight improvement in the local spot market due apparently to some rather heavy requisitions from the large canning factories, which are making preparations to resume operations within the next few weeks. There are a great many of these plants in this vicinity, and most of them buy their supplies in the spot market. Those who do contract have not yet signed up.

Because of this improved demand quotations are somewhat firmer especially on the better grades which are in the shortest supply. The situation on the off qualities has not experienced any noticeable change. There is a free movement under contract, consumers mostly taking their maximum requirements. The labor shortage in the West Virginia fields is becoming more pronounced each week and the outlook for the future is regarded by many as rather unfavorable. This will be particularly true should the Federal Government start investigating the situation as now seems probable.

The car supply is adequate and meeting the full requirements at the moment but some believe that conditions in this respect do not look favorable for the future. The production of coke is still curtailed because of the light demand, and there are reports from the trade that prices are weak.

COLUMBUS, OHIO

Activity in the coal trade in Ohio during the past week was divided between the lake business and the steam trade. Both classes showed up well and as a result the tone of the market is very good. Operators and shippers are looking forward to a good season in both lines and preparations are being made for a heavy production.

The lake trade is opening extremely active in every respect. Chartering of vessels is going on rapidly and the movement is quite large. Since there is a good demand from the Northwest it is believed the present season will exceed that of 1912. Prices f.o.b. vessels are 10c. higher than last year, or at the same level which prevailed in 1911. The ore trade is opening actively and this means a better movement of coal.

Steam trade is strong in every way. The demand from manufacturing establishments is increasing since most of the factories put out of commission by the flood have resumed opertions. Accumulated orders has made it necessary for these factories to buy a larger tonnage of steam coal. The demand from railroads is also increasing as the freight movement is larger. Contracts which have expired recently are being renewed at higher figures than prevailed in 1912.

Considerable attention is being given to railroad contracts which will be placed soon. The one weak spot in the market is the fine coal, which is usual when the lake season is booming; but the weakness is not as marked as in former years. All other grades are holding up strong.

Some little demand is reported for domestic grades, but not sufficient to cause much stir. Most of the orders are traceable to the effects of the high waters of a month ago. Dealers, however, are preparing for the stocking season which is expected to be slightly earlier than usual.

The output in Ohio fields during the week has been good. Since the railroads are better able to handle coal, eastern Ohio and the Hocking Valley has been producing about 75 to 80 per cent. of normal. The output in the Pomeroy Bend district is not quite so large because the flood damages in that field was heavier. In the domestic fields the output is not large.

Quotations in the Ohio fields are as follows:

	Hocking	Pittsburgh	Pomeroy	Kanawha
Domestic lump	$1.50	...	$1.50	$1.50
4-inch	1.35	$1.20	1.35	1.30
Nut	1.25	...	1.25	...
Mine-run	1.15	1.10	1.15	1.10
Nut, pea and slack	0.70	...	0.90	0.80
Coarse slack	0.60	0.75	0.80	0.70

HAMPTON ROADS, VA.

The last week has brought about little change in the coal situation at Hampton Roads. While there have been some large shipments both coastwise and foreign they have not relieved the accumulation at the several piers and the railway yards are still in a badly congested condition. However, producers are not cutting prices, while buyers are holding off evidently expecting a decline, and there were few sales made during the past week.

The enormous total of more than one million tons of coal was dumped over the three Hampton Roads piers during the month of April, the exact figures being 1,054,208 tons. Of this quantity the Norfolk & Western Ry. handled at Lamberts Point 508,158, the Virginian Railway at Sewalls Point 249,225 tons and the Chesapeake & Ohio at Newport News 296,825. Work on the steel pier at Newport News which has been badly delayed is now being pushed forward as rapidly as possible day and night.

LOUISVILLE, KY.

The local situation has not changed to any material extent during the week, the domestic grades still continuing in light demand with the steam coals rather tight, although also showing a tendency to become easier. The car supply is adequate at the moment, but may become shorter with the result that operators are becoming cautious over future commitments both for this reason and because higher prices are anticipated in the near future. The improvement in the price situation will be brought about by the increased demand from the Northwest; the West Virginia producers are finding themselves less able to meet the rapidly increasing requisition from there and the result is that much of this business is being diverted into the Kentucky field in spite of the fact that the latter is under some disadvantage in freight rates. The West Virginia operators are also more handicapped as a result of the recent flood than is the case with the local producers. There is a strong demand for the Southern coals in the Northwestern market.

Prices continue around the summer level with the exception of the steam grades which as already noted, are in strong demand. The eastern Kentucky block is plentiful at $1.45 to $1.50 f.o.b. mine with lump and block at $1.25, mine-run $1.05 to $1.15, No. 2 at 85 to 95c., and domestic nut at $1.25 to $1.35. Nut and slack are firm at 85 to 95c. and western Kentucky screenings, nut and slack are quoted from 75 to 85 cents.

BIRMINGHAM, ALA.

There is little encouragement to be found in the general situation in this district, the depression being more keenly felt in the pig-iron and steel markets and the coal trade has not by any means escaped. Steam coal has suffered most and low record prices for the season have been made on what might be termed second-grade product. The lump and nut situation, while better than steam, is not showing any activity worthy of mention. The real cause of the apathy in business is somewhat difficult to place and many and varied reasons are advanced as the source of the trouble.

In contrast to other markets, the foundry coke demand is very good and is showing no signs of weakness. There is little demand for furnace coke and the surplus supply is not large. Practically all of the pig iron smelting companies in this district have sufficient coke ovens for supplying their own requirements of furnace coke. The question of securing common labor is a weighty problem with many of the large industries.

DETROIT, MICH.

Bituminous—Slack coal is somewhat more active than the larger sizes and is the strongest feature in the local market at the present moment. Consumers are showing no anxiety about closing contracts to cover their future requirements, apparently believing that the settlement of the West Virginia labor situation will react to their advantage and result in a material reduction in quotations. Rail shipments are heavy and operators maintain an optimistic view of the situation and believe that they will have no trouble in obtaining the increased circular of the year. Local prices continue on approximately the following basis:

	W. Va. Splint	Gas	Hocking	Cambridge	No. 8 Ohio	Pocahontas	Jackson Hill
Domestic lump	$1.50	...	...	...	...	$2 25	$2 00
Egg	1 50	...	$1 35	...	...	2 25	2 00
1¼-in. lump	1.25	...	...	...	...	...	...
2-in. lump	1.20	$1 20	$1 20	$1 20	$1 20	...	...
Mine-run	1.10	1.10	1.10	1.10	1 10	1 50	...
Slack	1 00	1.00	1.00	1.00	Open	Open	...

Anthracite—The hard-coal market is showing none of the activity that was anticipated for this time. Consumers generally are refusing to place orders that could be advantageously filled both for themselves and the producers; they appear to believe that there is a recession of prices in sight and it is probable that the late fall will see the usual scramble for deliveries at the last moment.

INDIANAPOLIS, IND.

Mines in this state are averaging about four days a week which is normal for the season. The demand for domestic is at a minimum, but screenings are strong. Some time back a scarcity was reported but it is said that mines are now caring for all requisitions in a very satisfactory manner.

April will be memorable as the month of the great flood; railroad communication was badly demoralized and has not yet fully recovered. Many factories were damaged and the coal industry seriously interfered with, outside the flooding of some of the mines. But much coal was needed immediately following the subsidence of the waters and the volume of business for the month was thus kept up to about normal.

Prices at the mines for standard grades, f.o.b. are:

No. 4 mine-run	$1.10@1 20	Domestic 4- and 5-in.	$1.50@1.60
No. 8 5 and 6	1.05@1.10	Screenings No. 4	0 90@1 00
Steam lump, 1¼-in.	1.15@1 35	Screenings 5 and 6	0 80@0 90
Nut and egg	1 20@1 55	Brazil block	2 00@2.10
Domestic 3-in.	1.40@1 65		

CHICAGO

As a result of an early spring, which has cut off the consumption of household coal, the domestic market is unusually quiet at the present time. There is a strong tendency to cut down storage piles and get rid of stocks as rapidly as possible.

Steam lump from Western mines is commanding prices ranging from $1 to $1.25, while mine-run coal is selling all the way from 95c. to $1.10. Western screenings are selling at from 75c. to 85c. Prices for smokeless coal remain firm and it is expected there will be a rise in quotations on this commodity within a short time; according to some, mine-run will be advanced to $1.50 and a still higher price for the prepared coal. There is a fair demand for coke in the spot market. A large number of contracts are now being made and the prices obtained vary. Contracting for coke among retailers and jobbers is especially heavy.

Prevailing prices in Chicago are:

	Springfield	Franklin Co.	Clinton	W. Va.
Domestic lump	$1 97@2 07	$2 30@2 40	$2 27	...
Egg	...	2 30@2 40	...	$3 65
Steam lump	$1 82@1 87	...	2 07	...
Mine-run	1 77	2 20@2 30	1 97	3 30
Screenings	1 57	1 95	1.57@1 62	...

Coke—Connellsville and Wise County, $6@6.25, byproduct, egg, stove and nut, $4.45@4.75, gas house, $4.60@4.70.

ST. LOUIS, MO.

Spring business is about normal in St. Louis with no demand for any size in particular. The policy of losing money on the operations still seems to continue. The lowest price quoted on Standard lump was touched the past week when it was offered at 80c. f.o.b. the mines. There are some contracts being signed up, but they do not, in a way, amount to much, and the prices are exceptionally low in view of the outlook.

Indications are that there will be a fair movement of anthracite during the present month. Coke is away off on demand but the price seems to be holding up. There is not much doing in smokeless, and it will perhaps lose in the spring tonnage this year on account of the aggressiveness of the anthracite shippers.

The prevailing circular is:

	Carterville and Franklin Co.	Big Muddy	Mt. Olive	Standard
2-in. lump				$0.90
3-in. lump			$1.20	
6-in. lump	$1.15 @ 1.20		1.25	1.05
Lump and egg		$2.25		
No. 1 nut	1.05 @ 1.15			
Screenings	0.90 @ 0.95			0.85
Mine-run	1.00 @ 1.10			0.80
No. 1 washed nut	1.35			
No. 2 washed nut	1.35			
No. 3 washed nut	1.35			
No. 4 washed nut	1.35			
No. 5 washed nut	1.10			

St. Louis prices on May anthracite are: Chestnut, $7.05; stove and egg $6.80; grate $6.55. Smokeless lump and egg is $4.45 and mine-run $4. By product coke is $5 and gas house $4.75.

MINNEAPOLIS, ST. PAUL

While there is a prevailing quietness in all the branches of the coal trade at the present writing, enough business is going on to keep all in an optimistic mood. The Northwestern states are in a very prosperous condition, and although little coal is being moved, coalmen are looking at the present situation philosophically, knowing that the trade will buy when the time comes. There does not seem to be any disposition on the part of dealers in the country to stock hard coal even at the reduced spring price, which in May is 40c. lower than September.

Immediately upon opening of navigation the head-of-the-Lakes harbors became a scene of great activity and one of the busiest shipping seasons is now in progress.

OGDEN, UTAH

April started out very good and many of the operators predicted an excellent business but about the middle of the month the dealers began to anticipate a storage period, May 1, and the operators began inquiring of the railroads concerning a reduction in freight rates during May, June and July, but nothing definite could be learned. The dealer and the consumer, especially the former, anticipated some reduction on May 1, and held off buying during the last of April in order not to have high-priced coal on hand in case of a reduction. On Apr. 29 the railroads announced there would be no reduction in freight rates this year. This caused the operators to reduce the price of coal f.o.b. mines, and while circular quotations announcing the reduction were sent out to the trade immediately, it has not increased the movement.

The Utah mines are anticipating trouble ahead this winter. Their many inducements will no doubt cause the dealers to store Utah coal, in the latter part of the season, with the idea that they will be taken care of during the winter; however, all of the Utah mines are tributary to the Denver & Rio Grande R.R. and the car supply commencing about Sept. 1 will be about 25% of requirements.

Present quotations are as follows: Lump, $2.25; nut, $1.75; mine-run, $1.75; slack, $1; on both Wyoming and Utah grades.

PORTLAND, ORE.

Cool weather has set in again in this locality and coal for domestic purposes is in demand. However in a general way there is no material change in the situation and prices remain as during the winter.

Judging from the number of steamship lines that are to operate out of Portland upon the completion of the Panama canal there will be a strong demand here for bunker coal. Several foreign lines have announced that they will send steamers to this port from various ports of Europe, on regular route, and some of them are to make Portland their Pacific coast terminus. Two lines, the Hamburg-American and the Royal Mail, have already inaugurated sailings.

PRODUCTION AND TRANSPORTATION STATISTICS

SOUTHWESTERN TONNAGE

The following is a comparative statement of the southwestern tonnage for January, 1912 and 1913:

State	1912	1913	Increase	Decrease
Missouri	281,453	305,825	24,372	
Kansas	537,928	523,605		14,323
Arkansas	155,666	183,648	27,982	
Oklahoma	348,982	366,859	17,877	
Totals	1,324,029	1,379,937	70,231	14,323

ANTHRACITE SHIPMENTS

The following is comparative statement of the anthracite shipments for April and the first four months, of the years 1912-13, in long tons:

	April		4 Months	
	1913	1912	1913	1912
Phila. & Reading	1,180,115	31,324	4,579,408	3,893,690
Lehigh Valley	1,149,896	4,840	4,216,678	3,334,231
Cent. R.R. N. J.	738,579	58	2,978,872	2,393,203
Del. Lack. & West.	861,078	112,858	3,078,995	2,604,079
Del. & Hudson	561,700	.....	2,344,688	1,718,283
Pennsylvania	585,472	49,687	2,082,297	1,653,515
Erie	672,386	67,798	2,745,928	2,222,648
Ont. & Western	216,963	60	859,199	656,927
Total	5,966,189	266,625	22,886,065	18,475,976

Stocks at Tidewater at the close of April were 546,243 tons as compared with 772,115 tons on Mar. 30.

FOREIGN MARKETS

GREAT BRITAIN

Apr. 25—The demand is quiet at present, but collieryowners are well placed as regards orders and are not willing to reduce quotations for prompt or forward loading.

Quotations are approximately as follows:

Best Welsh steam	$5.04@5.16	Best Monmouthshires	$4 56@4.68
Best seconds	4.86@4.98	Seconds	4.44@4.50
Seconds	4.68@4.80	Best Cardiff smalls	3.54@3.60
Best dry coals	4.74@4.92	Seconds	3.18@3.30

The prices for Cardiff coals are f.o.b. Cardiff, Penarth or Barry, while those for Monmouthshire descriptions are f.o.b. Newport; both exclusive of wharfage, and for cash in 30 days—less 2½%.

SPANISH IMPORTS

Spanish imports of coal for the first two months of the current year were 409,975 tons as compared 397,489 for the same period last year. Coke imports for the same periods were 59,537 tons and 78,193 tons respectively.

COAL SECURITIES

The following table gives the range of various active coal securities and dividends paid during the week ending Apr. 26:

Stocks	Week's Range High	Low	Last	Year's Range High	Low
American Coal Products	87	87	87	87	87
American Coal Products Pref.	109½	109½	109½	109½	109½
Colorado Fuel & Iron	32½	31	31½	41½	31
Colorado Fuel & Iron Pref.	....	....	155	155	150
Consolidation Coal of Maryland	102½	102½	102½	102½	102½
Lehigh Valley Coal sales	225	210	215	...	...
Island Creek Coal, com.	52	51	51	....	
Island Creek Coal Pref.	85	84	84	...	...
Pittsburgh Coal	18	17¼	18	24¾	17¼
Pittsburgh Coal Pref	80¾	79¾	80	95	79¾
Pond Creek	22¼	19¼	19¼	23¾	19¼
Reading	161½	157½	160½	168½	152½
Reading 1st Pref.	91	90	90	92¼	89¼
Reading 2nd Pref.	92	92	92	95	87¼
Virginia Iron, Coal & Coke	47	45	45¼	54	44¼

Bonds	Closing Bid	Asked	Week's Range or Last Sale		Yea.'s Range	
Colo. F. & I. gen. s.f.g. 5s	95	98½	95	95	95	99½
Colo. F. & I. gen. 6s			107½	June '12		
Col. Ind. 1st & coll. 5s. gu.	78¼	79	78¼	78¾	78¾	85
Cons. Ind. Coal Mc. 1st 5s.	75	80	85	June '11	..	..
Cons. Coal 1st and ref. 5s.	..	94	93	Oct. '12	..	..
Gr. Riv. Coal & C. 1st g 6s	..	100	102¾	April '06	..	..
K. & H. C. & C. 1st s f g 5s	..	..	98	Jan. '13	98	98
Pocah. Con. Coll. 1st s f 5s	..	87½	87¾	Mar. '13	87¼	87¾
St. L. Rky. Mt. & Pac. 1st 5s	77	78	76	Mar. '13	76	80
Tenn. Coal gen. 5s	100	101¼	100	April '13	100	103
Birm. Div. 1st consol. 6s	101¼	103¾	101	April '13	101	103
Tenn. Div. 1st g 6s	..	103¾	102	Feb. '13	102	102
Cah. C. M. Co. 1st g 6s	..	104	110	Jan. '09	..	..
Utah Fuel 1st g 5s						
Victor Fuel 1st s f 5s	80	82½	79¾	Feb. '13	79¾	79¾
Va. I. Coal & Coke 1st g 5s	93	95	93	93	93	98

DIVIDENDS

Mahoning Coal R.R.—Common—Dividend of $25 payable May 15 to holders of record May 1.

Lehigh Coal & Navigation (No. 138)—Regular quarterly of $1 payable May 31 to holders of record Apr. 30.

Roby Coal Co. (Cleveland)—This company is offering at par and interest, $200,000 consolidated first mortgage 6% bonds, the balance of an authorized issue of $675,000, of which $75,000 has been retired. Par value of bonds is $1000, and they are secured by a sinking fund of 5c. per ton of coal.

PRICES OF MINING SUPPLIES

THE MARKET IN GENERAL

Sentiment did not improve during April as was expected, in fact, there was more pessimism on May 1 than there was on April 1. Numerous factors combine to cause this, not the least of which was the continuation of the unrest in the far East, due to a quarrel among the allies regarding the spoils of war, which further disturbed the peace of Europe and upset the balance of powers. Monetary conditions grew slightly easier toward May 1, but it is a noticeable fact that large corporations and even municipalities were unable to secure funds on as favorable terms as heretofore.

The course of prices has been toward lower levels in the market for iron and steel, and the demand for a number of products has not been as great as was expected, save in the regions lately devastated by flood and cyclone. Metals are higher in price, while cement is in excellent demand at unchanged quotations. The steel companies have made satisfactory returns for the first quarter of the year, although the earnings of the leading manufacturer were not up to expectations, and other industrial companies are making fair profits.

The tariff bill which was introduced in Congress, and is being discussed, is not as drastic as many believed it would be, and as yet it has not had the effect of unsettling business that even the most sanguine expected.

LABOR

Strikes have been of more frequent occurrence, and labor unrest is more pronounced this spring than it was a year ago in spite of the fact that there is less demand for labor than at that time. In addition to a bitter and prolonged strike among the silk mill operators in Paterson, there is a prospect that the machinists may endeavor to force the issue for an eight-hour day, and now that the wages of the firemen have been settled, other railway employees are making demands for higher wages. This time it is the trainmen.

The strike among the operators of the twine mill of the International Harvester Co. continued during the early days of April with much bitterness, and finally the company announced that if settlement were not made by a certain date, the mills would be dismantled and the machinery shipped abroad. The company even went so far as to have machinists take apart some of the machinery preparatory to shipment abroad. Such a proceeding does not help the employer in any endeavor to gain the good will of the employees.

There is a general demand for outside labor, but it is not as urgent as last year.

IRON AND STEEL PRODUCTS

Business during April did not develop as was expected, and the total business transacted was slightly less than during March. In the line of finished steel, there were no great reductions in price, in fact there were some advances, but there was a feeling of unrest which resulted in fewer orders being placed, and less activity at the mills. The particularly unsatisfactory part of it is that the price of pig iron continued to decline.

Steel billets are $1 a ton cheaper than last month; wire products are slightly higher; there has been come uneasiness in the price of sheets with a result that quotations are $2 per ton less at certain quarters. Bars are fairly active, and, especially those for reinforcing work, are in excellent demand. Rails have been in less requisition, although somewhat over 100,000 tons were purchased during April, and a good export order received. The price of pipe was advanced, but the great falling off was in the demand for railway cars and equipment. The railways are too beset by financial troubles, and the securing of funds is too uncertain to permit them to buy more equipment than is absolutely needed.

Steel Rails—The demand for light rails has not been as large as earlier in the year, but some very fair orders for contractors' equipment were received. Early in the month the railways purchased 65,000 tons, and during the last week, a single system ordered 35,000 tons, and there were a few scattered orders aggregating 20,000 tons more. Quotations continue unchanged at 1.25c. per lb. for standard sections, weighing from 50 to 100 lb per yd.; 1.21c. for 40- to 50-lb. rails; 1.30c. for 16- to 20-lb. rails. These quotations are for carload lots f.o.b. Pittsburgh. In Chicago, 16- to 20-lb. rails, are 1.30; 12-lb., 1.35c.; 8-lb., 1.40c. Relaying rails in Chicago are $24 per gross ton and they can be had at other centers at approximately the same quotation.

Track Supplies—Due to the floods in Ohio, and the demand for an unusual number of track laborers in that section for work other than the relaying of rails, there has not been the active demand for track material that there was earlier in the season. By June, this should return, however, and at that time, business will be just as rushed as ever. Spikes are 2.10c. base for large lots; track bolts with square nuts, 2.40@2.50c. base, and tie plates $34@36 per net ton. These quotations are for Chicago delivery. In Pittsburgh angle base are 1.50@1.60c. and spikes 1.95@2.15c. These quotations are per lb. in fairly large lots.

Pipe—On Apr. 12, there was a revision of discounts for pipe, amounting to an advance of approximately $1 a ton, or a half point in the discount. Business during the month was exceptionally large, one of the leading fuel companies in Pittsburgh buying about 80 miles of pipe, and other companies inquiring for large quantities. The mills are able to make fairly prompt shipments, but the pipe business is very satisfactory. New discounts are as follows:

	Black	Galvanized
¾- to 2-in. butt welded	79½ %	70%
2½- to 6-in. lap welded	78½ %	70%

Based on these discounts, the net price of pipe per foot are as follows in carload lots f.o.b. Pittsburgh:

Size, inches	Black	Galvanized
¾	2.35	3.40
1	3.50	4.90
1¼	4.75	6.60
1½	5.55	8.00
2½	12.60	17.50
3	16.50	23.10

Sheets—There was considerable weakness in the sheet market before the floods in Ohio put a number of mills out of commission, but that strengthened the market materially. Since that time, these mills have been able to resume operations, and in consequence the market has again weakened. The mill which was the leading factor in lower prices during March, has again gone out aggressively after orders, and is cutting prices from $1 to $2 per ton. There has been no change in price by the largest manufacturers, and it is stated that this weakness is only temporary, being due to peculiar causes, and the shortness of semi-finished steel will in itself prove a barrier to any lower prices. However, this is more a matter of conjecture than anything else.

The following prices are for lots of a few bundles f.o.b. Pittsburgh and Chicago. These should not be confused with the quotations for carload lots, which is 2.30c. f.o.b. Pittsburgh for No. 28 black.

	Cents per Pound			
	Pittsburgh		Chicago	
	Black	Galv.	Black	Galv.
Nos. 22 and 24	2.75	3.55	2.70	3.50
Nos. 25 and 26	2.80	3.70	2.75	3.65
No. 27	2.85	3.95	2.80	3.90
No. 28	2.90	4.00	2.85	2.95

Structural Materials—Replacement orders by the railroads have not been as large as was expected at the time of the flood, and the only really large order placed was by the Big Four for 6000 tons of bridge material.

Fabricating shops are not nearly as busy as they were, and shops in the Middle West, as well as those in the East, are able to make contracts for fairly prompt delivery. The plate market is easier, chiefly because of the falling off in the demand for car-building materials. Shipbuilding work continues fairly active.

Quotations are without change as far as future deliveries are concerned, but for prompt shipment there has been a reduction of $1 to $2 per ton. Plates, beams and angles are 1.50c., base Pittsburgh, for future shipment, and 1.60c. for prompt shipment. In Chicago, the quotation for future ship-

ments is 1.68@1.73c., and prompt deliveries are held at $1 per ton higher. All of these prices are per 100 lb. in carload lots.

WIRE PRODUCTS

Wire—Business is fairly active as far as shipments are concerned, but few new orders are being booked on account of the advance in March. Previous to that time, most of the large consumers were fairly well informed that an advance would take place, and in consequence placed large orders, so there will be no orders for some time to come. For large lots, quotations are as follows: Painted barbed wire, $1.86; galvanized, $2.20; annealed fence wire, $1.60; galvanized, $2.05. In Chicago, annealed fence wire is $1.78 and galvanized, $2.18. Barbed-wire fencing in that market is $1.98 and galvanized, $2.38. All of these quotations are per 100 lb.; for smaller quantities bought from jobbers' stores, an advance of about 25c. per 100 lb. is named.

Wire Rope—The market is steady and prices are unchanged. Two-inch rope in Pittsburgh is held at 57c. per lin.ft.; 1¼-in., 23c.; ¾-in., 10c. These quotations are for best grades or for special grades of wire rope, but cheaper grades can be obtained at considerable concessions.

Copper Wire—The market is steady, business is active and prices are higher. There has been an unusual demand for special grades of copper during the month and quotations are high at 17c.

Telegraph Wire—Business is fairly active with quotations unchanged as follows:

Prices are as follows in cents per pound for wire measured in the Birmingham wire gage: "Extra Best Best," Nos. 6 to 9, 4¾c.; Nos. 10 and 11, 4½c.; No. 12, 4⅝c.; No. 14, 5⅛c.; "Best" Nos. 6 to 9, 3½c.; Nos. 10 and 11, 3⅝c.; No. 12, 3½c.; No. 14, 4c. Actual freight is allowed from Trenton, N. J., where it does not exceed 25c. per 100 lb.

HARDWARE

Bar Iron and Steel—Prices are steady. Stocks are well assorted, and consumers can secure supplies desired with little difficulty. Quotations from jobbers' store in New York and Chicago are as follows:

	Per lb.
Refined iron:	
1 to 1⅞ in., round and square	2.10c.
1½ to 4 in. x ⅜ to 1 in.	2.10c.
1½ to 4 in. x ¼ in. to ⅝ in.	2.30c.
Norway bars	3.60c.
Soft steel:	
¾ to 3 in., round and square	2.05c.
1 to 6 in. x ⅜ to 1 in.	2.05c.
1 to 6 in. x ¼ and ⅝ in.	2.20c.
Rods—⅝ and ½ in.	2.15c.
Bands—1½ to 6x⅜ in. to No. 8	2.35c.
Beams and channels—3 to 15 in.	2.15c.

Nails—Building all over the country is not as active as last year and in consequence the demand for nails has slumped off to quite an extent. Prices, however, are steady, large lots being held at 1.80c. Pittsburgh, 2.08c. Chicago. For small lots from jobbers' stores the price is 2c. in Pittsburgh and 2.28c. in Chicago. Quotations approximating those of Chicago are made for most Central West jobbing points.

Rivets—The demand for rivets is not as active as last month, and there is less urgency for shipments. Quotations are $2.20 for structural rivets and $2.30 for boiler rivets. These prices are per keg of 100 lb.

Chain—Prices of chain are firm, but the buying has not been especially large. Ruling quotations per 100 lb., f.o.b. Pittsburgh, are as follows:

⅜ in.	$7.50
¼ in.	4.95
⅝ in.	3.95
5/16 in.	3.40
¼ in.	3.20
7/16 in.	3.00
½ and 9/16 in.	2.90
5/8 and 11/16 in.	2.80
¾ and 13/16 in.	2.70
⅞ and 15/16 in.	2.60
1 to 1¼ in.	

Extras for BB

⅜ in.	1.50
¼ in.	1.50
⅝ and larger	1.25

Extras for triple B (BBB)

⅜ and ¼ in.	2c.
⅝ and larger	1.75c.

METALS

Copper—The excellent buying in the copper market, which was noted a month ago, has continued practically throughout the month, domestic consumers having purchased large quantities at steadily advancing quotations. In addition to this, consumers of copper abroad have made large purchases, and exports during April were large, but did not come up to the record-breaking figures of March. It is practically impossible to secure deliveries of special grades within 60 days. Electrolytic copper sells at 15¾ to 16¼c. for large lots, and Lake, 16¼ to 16¾c. from store New York.

Tin—The market is steady and higher, and tin is selling at around 50c. per pound in New York.

Lead—Prices are very firm, and the market is steady at 5.50c. New York and 5.35c. St. Louis.

Solder—Strictly half and half solder is selling in the New York market at 27½ to 28c.

MISCELLANEOUS

Castings, Gray Iron—The foundries making castings are not able to secure all the orders they desire, and have been going out after business. Rough castings in large quantities can be had at 1.75 to 2.25c. per lb.; smaller castings, such as are used for construction work, command from 2.50 to 3c. per lb.

Brattice Cloth—Conditions have not changed materially regarding brattice cloth. The demand is just as active as it was, in fact more so, and the supply continues short. Deliveries are being made with more freedom, especially by foreign manufacturers, but there are no large stocks on hand at any point. The tariff situation is not troubling dealers in brattice cloth any for the present, for the reason that there are no stocks on hand, and, according to the present schedule, it is difficult to see where there will be any material change in the price of this material.

Portland Cement—Manufacturers and dealers in cement are not as optimistic regarding the outlook as they were two months ago. There will be a large quantity of cement used in various places, but a great many of these contracts have been covered and, moreover, a good deal of this work will extend over a long period of time. Consequently, there is not the feeling at present that there will be an advance, as was so sanguinely stated about two months ago. Quotations are firm at $1.58 in both New York and Pittsburgh. This allows 40c. for bags returned.

Rope—Manufacturers of rope have never had such a season as the past one. Prices have advanced, and the best grades of Manila rope are selling at 15 to 16c., while hardware grades, which formerly sold at 6c., are now commanding 12 to 13c.

Bars, Concrete Reinforcing—Orders for bars are large, but stocks are sufficient to meet the demand. Prices are firm and for small lots from warehouse stock are as follows:

PITTSBURGH PRICES IN CENTS PER POUND

	Warehouse Stock
¾-in.	2.00@2.10
⅝-in.	2.05@2.15
½-in.	2.10@1.20
⅝-in.	2.25@2.35

Triangular Mesh—Makers of this material are able to make prompt shipments.

From mills in De Kalb, Ill., quotations are 18c. per 100 lb. higher than those quoted below, which are 100 sq.ft. f.o.b. Pittsburgh. These are for lots of less than 10,000 sq.ft.

No. 23	$1.23	No. 32	$2.62
No. 23	2.05	No. 36	1.05
No. 26	1.42	No. 40	3.25
No. 28	1.97	No. 41	2.48

Shafting—Specifications are coming in freely and although the automobile manufacturers seem to have contracted for all the material they will need this year, there is some very fair business. A slight revision has been made in the price of shafting, and new discounts are 58% from list in carload lots and 53% from list in less than carload lots. Business is fair. The following net prices per foot are based on the discount of 53%.

Diameter in inches	Cents per foot	Diameter in inches	Cents per foot
¾	4.25	2¼	31.50
1¼	10.80	2½	39.30
1½	14.05	2¾	48.00
1¾	19.20	3	56.50
2	25.00	3½	84.00

Packing—Prices vary within wide limit, according to the brands of various dealers, but in general, packing can be purchased at the following quotations: Asbestos, wick and rope, 13c. per lb.; sheet rubber, 11@13c.; pure gum rubber, 40@45c.; red sheet packing, 40@50c.; cotton packing, 16@25c.; jute, 5@6c.; Russian packing, 9@10c.

Plates—Manufacturers continue to catch up with orders and shipments are much more satisfactory. New business is coming in slowly, and there is a dearth of new orders, especially from car builders. Railroads are not buying cars in any quantity.

COAL AGE

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The Mine Telephone

By Berton Braley

Written expressly for Coal Age

"Ting-a-ling-a-ling" you can hear my noisy ring
As it echoes in the chambers of the mine,
When I clearly come across with the orders of the boss
Which are ripping in a volley down my line,
Though for miles the workings run I have hitched 'em up as one,
I have made the mine a unit by my call,
From the busy bottom pump to the breaker and the dump
I'm the blooming nervous system of it all!

"Ting-a-ling-a-ling," hear the message that I fling,
"There's a cave in Number 20, send a crew,"
So they listen to my shout and they come and dig us out
While without me 'twould be hours before they knew.
On my slender singing wire thrills the warning of the fire,
I give notice of the vapor's deadly breath,
And again and yet again I have saved the lives of men
Who would otherwise have faced a fearful death.

"Ting-a-ling-a-ling," you can hear my noisy ring
With its tintinnabulation on the ear,
I'm the terror of the shirk as I drive him on to work
But when danger comes he's thankful I am here,
I'm the foe of all delay and I help to "make her pay"
As a master of efficiency I shine,
From the collar to the sump I can keep 'em "on the hump"
I'm the blooming nervous system of the mine!

The Preparation of Coal

By Gordon Buchanan*

SYNOPSIS—In the last 35 years the preparation of coal in Illinois has experienced several revolutionary changes. Powderless extraction of coal in longwall workings, accompanied by hand screening on forks, has given place to modern methods of undercutting and shooting, with preparations on screens and rescreens and in washers. The author believes that grading will probably be carried as far as in the anthracite region and that the spiral is the best suited coal cleaner for some types of coal. He suggests that a medium size of bituminous coal may possibly soon command a premium in the market.

My experience in coal mining began some 35 years ago when, as a boy, spending my vacations at the mines, my attention was first drawn to the production and preparation of coal. It may not be amiss, to sketch briefly the changes which have come about during the elapsed period.

Reminiscences

I vividly recall the equipment at our old No. 3 shaft, which was no better, and no worse, than those of our competitors. It consisted of one old boiler, which, following its Sunday cleaning, was often the cause of much picturesque profanity on the part of our old Scotch engineer, Andy McKean. It had a practice of squirting so much water through its seams over the fire as to make it an even bet whether the coal could be made to burn or not. Usually the expansion conquered; if not, we shut down until the seams had been calked.

The hoist was a single-cylinder link-motion engine with a flywheel on the shaft, which frequently got on a dead center. Then it became necessary for Andy to walk on the flywheel spokes and "put her over," as he expressed it. There is still current among the older men in the field a tale relating to a similar installation which "ran away" one day, due to the breaking of the throttle valve, whereupon the engineer, during the ensuing excitement, was advised by a friendly Scot to "fling a prop in the wheel, Sandy." The resulting cast-iron shower forever established Sandy's reputation as an artful dodger.

Prior to my time the coal was forked in the mine before loading into pit cars, the screenings being thrown into the gob, and becoming a fruitful cause of trouble through gob fires. The gobbing of fine coal continued long after forking was abandoned. Many a day I puzzled my brain in an effort to provide means to insure the loading out of this fine coal.

During this period railway equipment consisted of ten-ton cars. Later, a certain few of our favored customers were taken over to the old Canal Street station of the Alton R.R., in Chicago, where now stands the Union Station, to see the world beater, a 12-ton coal car. Strange to say, on certain roads the spectacle of a wood-burning locomotive drawing a train consisting of cars of coal was frequently to be seen.

Mining Coal without Powder

Our longwall miners prided themselves on their skill with the pick, striving to make their cuts as narrow and as deep as possible. Explosives were practically unknown. I have known men to go home for several days on a stretch because their coal had not broken, only as a last resort using sledge and wedge to bring it down. It was nothing uncommon for a man to put in 14 hours' work daily, although the mine only hoisted during ten hours. As they expressed it, "they could take their time to it."

Under these conditions few appliances for cleaning the product were necessary. The bar screen set in the bottom of the loading chute between the tipple dump and the car was later supplemented in some few instances by a revolving screen for further sizing of fine coal, and the cleaning was provided by hand picking on the car. These simple methods constituted the sum total of preparation and continued in use for many years.

However, finally, the mine-run system was introduced into Illinois. It brought with it an increased percentage of fine coal, containing a greater proportion of impurities, due partly to the lowering of the standard of skill employed in mining. The miners now loaded out their fine coal which had formerly been thrown into the gob, and this was largely mixed with fire clay. Thus it became necessary to provide new methods of preparation in order to obtain a return from fine coal to offset the loss of revenue due to decreased percentage of lump.

Coal Passing from Tipple to Rescreener on Rubber Belt

This condition was met by the shaker screen containing various-sized perforations, which permitted a closer sizing of small coal by a single operation, with delivery direct into cars, thereby eliminating re-screening plants.

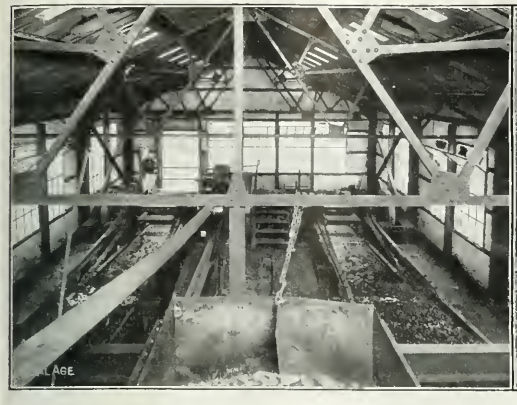
Following this a campaign was started to educate the steam consumers for the purpose of creating a demand for the smaller sizes produced. As a result various forms of stokers were introduced and perfected.

Coal Cleaning

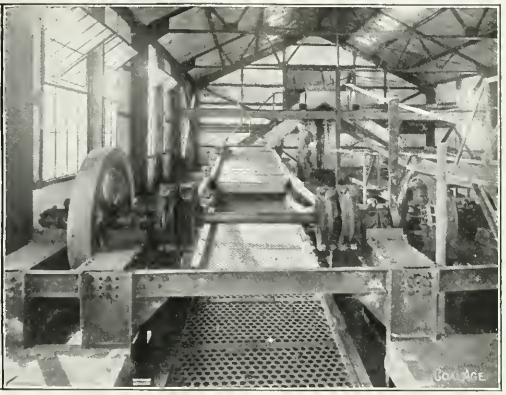
The next problem confronting the producer was that of eliminating impurities, such as clay and pyrites con-

*President, Ohio Valley Mining Co., Chicago, Ill.

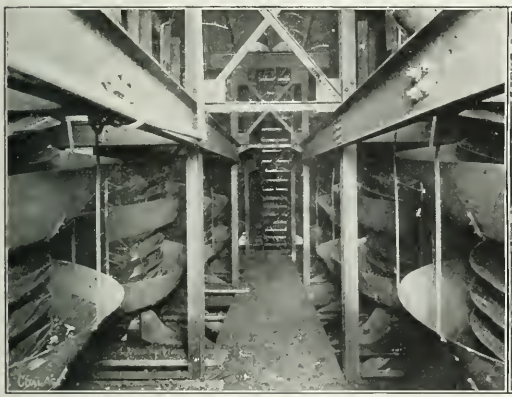
Note—An article read May 9, 1913, at the dedication of the Transportation Building and the Locomotive and Mining Laboratories of the University of Illinois, Urbana, Ill.



View Showing Actuating Dynamo and Rear End of Shaker Screens

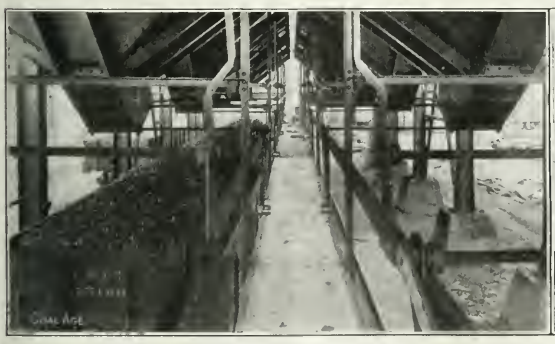


View Showing Where Coal Enters Rescreener and Upper End of Screens



Spirals below the Screens Shown in Previous Figures

First Floor, Showing Bins, Bone and Slate Belt and Spirals



View of Tracks and Underside of Bins beneath Rescreener

Four Hours' Run of Slate Taken from the Coal

tained in the smaller, or steam sizes. These caused clinkers and impeded combustion through clogging of the grates, particularly in the furnaces of the traveling-chain type. Thus was introduced the coal washer in its various forms, which for a time solved the problem. Like all other appliances the washer has its limitations, and must be modified to suit the needs and peculiarities of the coal under treatment.

As perhaps is well known, it will not produce results with all coals; in fact, with some it will not produce results at all and other means must be sought. It has its drawbacks even when it does produce a clean coal. The fuel is prone to freeze in winter, thus causing increased labor and expense in unloading, while in summer disputes are frequent because of the claims for shortage at destination, which our railroad friends are prone to shift over onto the shoulders of the coal-mine operators. The shortage is invariably charged by them to evaporation of moisture and not to any other loss in transit.

Having passed through all these changes in the conduct of the industry in a period of short duration, we quickly realized, on entering the Franklin County field, that while the percentage of impurities, due to difference in mining methods, was relatively less per ton, the increase of output necessary, together with largely increased speed of handling, necessitated some method of preparation in addition to that of screening and hand picking.

In Europe, Coal Preparation is a Leading Problem

The preparation of coal is a subject on which a great deal of thought can and should be expended; yet up to the present, considering the magnitude of the bituminous industry in America, comparatively little has been done. America, unfortunately, is far behind foreign countries in this respect, and we may well take a leaf from their book of experience and profit thereby.

The European coals as a rule, compared with those of America, are poor and the beds thin, consequently, a large amount of care and labor must be expended to prepare them properly for market. In Great Britain the quality of coal is much better; nevertheless a large share of the expense involved in equipping British mines is devoted to the machinery for cleaning and sizing.

Our American coals, as a rule, are of much better average quality than the foreign coals, and have required less attention to prepare them for market. Today competition is such that the preparation often is the determining factor in retention of trade. There is a vast field for improvement in this direction.

Up to the present time, except as already briefly outlined, not much in the way of machinery to perform this work automatically has been developed for use in the bituminous field, although considerable advance in this line has taken place in the anthracite regions.

Soft Coal of Chestnut Size Should Lead in Price

One of the curious facts in the marketing of coal is that the trade pays a premium for anthracite of certain small sizes, notably chestnut, whereas in the bituminous fields the opposite is the case where at times a premium is paid for the large sizes, the small being frequently a drug on the market. The reason, undoubtedly, for this is the fact that appliances for burning domestic soft coal are not as efficient as those for the consumption of anthracite.

It would, therefore, seem as though there was a large field here for the enterprising manufacturers, who will develop and market, at reasonable cost, devices which are fitted and designed to burn the small sizes of soft coal without smoke. These are now being burned in certain types of house-heating furnaces and boilers, but as yet no practical efforts have been made to apply this principle to the ordinary heating stoves of small size, nor to the cook stoves, which make up the great bulk of the fires fed by soft coal.

Efforts to educate the consuming public to the value of the smaller sizes for domestic use would tend to make for market stability. If this campaign of education is to prove successful, it goes without saying that the fuel used must be closely sized, as clean and as free from impurities as possible. As large tonnages must be produced if operating expenses are to be maintained at a low figure, the old-fashioned methods of preparing coal are unsuccessful through their inability to take care of the volume of coal

One of the Twenty-Eight Spirals by Which Dirt and Low-Grade Coal Are Removed

at the rate of speed at which it must be handled. It is difficult, also, to obtain conscientious labor which will remove impurities by hand, also difficult to obtain labor which can stand the rate of speed necessary for this method of cleaning, and it is impossible to remove all impurities by hand methods.

The Spiral Cleaner

In searching for new ways to improve the quality of our output, our company reached the conclusion that we must look for some mechanical process which would work perfectly at high rates of speed. We, therefore, searched the anthracite field thoroughly, and also examined certain of the foreign fields. We found a number of appliances, all of which had good points, some more and some less than others. For our particular kind of coal, after careful practical tests, we concluded that one certain type of machine would do the work better than others, and we therefore installed it.

The result has more than warranted our belief in its efficiency. It is true that it is not absolutely automatic,

care being necessary to see that it is not crowded beyond its capacity. This particular device utilizes gravity, friction and centrifugal force to separate the slate and bone from the coal. When adjusted to the particular size of coal and fed within its capacity, it automatically rejects slate and bone, delivering the coal in a remarkably pure state. The coal must be first closely sized and delivered to machines built to suit the various sizes. Like all such devices, it has its limitations and probably would not work on all kinds of coal.

It must be apparent to the thoughtful producer that, given a good coal, the successful members of the industry will be those who deliver to the trade, the coals which contain the least amount of foreign matter, and which are the most uniformly sized; those which have, through close study of the needs of the consumer best fitted themselves to know and to advise which coals will give greatest economy under the consumer's peculiar conditions; not necessarily those who sell coal of the lowest price, for in the analysis the intelligent consumer is concerned less with what he pays, than with what he gets for his money.

The producer who delivers a satisfactory product exactly suited to the peculiar needs of his customer, thereby relieving him from the annoyance and loss arising from a fuel unsuited to his needs, surely should, and undoubtedly will, receive the consideration due his forethought and labor.

In conclusion, it seems apparent that more thought and care bestowed upon the preparation of our Illinois coals should result in increased returns, expansion of our selling territory and the establishment of a reputation for quality which should prove sheet anchors during a depression.

⁂ ⁂

Systematic Operation of Coal Mines

By A. J. Moorshead*

SYNOPSIS—The modern mine fails hopelessly to produce results if not planned and managed with system. But a mere assembling of physical and mental forces, even though grouped with judgment, will not create a successful operating organization without the harmony of effort resulting from the employment of men of strong character and moral force.

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It is vitally important that all corporate operating bodies be efficiently organized. Every phase of the coal business is dependent for its success on the character of the organization of the body conducting it.

But no matter how elaborate may be the framework, how well it may be suited to the purpose in hand, it is valueless unless it works harmoniously. No success can be obtained without harmony and in no business is such coöperation more necessary than in the dangerous occupation of coal mining. Organization and discipline, little as we like the latter, must be linked together if we would conduct any business with success.

Forethought

The conditions of today are such that we cannot hope to succeed by merely meeting each difficulty as it arrives. Modern coal mines must develop a large tonnage and must be conducted in the most efficient manner if any return is to be obtained. Hence, the whole future of the mine must be considered before any action, however unimportant, is taken.

Complete plans must be drawn at the very outset of the enterprise, showing the fully equipped plant both below and above ground. Furthermore, the great need for enough capital to conduct the business without embarrassment, after all the expenditures of purchase and construction are completed, must never be overlooked.

Character

In selecting a working force, mere ability to design the details of operation does not constitute the sole qualification. Supervising officers should add to such ability, the force of character which will impress not only the executive, but the employees. Otherwise they will be unable to control the situation at times when danger is imminent.

Location

All shafts, slopes and drifts should be placed well above the highest flood level, and too much attention cannot well be given to drainage. Reservoirs must be established where not only good boiler water can be obtained, but of ample size to impound sufficient water to take care of the power plant and washer for a period of not less than ninety days, otherwise the colliery will be closed down in times of drought, which occur so often in the state of Illinois. Tracks for railroad cars should be on sufficient grade that both empty and loaded railroad cars may be moved by gravity and should be of such capacity that they will take care of the output of the mine for 12 hours of operating time.

All power and supply houses, machine and carpenter shops, should be ranged on definite building lines and so located that the tracks containing material will be kept out of the way of the operating tracks of the mine.

Supervision

In the arrangement of the underground working forces, the safest and most efficient practice is to have not more than three gangs for work on the roadways—one for track repairs, another for timbering, and the third for keeping the haulageways and air courses clear. To this must be added special organized gangs for any particular class of underground improvements, such as making concrete stoppings.

A gang leader or foreman should have charge of each of these separate bodies. This plan has, in actual practice, been found by far the more economical, both in point of safety as well as in service performed, than the old method of having many scattered gangs working without leaders, and subject only to the infrequent oversight of the mine manager* or his assistants.

One or two inspectors, as the size of the mine may require, should be employed on the day shift to travel the

*President and general manager, Madison Coal Corporation.

Note—Abstract of an address delivered May 9, 1913, entitled "Organization as Affecting Mining," read at the dedication of the Transportation Building and of the Locomotive and Mining Laboratories, University of Illinois, Urbana, Ill.

*The mine manager is in Illinois the certificated officer corresponding to the mine foreman in other states. He is subordinate to the superintendent.

haulageways and air courses for the purpose of inspecting all trap doors, track, switches, electrical circuits and roof. The inspectors should also test the air and locate defective stoppings, as well as watch for reckless drivers. All irregularities found should be reported to the mine manager.

Sufficient assistant managers should be employed. Their duties should require them to visit the faces of the rooms and of the entries only, to see that the ventilation is properly maintained and that all the miners are supplied with sufficient timber and that they are timbering their places adequately for their own safety. They should see that all working places are kept in good condition; also, when necessary, they should give instructions as to the manner in which the faces should be drilled to be shot with safety, and a large size of coal obtained with a minimum of shots.

It is, I believe, a fair statement to make, that in altogether too many mines, the underground managing force is totally inadequate for the number of men employed and tonnage produced, and I have, myself, known of many instances where the mine manager was without assistants, so that he became in fact a mere timekeeper. He seldom saw an air course unless a fall baffled the air and interfered with the ventilation, or visited the face except when some trouble called him there. Wherever such conditions exist, the force is seriously incomplete, and the owner of the property is permitting an unwise economy to be practiced. Leakages and mistakes must in such cases occur, and in an indirect manner the mine owner is losing a far larger sum than the yearly salaries of several assistants.

Drilling and Co-operation

It will be recognized that it is a waste of money to provide equipment without a properly organized, efficient force to handle it, and this is particularly true of fire-fighting and rescue appliances. Each and every man on the surface, and all supervising officers in the mine, as well as all employees working round about and in the vicinity of the shafts in the mine, should not only have specific duties to perform, but should, through systematic drilling, be prepared to act as a unit, because by quick, energetic action, and complete discipline alone, can even a fair degree of success be expected.

Harmony, together with firm and fair discipline, is necessary for the success of all institutions, but more particularly is it essential in coal mining, because most of the men underground are for the greater part of the working time beyond the observation of the managing forces.

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No. 2 Mine of the United Coal Mining Co.

By C. M. Moderwell*

SYNOPSIS—The mine at Buckner, Ill., is one of the uptodate mines of which so many are found in Franklin County. The cars are exceptionally large, the boiler equipment will make steam both economically and with minimum labor, and the rescreener makes five sizes of coal.

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The No. 2 mine of the United Coal Mining Co. is located about three miles east of the village of Christopher. This location was selected because, while not exactly in the center of the field which is to be developed, it is as near that point as the nature of the surface would permit.

The railroad tracks forming the working yard run in an easterly and westerly direction with the empty storage tracks on the west. The connection from the Illinois Central is made by a spur coming in from the north which forms a "Y" connecting both empty and loaded yards. The Chicago, Burlington & Quincy R.R. comes in from the south in the same manner. The mining plant is located within this double "Y," which makes a convenient arrangement for the handling of empties and loads and also for the receiving of mine supplies. The tracks are equipped with railroad track scales on the empty side and also with a scale for weighing the loads.

The Surface Plant

The mine was planned both above and below ground to produce ultimately 4000 tons of coal in an eight-hour day. The tipple loads onto four tracks and a steel rescreening plant has been built with a bin capacity of 1000 tons and a screening capacity of 1800 tons daily. The steel tipple is complete with weighing, screening and loading equipment. A combined boiler and power plant, including hoisting engines, electrical equipment and water-tube boilers; boiler-house coal conveyor, including overhead steel storage tanks for delivering coal to automatic stokers; ash-handling equipment by means of an ash tunnel under the boilers with steel ash car and hoist for delivering ashes into a hopper located outside of building: the usual repair and blacksmith shops, supply house, etc. There is also an auxiliary air shaft with a separate compartment for hoisting men and material during working hours.

Another Mine (No. 1) of the United Coal Mining Co., Urbain, near Christopher, Ill.

The ventilating plant consists of a Clifford-Capell 8x16-ft. fan housed in steel direct-connected to a Chuse four-valve engine housed in concrete. There is also a complete water system consisting of a reservoir, an electrically driven pump and an elevated steel tank with a distributing system. The entire plant is built of concrete,

*President, United Coal Mining Co., Chicago, Ill.

Note—Paper read at the meeting held May 8, 9 and 10, at the dedication of the Transportation Building and Transportation and Mining Laboratories, University of Illinois, Urbana, Ill.

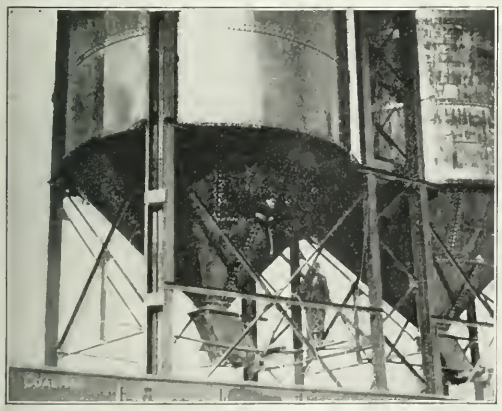
steel and brick construction and is as near fireproof and permanent as possible.

The mine is laid out underground to fit as nearly as possible the conditions found in the No. 6 seam in Franklin County. It is being worked on the panel system and it

THE BUCKNER RESCREENER IN COURSE OF CONSTRUCTION

is proposed to take the pillars on retreat. The seam of coal averages about 10 ft. in thickness and about 2½ ft. is left up for roof support in the first mining. This top coal is taken down when the pillars are drawn.

As the Franklin County field is comparatively new, the experience of the operators in that field does not permit of a statement as to the amount of coal recovered, but it is supposed that the total recovery will be about 80 per cent. of all the coal in the ground. If commercial conditions justify, it might be possible to recover more of the coal.



SHOWING NOVEL ARRANGEMENT FOR REMOVING COAL FROM BINS WITHOUT BREAKAGE

The mine at the present time is producing about 2500 tons per day, but has something like 200 rooms turned which are available for quick development.

The landing underground on the loaded side is equipped with a Jeffrey car haul which brings the trip down to an automatic car stop which releases the cars one at a time as they are caged. The main haulage roads are laid with 50-lb.; the cross entries with 30-lb. and the rooms with 20-lb. steel. A four-ton car is used and the mine is equipped with electric motors for both haulage and gathering. Overcasts are built of concrete-steel construction and permanent stoppages are built of brick.

The life of the mine is estimated at 30 years and in that time it is expected that about 1500 acres will be worked out. On the basis of 200 working days, it is expected the ultimate capacity of the mine will be 700,000 to 800,000 tons per annum.

Illinois Mining Conference at Urbana

On Friday and Saturday, May 9 and 10, an interesting conference was held at the University of Illinois, Urbana, Ill., following the dedication of the Transportation Building and the Locomotive and Mining Laboratories. During this conference, the following program was carried out. On Friday, May 9:

"Conservation and Commercialism," by Francis Peabody, president, Peabody Coal Co., Chicago, Ill.; "Organization as Affecting Mining," A. J. Moorshead, president, Madison Coal Corporation, St. Louis, Mo.; "Illinois Mineral Producers," E. W. Parker, chief statistician, U. S. Geological Survey, Washington, D. C.

Prof. H. H. Stock, acting as chairman of the conference, suggested to those attending the meeting that it might be beneficial to the coal industry of the state if more frequent meetings of this same kind were held at stated intervals. A short discussion followed this remark from the chair, and it was resolved that the chairman appoint a committee to consider ways and means for the formation of an Illinois mining institute. Prof. Stock called the newly appointed committee together in the afternoon, and the following organization was effected: J. D. Peters, general manager of the Chicago-Carterville Coal Co., Herrin, Ill., chairman; Martin Bolt, chief clerk of the State Mining Board, was elected secretary of the committee. The first regular meeting of the full committee was called for June 24, at Springfield, Ill. All suggestions concerning the formation of this proposed Illinois coal-mining institute should be forwarded to Mr. Peters at Herrin, or to Mr. Bolt at Springfield.

At 8 p.m. in the evening, the following topics were discussed:

"The Preparation of Coal," by D. W. Buchanan, president of the Bituminous Coal Washing Co., Chicago, Ill.

"Safety First." (a) From the Standpoint of the Miner, Joseph Pope, president of the United Mine Workers of America, District No. 12, Springfield, Ill. (b) From the Standpoint of the Operator, Thomas Moses, general superintendent of the Bunsen Coal Co., Westville, Ill. (c) From the Standpoint of the Mine Inspector, John Dunlop, state mine inspector, Peoria, Ill. Also a discussion of this topic led by Martin Bolt, chief clerk of the State Mining Board, Springfield, Ill.

"Modern Practice in Illinois Mines, as Illustrated by Some Recently Developed Mines." (a) The Buckner Mine, C. M. Moderwell, president United Coal Mining Co. (b) Cedar Point No. 5 Mine, C. C. Swift, general superintendent, La Salle County Carbon Coal Co., La Salle, Ill. (c) Saline No. 3 Mine, W. R. Johnson, general superintendent, Saline County Coal Co., Harrisburg, Ill.

On Saturday, May 10, the general subject of the conference was "Fireproof Mine Construction," and the various topics discussed were:

"Concrete in Mine Construction," by S. F. Allard, chief engineer of the Bunsen Coal Co., at Westville, Ill.

"Steel in Mine Construction," by Carl Scholz, president, Coal Valley Coal Co., Chicago, Ill.

"Modern Steel Tipple Design," by John A. Garcia, of Allen & Garcia, McCormick Bldg., Chicago, Ill.

"Fire Protection of Mines." (a) From the Standpoint of the Mine Operator, John P. Reese, general superintendent, Superior Coal Co., Gillespie, Ill., and Walton Rutledge, state mine inspector, Alton, Ill. (b) From the Standpoint of the Miner, Duncan McDonald, secretary of the United Mine Workers of America, District No. 12, Springfield, Ill. (c) From the Standpoint of the Mining Engineer, G. E. Lyman, mining engineer, Madison Coal Corporation, St. Louis, Mo.

The subject was then presented, "The Fireproofing of Mining Plants," by H. M. Wilson, chairman of the Mine Committee of the National Fire Protection Association.

Illinois as a Mineral Producer

By E. W. Parker*

SYNOPSIS—Illinois enjoys the unique distinction of having the center of mineral production for the United States within her boundaries, and ranks second among the producing states. Although exceeded by West Virginia in coal tonnage produced, the gross value of Illinois output is the greater.

A general but somewhat erroneous idea prevails that the Rocky Mountain and Pacific Coast States are our mining states, probably because the bulk of our supply of precious metals and the larger part of the output of copper comes from that portion. The fact of the matter is that fully two-thirds of our mineral production comes from the states east of the Mississippi River, and these Eastern States constitute only a little more than one-fourth (28.8 per cent.) of the total area of the United States, exclusive of Alaska and our insular possessions.

The center of mineral production, determined in the same manner as the Census Bureau arrives at the center of population, is located in this state of Illinois—in Cass County, about 90 miles north of St. Louis and 50 miles east of Quincy. The rank of Illinois as a mineral-producing state depends upon whether we consider iron ore or pig iron as the basis of iron production, but in either case it ranks among the first three or four. As you all well know, Illinois is not a producer of iron ore, the furnaces here obtaining their supplies of ore from the Lake Superior region, but Illinois is one of the three leading states in the manufacture of pig iron, being exceeded in this respect by Pennsylvania and Ohio, both of which produce some iron ore, but depend upon Lake Superior for by far the larger part of their supplies.

In 1911, with pig iron as the basis of production, Illinois had a total output valued at approximately $137,400,000 and was third in rank, with Pennsylvania first and Ohio second. If we substitute iron ore for pig iron in our statistical compilations, the value of Illinois' production drops to $106,230,000, but Ohio takes a bigger drop to less than $100,000,000 and Illinois comes second as a mining state and without reflected credit from the manufacture of ore mined in another state.

Illinois owes its high rank among the mineral-producing states principally to the extensive development and intelligent utilization of the coal resources with which she has been so bountifully endowed. The state has 102 counties, and coal is mined in 51 of them, which is more than in any other state in the Union, not excepting Pennsylvania. In point of coal tonnage Illinois has been exceeded in the last three years (that is 1909, 1910 and 1911, the figures for 1912 not being available) by West Virginia, but in point of value Illinois continues to lead. In 1911 West Virginia's coal production exceeded that of Illinois by over 6,000,000 short tons, whereas in value the output of Illinois was the greater by nearly as many dollars ($5,840,000). The cause usually assigned to this is that the cost of mining per unit of output in Illinois is higher than in "unorganized" West Virginia and this is doubtless true to some extent, but compensation for this condition is secured through the relatively local markets with which the operators of Illinois are blessed.

This state ranks third as a manufacturing state, with New York first and Pennsylvania second. West Virginia, her close and for the last three years her successful rival in coal production, is of relative unimportance as a manufacturing state (ranking twenty-ninth) and must seek an outlet for her coal in distant markets. All of the coal production in Illinois, on the contrary, is consumed within her boundaries or in immediate adjacent territory, and, relieved of long distance rail haul, the trade can bear within limits, a higher cost of production. No person here present, nor any one familiar with the quality of the coal produced in the United States, will claim that the average of Illinois coal is of as high quality as that of West Virginia's product and yet in 1911 the average value per ton at the mines was $1.11 for Illinois coal, and 90c. for West Virginia. In 1910 the corresponding values were $1.14 and 92c. The moral is obvious. Use your raw material at home.

In addition to consuming her own coal, Illinois uses large quantities of the West Virginia product, and some from Pennsylvania and Kentucky. Within the last two or three years, owing to the construction of large by-product coking ovens at Chicago and Joliet, Illinois has pushed to the front as a manufacturer of coke, but the greater part of the coal used (fully 80 per cent.) comes from West Virginia. Some of the Illinois coals possess coking qualities, but do not make satisfactory furnace coke. An entirely satisfactory coke is made at Joliet, using a mixture of 80 per cent. West Virginia and 20 per cent. Illinois coal.

Of the 51 counties in the state, two (St. Clair and Williamson) produce over 5,000,000 tons each; two others (Madison and Sangamon) produce over 4,000,000 tons, and several others produce from 1,000,000 to 3,000,000 tons. These are large figures, but shrink in comparison with two counties in the bituminous region of Pennsylvania, Fayette and Westmoreland, whose combined tonnage equals that of the entire state of Illinois and with two others, Luzerne and Lackawanna, in the anthracite region with about the same aggregate output. But then Pennsylvania's total production of anthracite and bituminous coal is four and a half times that of Illinois.

Second in importance among the minerals of Illinois is petroleum, the development of which in significant quantity is part of the history of the last decade. Prior to 1905 the petroleum production of Illinois was measured in hundreds of barrels; it is now reported in tens of millions. They "struck oil" in Illinois in 1905, and in the following year the wells yielded nearly 4,500,000 bbl., jumping to nearly 25,000,000 in 1907, since which time the production has been between 30,000,000 and 35,000,000 bbl. annually.

Illinois now exceeds both Pennsylvania and West Virginia in the production of petroleum and is indeed the leader in this respect among the states east of the Mississippi River. It ranks third among all of the states, be-

*Statistician, the U. S. Geol. Survey, Washington, D. C.

Note—Abstract of an address delivered at the dedication of the new buildings at the University of Illinois.

ing exceeded only by California and Oklahoma. Natural gas is produced in Illinois, but in relatively small quantities, and is used principally locally. The production of gas is valued at only approximately $600,000 per annum.

As stated earlier in this discussion, the manufacture of pig iron is not included in the mineral industries of the state, as it is not based or dependent upon the development of natural resources within the state, but it is a manufacturing industry of large proportions and deserves special mention. As a manufacturer of pig iron, Illinois ranks third among the states, the total output in 1911 (an "off" year in the iron trade) being valued at over $31,000,000. In 1910 when conditions were more nearly normal, the pig-iron product of Illinois was worth $41,500,000.

In 1910 Illinois produced 2,688,000 long tons of steel ingots and castings. In 1911 the production decreased 550,000 tons. This was due to the general falling off in iron and steel production in that year. As in the manufacture of pig iron, Illinois ranks third in the production of steel ingots and castings, although now rather closely pressed by Indiana, whose production of ingots and castings amounted in 1911 to about 1,600,000 tons.

Excluding pig iron from consideration, Illinois stands second in the 50 states and territories comprising continental United States, and contributes one-sixteenth to the annual mineral production.

Steel in Mine-Construction Work

By Carl Scholz*

SYNOPSIS—The author believes that the future will bring an increased use of steel in mine work. Steel construction, if not too heavy, is as cheap as wood and pays even where temporary. Steel tipples can be moved to new locations when the coal is exhausted. A description is given of a shaft which was cheaply lined with steel and concrete.

The tendency to secure greater safety and the development of mines, larger and of longer life, have brought about a change in the character of the material used for construction purposes, both above and below ground. Up to a comparatively short time ago, wood was used entirely for the construction of coal tipples, head frames, and buildings on the surface; the only metal used was for the screens, which were of simple design and usually only planned for a single separation. Already, however, wooden tipples are no longer built, except for small country mines, and steel and concrete are used almost exclusively for the surface plants.

No. 1 Plant Consolidated Indiana Coal Co., Dallas, Ind. An Escapeway Is Being Constructed on the Right on a 17-Deg. Slope, by Which Men Will Enter Mine. No Men Will Be Hoisted

Light Steel Tipples as Cheap as Wooden Construction

Steel tipple construction has undergone a very satisfactory change during the last ten years; prior to that time the steel tipples were clumsy imitations of the wooden structures and were built without consideration of the correct strength and location to secure the best results. The earlier tipples were much too heavy. Usually, 12-in. double-channel columns, elaborately laced, were used to take the place of 12-in. square timbers. This made a structure strong enough to raise a heavy locomotive, and the resulting cost prevented extensive adoption of steel tipples.

With modern engineering, however, a properly designed steel tipple is no more expensive than a like wooden structure of equal strength and it has so many advantages that there can be no question of the advisability of replacing wood by steel. The elimination of fire risk alone is of much importance, not only on account of the saving in insurance premiums and possible property loss, but because of the further injury to business should a fire occur in the rush season. Owing to fires for heating purposes being used during the winter months when business is most brisk, more conflagrations occur during the busiest period of the year than during the summer. The use of steel tipples enables the designer to place the supports some distance away from the shaft, and the "A" frame type has become popular and is extensively used. With a tipple of this design the wear of the shaft lining does not affect the structure because the supports are not weakened by the deterioration of the shaft. Even caving would not affect the supporting foundations.

*President, Coal Valley Mining Co., 141 Van Buren St., Chicago, Ill.

Note—Paper read on May 9, 1913, at the dedication of the Transportation Building and the Locomotive and Mining Laboratories of the University of Illinois, Urbana, Ill.

Where fireproof shafts are used, the three-leg tipple, which has been exploited by a Chicago engineering firm, can be used advantageously and at a minimum cost. The figures accompanying this article show different views of one of these tipples which is now being erected.

A Steel Tipple Can Be Re-erected in a New Location

Within the last two years I have developed two new mines, both of which will have a life of approximately ten years. One was a shaft mine and was equipped with a steel tower, bolted so that upon extraction of the coal, it can be taken down and removed to another location. In its present installation only three tracks were needed for the preparation of the coal, but the tower was built for a four-track tipple, which may be wanted at the second location.

The second mine was entered by a slope, and since it is expected to be the last slope mine which our company will develop and there would be no further use for the bents, wooden construction was adopted. Thirteen months after this mine began operation, the tipple was destroyed by fire, and the resultant losses would have paid for the steel construction even though it would have been wasted entirely upon the extraction of the coal at this locality.

The other buildings on the surface, and particularly the boiler and engine houses, must be fireproof and much steel and iron is used for this purpose, particularly siding, roofing and roof trusses. The contents of these buildings are nearly all steel and iron.

Use of Steel in Shafts

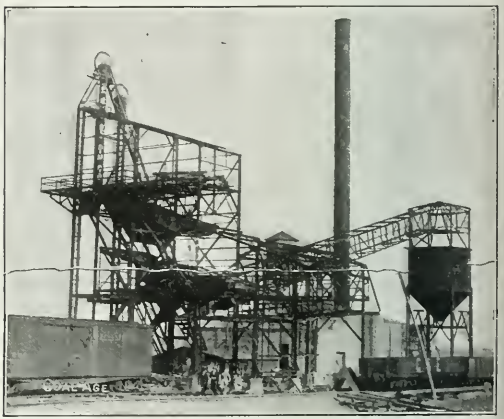
Fireproofing of shafts is regarded as important for safety, and many state laws require such construction. In large and important mines a permanent shaft lining is desirable because only by this means can delays due to frequent repairs be avoided. Steel frames similar in design to wooden sets for two- and three-compartment shafts have been installed with steel sheeting as lagging. This construction, however, is expensive and has not met with much favor.

I recently designed a modification of a steel shaft lining and it is installed at Shaft No. 1 belonging to the Consolidated Indiana Coal Co. and located at Dallas, Iowa. The arrangement of steel in this design provides for the principal members to be placed vertically instead of horizontally, as is the case when timber is prefered. Eight I-beams are used—four near the outside corners of the cages, two in the center of the cages and to these the buntons are fastened, and two on the sides to which the outside guides are attached. The shaft is of elliptic cross-section. The height of the I-beams ultimately forms the thickness of the concrete lining. In sinking, they are fastened together on the outside with curved angle irons bolted to their flanges, spaced about 5 ft. apart, and thin lumber lagging is used to prevent the caving of material.

When the bottom of the shaft is reached, the concrete is put in from the bottom to the top by clamping short form panels to the inside flange of the upright I-beams. These inside forms are made from 3 to 5 ft. in height, and ordinarily two sets are sufficient to enable concreting to progress continuously, the sets being used alternately. In the Dallas shaft this wall is made 7 in. in thickness and the outside lagging was left in place, with openings at intervals to permit the concrete to tie firmly into the rock surrounding the steel frame. The advantage of this steel and concrete combination is that the fabricated steel can be put in with very little expense and without the employment of skilled labor. Sections are bolted together with fish plates, and each section is made self-supporting by having a brace riveted to the outside of the I-beam, which rests in the rock or is supported by a shore or prop safely embedded in the shaft wall.

System which Makes Steel and Concrete Lining Cheaper than Wood

By this means not much attention need be given to the plumbing of the shaft as it is sunk, because the steel frames can be shifted into the proper position as the concrete is placed. The old method of putting in con-



Plant Being Constructed for Consolidated Indiana Coal Co., Dallas, Iowa

crete shafts by the use of wooden forms is complicated and requires much skilled labor and involves delay, because the forms must be very carefully set before the concrete is poured in order to have the required alignment for guides and buntings. In the Dallas shaft the vertical I-beams were made in 15-ft. sections, and in soft material a blind ring slightly larger than the completed shaft was used to permit lagging down to the very bottom of the excavation. Whenever the proper depth was reached and permanent steel frame was installed, the temporary rings were removed and the lagging adjusted itself to the permanent belts.

The weight of material in this construction, including 45-lb. steel rails for guides and the $\frac{1}{4}$-in. reinforcement rods six inches apart, is about 165 lb. per foot of shaft, and is less costly than the amount of lumber required for the same strength. In other words, what has been proven in tipple construction also applies to shaft lining. The method of lining a concrete shaft from the surface downward is as reasonable as would be the construction of a chimney from the top down.

The Steel Tie

In the mine workings proper, steel is used for various purposes. The oldest and most extensive application is for rails on the haulageways. Formerly wooden rails were used exclusively and on the more important roads iron

straps were placed on the upper surface. Later, 8- and 12-lb. iron rails were used, but with the increased weight of cars and motive power the important entries are now laid with 50- and 60-lb. steel rails bedded in rock ballast. Steel ties are becoming quite popular, and while at first thought, the expense seems prohibitive, considering that a steel tie for a 36-in. gage costs about 35c., whereas a wooden tie costs about 7 or 8c., the saving in wages and the reduced number of ties which are then required make steel more economical than wood under certain conditions.

Where the mine bottom is hard, steel ties can be spaced from 4 to 6 ft. apart enabling the base of the rail to rest on the floor and thus carry the load. The ties principally prevent the spreading of the track. The reduction in height required is important in low beds, and the ability to use steel ties over and over again with very little cost for recovery makes the steel ties more economical than wood.

Miscellaneous Use for Steel

Steel I-beams have been used for many years around shaft bottoms and on partings where wide entries have to be maintained, but the use of specially made steel props and cross-bars is of more recent adoption. Special H-sections have been made and found to be economical under certain conditions. The greatest strength of steel results in the use of smaller sizes which require less excavation for the same finished clearance, and the saving of wages in bolting these sets together, as compared with the costly preparation of timber, brings down the first high cost of the steel frames.

The rapidly increasing cost of timber and the damaging effect of mine air which results in dry rot warrants the investigation of these frames in many localities. Practically all of the underground equipment has been changed to steel, including mine cars, which formerly contained much wood. Locomotives have replaced animal power, and there is no part of the mine operation into which steel does not enter to a greater or lesser extent, beginning with the tools with which the coal is brought down.

Steel is now used in the cars into which the coal is loaded, in the track over which it is hauled, in the steel rope by which it is hoisted, and in the surface buildings which are used for preparing it: and yet twenty years hence we will see more new uses for it than have been found in the last twenty years.

Fire Protection Above and Below Ground

By G. E. Lyman*

SYNOPSIS—A summary of the methods used in fireproofing mines. The Illinois laws relative to the fire menace are perhaps as strict as any, but the author believes that they do not cover all the precautions which should be taken.

The broad, humanitarian features involved in fire protection will alone make the question command the earnest attention of all, and the engineer realizes that every step taken in this direction is not only in keeping with the spirit of the day, but is a policy that pays well in dollars and cents.

If there is any line of effort in which the energies of the mining engineer should be especially centered, it may be said to lie in these directions:

1. The adoption of every possible means of preventing a fire getting started, both above and below.
2. The planning and installation of the best and most complete fire-fighting equipment possible to obtain, including every available provision for rescue and escape, so frequently needed in fires below.
3. The organization of a competent fire-fighting corps, whose discipline and efficiency shall be maintained by frequent practice.

The Fireproof Plant of the Ohio Valley Mining Co., West Frankfort, Ill.

The labors of our commission for the revision of the mining law have given Illinois some advanced legislation in this direction, making compulsory many preventive measures in new developments, and the installation of certain fire-fighting equipment in old mines. The con-

*Mining engineer, Madison Coal Corporation, Glen Carbon, Ill.

Note—Paper read on May 9, at the dedication of the Transportation Building and the Locomotive and Mining Laboratories of the University of Illinois, Urbana, Ill.

scientious engineer will recognize that no statute, however broad, can take care of every detail in widely differing conditions of operation, and after satisfying himself that the law is fully complied with, he will make a further careful study of the individual conditions to be met and endeavor to provide such additional safeguards as he can devise for the better protection of life and property.

Fireproofing at the Surface

One of the first things he would consider in planning the surface plant of a new development would be the design of fireproof structures throughout, making them of brick, masonry or reinforced concrete, with modern structural-steel tipples, making the floors of these, as well as the bin linings, concrete or some equally fireproof material, so that it would be well nigh impossible for a fire to occur on the surface.

as well as an independent gravity head, so that it may be thoroughly reliable.

In certain places like wooden fan houses and tipples, means of flooding the structures through automatic sprinklers, as well as perforated pipes handled by valves outside the buildings, may save great losses. The value of steel doors to cover the shafts in case of fire is too obvious to dwell on at length.

The practice of allowing waste and other such material to accumulate is extremely dangerous, and the time required in frequent inspections with the idea of eliminating this practice is well spent. The condition of the electrical wiring, above and below, and of the cables in the shafts, is important.

Fire Protection in the Mines

Within the mine itself much can be done toward preventing fires by the elimination of everything combus-

The Buckner Plant of the United Coal Mining Co. Is Completely Fireproof above Ground and a Model of Incombustibility Underground

The fan would be housed in such a manner as to have nothing inflammable about it, outside of the oil in the journals, and would be set back a sufficient distance from the shaft to eliminate chance of injury, even though the entire shaft lining should be burned out. The boiler and power houses should be fireproof throughout, so that they could be operated if every other part of the equipment is involved in a fire.

However thoroughly fireproof the plant might be considered, it would yet be the part of wisdom to install a water system with an ample number of fire plugs at convenient points in and about the buildings, with hose connected ready for instant use. Some of the most disastrous fires have been where the contents of fireproof buildings were consumed.

In handling an old plant, the need of the water system just mentioned is doubly apparent, and altogether too obvious to require comment. Regular fire drills and the actual use of the equipment at frequent intervals are essential to its maintenance in proper condition. If possible the system should be connected to a power pump,

tible as far as possible, especially around the bottom and in the stables, oil houses, etc. The replacing of heavy lagging and timbers near the bottom, and in permanent entries, with steel and concrete, will be a matter of economy in maintenance in a property of long life, which will justify the expenditure required entirely aside from its value in eliminating the chance of fires. Such work is required by the Illinois law in new mines, within a certain area near the bottom, but its application to a modern mine can be economically extended much further.

The fireproofing of the shafts is a wise requirement, and one entirely in keeping with modern development.

The fires which cause great loss of life below generally involve the fan house, tipple, shaft linings, stables, or other like critical points. Owing to their volume and fierceness, these fires poison the entire mine atmosphere so rapidly as to render it difficult to get the men out. Here is where the value of good fire-fighting equipment, backed up by organization and discipline, becomes apparent. The first few moments are vital and in ninety-nine times out of a hundred, an organized force,

not allowed to grow stale through lack of practice, can quickly extinguish a blaze at the start. In fires of this character the value of adequate and well maintained escapement ways becomes apparent, and they should be made familiar to the men by requiring them to travel frequently through them.

The writer is a firm believer in the value of perforated sprinkling pipes in the stables and other critical points. These are operated by outside valves and are installed in addition to the automatic sprinklers required by law.

The water supply for the underground system should be not only connected to a standing head on the surface as required by law, but also to the pumps on both surface and bottom, so as to provide for all possible emergencies.

Tipple of Chicago, Wilmington & Vermilion Coal Co., Five Miles Southeast of Christopher, Ill.

Fire in the Coal

Where the coal seam itself is of such a character as to fire easily, a special study of conditions will be necessary to determine the most practicable precautions to take, and the details of such special methods of shooting, caring for machine cuttings, gob, etc., as may be determined therefrom, must be most rigidly enforced by the management. Fires on the inside, such as gob fires, both local and extended, and fires of the seam itself, generally offer less danger to life than to property, although the dangers to be encountered by the limited number who attempt to control them are often of the gravest character.

Opinions as to the proper methods of attacking such fires differ widely, and their discussion cannot properly be attempted here, but as to the necessity of the best and most complete equipment for handling them, there is no room for argument. Every mine should have available in addition to the usual small chemical extinguishers, a couple of large capacity mounted on trucks, which can be rapidly taken to the scene of action.

Iron dump cars, to be used in loading out a fire and disposing of it in that way, form useful equipment, and during ordinary operation can be used to advantage in handling dirt and refuse from roads and air courses, so as not to be idle capacity.

When pipe lines run over the mine extensively, as in cases where long-distance pumping is done from many sumps, it is an easy matter to arrange the connections so that the pump pressure can be turned into the suction lines. The writer has seen this done to most excellent advantage, and is a firm believer in its desirability. In cases of sufficient emergency, even air transmission lines may be thus pressed into service.

Oxygen helmets will often enable explorations of a fire territory to be made that could not be attempted otherwise, and may even permit of taking lines of hose or chemical extinguishers to the very seat of the trouble. It becomes necessary, therefore, for any mine desiring the most adequate fire protection to have its own equipment of helmets, pumps, supply tanks and all accessories, including pulmotors and first-aid supplies. The time lost in getting one of the state rescue cars on the ground may allow the fire to make such headway that nothing but walling off the territory can be done.

The saving to a company in a single bad fire alone could easily pay for the cost of its own rescue station and helmet equipment, while a group of mines operated by individuals could divide the expense of a common station between them and make the burden very reasonable. Their object would not be to supplant the state rescue cars in any sense, but merely to take advantage of the first vital moments, and often by such action not only avert a serious calamity, but nip in the bud what might otherwise develop into a difficult and dangerous job for the state corps. Such individual stations would, of course, be in charge of competent men who had received thorough training at the state stations.

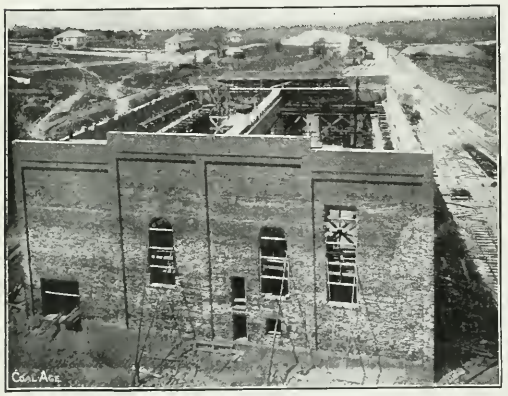
A frequent and often serious source of trouble in fighting large fires in the workings is the lack of accurate maps, and the consequent difficulty of determining the best way of walling off the territory affected. Only too often it happens that some unrecorded opening into the fire area supplies air sufficient to keep it alive, and at the same time is very difficult to locate. An accurate map would indicate at once the best way to wall off the fire and lose the least amount of territory thereby.

Where companies maintain their own engineering departments, this question of maps should, of course, give no trouble. But where it is the practice to have an outside surveyor extend the map annually to comply with the law, accuracy in details cannot be expected. Granted that the man doing the work is thoroughly competent, there will be portions of the mine inaccessible to survey. Accurate, detailed mapping requires frequent extensions, and the remedy for individual operation is for a few to

combine to secure the exclusive service of a competent engineer, and furnish him adequate help and facilities for handling their work in a manner commensurate with its importance.

Even where an adequate engineering department is maintained, and frequent map extensions made, places will frequently be found which cannot be entered for survey. The writer's experience has indicated that this situation can best be met by a system of monthly or semi-monthly reports, showing the length of every working place which has been closed since the last report was rendered, the number of cross-cuts right and left, and other pertinent information.

I do not allow these reports to be used in extending maps unless the engineers are unable to enter the place and measure it themselves. In such cases the desired information is obtained from the reports, and the place shown on the maps in dotted lines, thus differentiating it sharply from the work of the engineering department, and placing before the mine management a visible re-



THE LARGE FIREPROOF POWER HOUSE OF THE CHICAGO, WILMINGTON & VERMILION COAL CO.

minder of their responsibility for that portion of the map.

As the average number of places closed monthly in even a large mine is not great, it consumes little time to handle the report carefully, and the writer has found that it is possible to bring about a feeling of joint responsibility for this part of the work with the mine management which is helpful in many ways.

ISOLATING FIRES

There are few room-and-pillar mines which cannot be advantageously worked on the panel system, or some modification of it, which will permit the walling off of any fire territory with the least possible disturbance to the balance of the mine. The importance of having the maps show faithfully every connection between adjacent panels is obvious, and in the modern mining organization no departure in developing the mine should be permitted from the projections furnished to the mine manager for his guidance, unless the matter is properly considered and authorized by the main operating authority.

It is not uncommon to see a mine entirely, or nearly shut down on account of a fire which should ordinarily have been closely confined in its effects, and this is due to having the workings so cut up that isolation is difficult, and the ventilation hard to control. I believe that the main air courses in either direction from the shaft bottom out to the limits of the workings should be considered just as important as the shaft itself, and be just as carefully maintained. This, in connection with a powerful fan, will enable the circulation of a great volume of air at comparatively low velocity and pressure, which will permit a considerable increase in the number of splits, thus reducing the amount of territory affected by a fire in any one portion of the workings.

The maintenance of an abnormal amount of ventilation is not advocated, but the use of main air courses of more than ordinary capacity and excellence is strongly urged, so that the ventilation of the side entries can be treated as individual problems, as much air being diverted into each one from the main air courses—the arteries, so to speak, of the mine—as its individual requirements may demand.

With this method of ventilation established, there should be small necessity of ever sealing up more than one entire cross entry at the most. There are probably very few of us who have not known of instances where large mines were ventilated on two or three splits, and where a comparatively small fire caused the sealing off of perhaps half the workings.

Illinois as a Coal Producer

BY A. J. MOORSHEAD*

It recently became my duty, on account of prospective legislation, to prepare statistics to show the coal tonnage produced in Illinois and the service it required from the railroads.

OUTPUT OF COAL IN ILLINOIS, 1912

For the year ending June 30, 1912, the coal mines of Illinois produced	57,514,240 tons
Of that amount, there was used for power and wasted at the mines	2,471,326 tons
Taken by railroad locomotives at mine chutes	924,854 tons
Sold to the local trade at mines	2,615,678 tons
Leaving a total to be shipped in cars	51,502,382 tons
Which, on the basis of 46 tons to the car, would require 1,120,000 cars to move the product.	

Such figures in these days, when we commonly reckon, nearly everything in millions, do not seem great or astonishing, but when we couple the 1,120,000 cars together and figure them as averaging 40 ft. in length, we have a string of loads approximately 8500 miles long, and that equals one-third of the circumference of the earth. Or, in order to describe further the length of that train of cars I might note that it would reach from New York to San Francisco and back, and there would still be enough loads left to reach from Omaha, Neb., to Chicago, Ill., and from there to New Orleans, La., via the Illinois Central R.R.

It will be furthermore interesting for you to learn that on the basis of 75 empty and 35 loaded cars to the train, carrying 40 tons each, it would require nearly 43,000 trains to market the production of the mines of Illinois for this one year only.

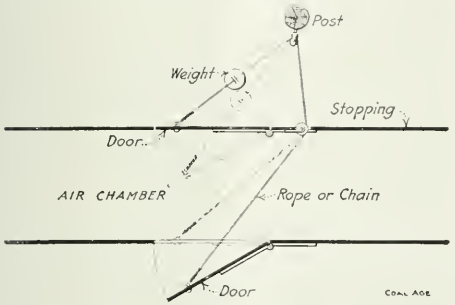
*President and general manager, Madison Coal Corporation.

Note—Preamble of an address delivered May 9, 1913, entitled "Organization as Affecting Mining," read at the dedication of the Transportation Building and the Locomotive and Mining Laboratories, University of Illinois, Urbana, Ill.

Keeping the Doors Closed

A novel method of keeping one door closed when the other is opened in an air chamber at the head of an exhaust shaft has been adopted at a mine in Roslyn, Wash.

Both of these doors, which are on opposite sides of the air chamber, swing on their hinges in the same direction. A chain or rope is fastened to the first door on the side opposite to the way in which it opens, passes around a pulley attached to a post, thence through a suitable opening in the stopping, and is attached to the second door at a point similar to its attachment to the first. Enough slack is left in the chain to allow either door to be fully opened when the other is closed.



Two Doors Closed by a Weight on a Rope or Chain

At a suitable point between the first door and the post, a weight is attached to the chain or rope. This is sufficiently heavy to pull both doors tight shut under ordinary circumstances.

The doors in question are near the fan at the top of the shaft on the return airway, which also serves as a manway. This arrangement prevents any careless person from short-circuiting the air, as only one door can be fully opened at a time.

Producing Inert Gas to Prevent Explosions

John Harger in his book on "Coal and the Prevention of Explosions and Fires in Mines," gives the following methods of producing the mixture of carbon dioxide and nitrogen whereby he proposes to make the mines free from explosions.

"An atmosphere with an abnormally low percentage of oxygen is readily produced by mixing ordinary air with the calculated amount of nitrogen and carbon dioxide, which mixture is easily obtained by the combustion of suitable fuel, but great care must be taken that it contains no carbon monoxide. The exhaust from a gas engine, with its exhaust apparatus suitably modified, will give excellent results, if the air supply is controlled and complete combustion attained. This can be assured by leading the hot gases over a catalytic surface.

"Using a 25-hp. gas engine, the exhaust gas was found to be so hot (1100° F.), that complete combustion was readily effected without the use of a strong catalyst. All that was necessary was to pass the hot gases, as they left the cylinder, over ordinary broken firebrick, which offers plenty of surface.

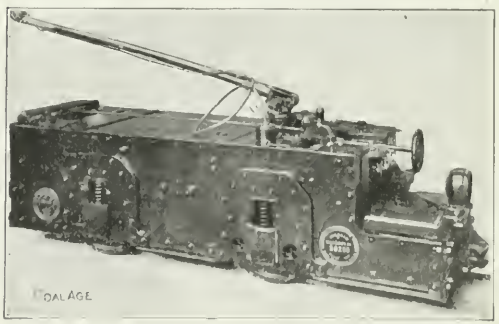
"But in many cases it would not be convenient to use such a source, and the products of combustion from a gas-fired or coal-dust-fired boiler would be preferred. The exhaust gases from these would certainly not be so hot as 1100° F., but, by the equilibriating device described below, complete combustion can be induced, without any excess of oxygen, carbon monoxide or other unburnt material being left in the gas. This device can also be used with the gases from an ordinary Lancashire boiler,* the gas being passed through the apparatus before the economizer is reached.

"The equilibriating apparatus (called an equilibriator) consists of an iron vessel divided into two parts; the front part is packed with ½x1-in. pieces of special bricks made of a mixture of clay and titaniferous bog-iron ore, or any other suitable catalyst, while the second part is packed with granulated copper or scrap copper wire. The bog-iron ore bricks have the property of causing combustible gas and oxygen to react at low temperatures, and by this means the last traces of gas are oxidized to carbon dioxide and water.

"Any carbon monoxide remaining is removed by the copper oxide, while if there is an excess of oxygen it is removed by the copper. To oxidize some of the copper a slight excess of air is introduced when the apparatus is started, but in normal working, when sufficient copper oxide has been once formed, only the exact amount of air required for complete combustion is allowed to enter."

An American Mine Locomotive in Japan

The accompanying illustration shows the construction of a Baldwin-Westinghouse electric mine locomotive at the mine of the Ishikari Coal Co. in Japan. This machine was designed for a track gage of 1 ft. 8 in., measures 8 ft. 9 in. in length, has a wheel base of 3 ft. 6 in., stands 3 ft. ½ in. above the track, has a total width of 2 ft. 11⅝ in. and weighs 6000 pounds.



General View of Locomotive

The frame of this locomotive is of plate steel. The drivers are 20 in. in diameter and are actuated by two motors hung inside the frame and wound for 500 volts. The machine is provided with sanders for all four of the wheels and two electric headlights. It is well designed, compact and well protected from dirt and dust.

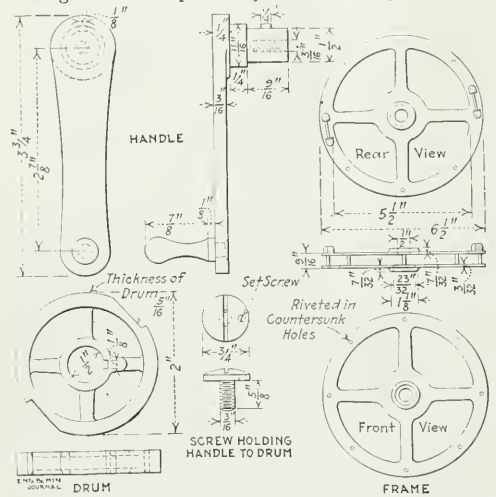
*A boiler with two large flues passing horizontally from front to back end. In these, combustion takes place. Probably any other boiler would serve as well.—Editor.

Reel for Underground Tape

By Charles H. Scheuer*

Experience with several varieties of tape reels in underground work led finally to the adoption of the Purdue model, manufactured by the Keuffel & Esser Co. It was found that considerable annoyance was experienced from the loosening of the screws, several of which entered into its construction.

To remedy this, certain improvements were described to the manufacturers and the reel shown in the detailed drawing was made up. The particular changes are: An



Reel for 100-Ft. Underground Tape

enlargement of the diameter so as to accommodate a muddy tape; the substitution of countersunk rivets for screws through the spreader washers between the two sections of the frame; the use of a countersunk riveted knob for the handle knob instead of a swiveled and screwed ring; and the fastening of the handle into the drum by a flat-headed screw, itself fastened by a setscrew. The result is a rigid and durable reel which can be taken apart as far as necessary by loosening the setscrew, removing the flat-headed screw and so releasing the handle from the drum. For a 200-ft. tape, the diameter should be increased to 7½ in. in the clear.

The Burning of Coal at Outcrops

The "Report on the Coal of Grand Mesa and West Elk Mountains, Colorado," published by the U. S. Geological Survey states that:

"The coals of Grand Mesa are burned along the outcrop in many places. Indeed where the rocks are well exposed, it is difficult to find coal at the surface. In place of it the rocks are reddened by the heat from the burning coal, and in some places they have been melted and form 'clinker.' Where the coal is protected at the outcrop by a covering of soil or slide rock, it has taken fire in fewer places.

"In the Palisades and Rollins districts, where the coals are low-grade sub-bituminous, the burning in the exposed slopes has been general. Farther east, where the coals have been hardened by the metamorphic influences of the igneous mountains, burned areas are rarely found. Because of their exposure to the hot sun, the southward-facing slopes about Grand Mesa become dry and do not support enough vegetation to hold the soil in place. The rocks consequently have become exposed, and the coal is generally burned along the outcrop.

"The northward-facing slopes are not parched so quickly by the sun and are more completely clothed with brush, the roots of which hold the soil, and this in turn protects the underlying rocks. On these slopes the coal has not been burned so generally as it has been on the southward-facing slopes.

"The belief is general that the fires were started by the spontaneous ignition of the coal. There seems to be proof that fires have been started in some coal fields in this way, and there is good evidence that some mines have taken fire in the same manner, but apparently the theory of spontaneous ignition of the coal has been too generally accepted.

"Careful observations were made in this field for evidence bearing on this question, and although coal was found in all stages of weathering, ranging from freshly exposed faces to beds of slacked coal that must have been exposed for many years, not a single place was found where the coal at a natural exposure showed any indication of heating.

"It is a well known fact that dampness favors spontaneous ignition, yet in the Grand Mesa field the coal in the southward-facing slopes, which are dry, is burned much more generally than that in the damp slopes which face northwards. The coals of the dry, exposed sidehills would be ignited by forest fires much more readily than those of the damp, soil-protected slopes, and in the writer's opinion the burning of the coal in Grand Mesa is more due to forest fires than to spontaneous ignition.

Summer Meeting of Rocky Mountain Coal Mining Institute

At a meeting of the Executive Board, held in Denver on Apr. 15, it was decided to hold the next meeting of the Rocky Mountain Coal Mining Institute in Salt Lake City. A special train, consisting of a baggage coach, dining car and Pullmans, will leave Denver at 9 p.m., June 9, arriving at Rock Springs the following morning, where the day will be spent in viewing the most important properties in this location, arriving in Salt Lake City early on the morning of the eleventh..

The Institute will convene at 10 o'clock on the morning of June 11 and hold a session for the balance of the morning. The afternoon will be devoted to a trip to the Bingham copper properties, probably the most interesting in the world. The morning of the twelfth will be devoted to Institute business, reading of papers, etc., and in the afternoon a visit to Salt Air will be made, where the rest of the day will be spent. The thirteenth will be devoted to any Institute business which may remain incomplete, to auto rides about Salt Lake City, and to a grand concert in the Tabernacle.

Note—From the "Engineering and Mining Journal," Apr. 26.

*Chief engineer, Fayal district, Oliver Iron Mining Co., Eveleth, Minn.

As at present arranged, the party will leave Salt Lake City on the return journey, by way of the Denver & Rio Grande R.R., some time during the night of the thirteenth, and will stop over at one or more important coal properties on the way back. It is proposed also to spend three or four hours in Glenwood Springs, to give the members an opportunity to indulge in bathing in one of the finest pools in the West. From this point there will be a daylight ride through the Grand River Cañon and the Grand Cañon of the Eagle River, so that the beauties of this wonderful portion of the state may be seen by those who have not yet had the opportunity of traveling over the line in daylight.

The railroad fares for the round trip will be as follows: From Trinidad, $26.15; from Walsenburg, $24.75; from Florence and Cañon City, $24.50; from Pueblo, Colorado Springs and Denver, $22.50. The Pullman charge for the entire time will be $9.10.

Please remember that the special train will be made up in Denver and will not leave until No. 3 of the Colorado & Southern arrives. Any member living in Wyoming may make arrangements to join the party when the train reaches his station.

Members returning may alight from the special train at Pueblo, Cañon City, or any point most convenient for making connections with their homes.

Several interesting papers will be presented at the convention and a good time is promised to all.

The Institute will furnish an official badge for all members and friends in attendance, and each person is urged to bring his family or any friends who he thinks would be interested in making the trip or in the proceedings of the convention.

In order that the Institute officers may make arrangements for the train, it is urgent that each member signify immediately whether or not he will be able to become one of the party. Let everyone make arrangements to attend.

E. H. Weitzel,
President.

F. W. Whiteside,
Secretary.

Miners Plan to Organize a W. Va. Field

SYNOPSIS—At a meeting of delegates in Charleston it was decided to organize a new district of the United Mine Workers of America. This will include the New River, Gauley and Winding Gulf coal fields in West Virginia.

One hundred and seventy-five members of the United Mine Workers of America, representing practically the whole of the New River, Gauley and Winding Gulf coal fields of West Virginia met in convention in Charleston, on May 10, for the purpose of forming a new district of the miners' organization.

As originally intended, the meeting was to be in the nature of a conference between the delegates and the operators. There was, however, no response when the chair asked for expressions from operators present. Vice-President Hayes then informed the delegates that, in carrying out the promise of coöperation from the national organization, the International Board had decided to form a new district in West Virginia.

The morning session, on Saturday, was addressed, in turn, by National Vice-President, Frank J. Hayes, who called the meeting to order, by District President Thomas Cairnes and International Board Member Thomas Haggerty, who had just returned from the International Board meeting at Indianapolis. National President John P. White also spoke for over an hour.

The afternoon session was addressed by Senator Wm. Green, of Ohio, who is a member of the United Mine Workers, and the International statistician of the organization, and, finally, the convention listened to an address by Governor Hatfield.

President White, in his talk, viewed the history of the organization and set forth its ideals. He spoke at length of what is expected of the future in West Virginia and pledged himself to do all in his power to assist in the work which has been so well begun.

Senator Green's address was one in which great emphasis was placed upon the benefits of organization, and, incidentally, upon the struggles that precede every achievement tending toward the welfare of humanity.

Governor Hatfield paid a fitting tribute to the men who toil—in mine, mill and shop. He wished the delegates a pleasant day in the city and assured them, unequivocally, that they had nothing to fear from him as governor of the state. "I exact but one thing," he said, "and that is respect for the law. The miners stand as high in my estimation as the mine owner. Show me and I will be your protector."

He referred, briefly, to the settlement of the Paint Creek and Cabin Creek strikes and of his part in bringing about their settlement.

"I do not question your right to organize," he said, "the physicians, lawyers and the mine owners organize, and why should I question your right to the same privilege. I am your governor, and I prefer to be the laboring man's governor to any other man's governor, and all that I ask of you, as your governor, is regard for the legislative enactments of this state and due respect to your God. Do not regard me as an oppressor. Demand your rights as men but do it in a legitimate way, and you will have me as your governor, to protect you in securing those rights.

"Do not take the law into your own hands. If you suffer from the oppressions of a stronger hand, appeal to the law. I know it has been said that the law is controlled by a certain class; but before God I tell you the interests do not control me.

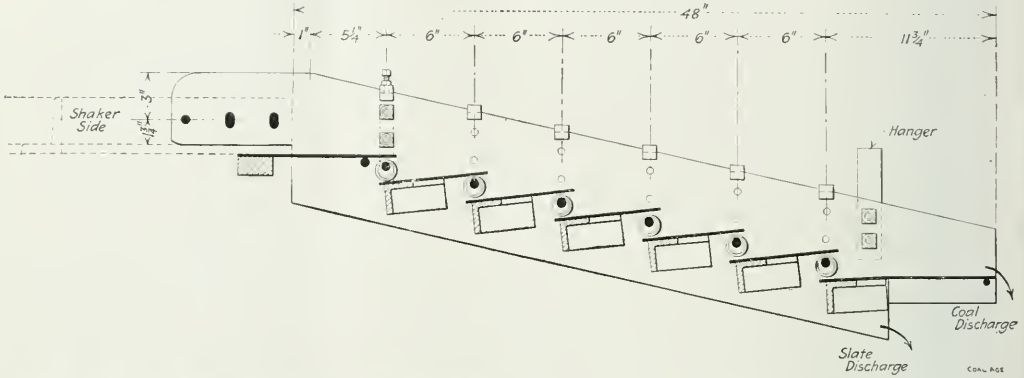
"Go about your work deliberately, lawfully, manfully. Demand your rights and you will achieve the victory. About the guard system, there is no necessity for guards in West Virginia or in any other state. The mine guard law is about to go into effect, and I promise you that I will see that the statute is absolutely and strictly adhered to and enforced.

"In conclusion, go about your deliberations like men. Do not put yourselves in the position of lawbreakers. Do the right. And, if a strike is necessary, and you act like men, you will have my protection."

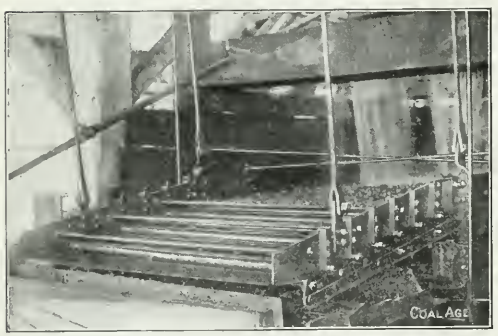
An Effective Slate Picker

The accompanying photograph shows a Mason & Allen flat slate picker in operation in a washery of the Hudson Coal Co. handling material containing 20 to 32 per cent. flat slate and throwing out 18 to 21 per cent. in the process. Tests of the droppings have never exceeded 3 per cent. coal and have been as low as 1 per cent.

The D. L. & W. R.R. is using these pickers on chestnut, pea and buckwheat coal. The machine is so constructed as to be attached readily to any standard coal shaker by means of bolts and suspension rods and is designed to separate flat slate and rock from the coal, as it passes from the shaker.



Cross-section of Picker, Showing Shelves or Steps and the Eccentric or Swinging Cylinders



The Picker at Work

This is accomplished by a series of horizontal plates rigidly fastened in a transverse position between the side plates in step fashion, so arranged as to permit a swinging cylinder, eccentrically pivoted to the side plates by means of adjustable boxes, to hang parallel with and under the front edge of each plate with an opening or space between the bottom of the cylinder and the plate below it.

This arrangement allows the flat slate and rock to pass back through the opening while the coal passes on over the plates to the chute. The cylinders swing automatically with the movement of the shaker and are controlled in the swinging movement by weighting.

The action of the machine is quick and effective, making the limit to its capacity difficult to estimate.

The simplicity of this device appeals to all coal experts. It is built to stand the severest usage, and is provided with adjustments to meet all conditions.

⁂

Rules of Thumb for Metric Conversion

Certain approximate relations between common metric units of measurement and their English equivalents exist. Albert A. Cary presents these in *Power*, Feb. 18, 1913, in the form of the following handy table:

Dimensions etc.	Unit Used	Converted to	Rule
Weight	Kilogram	Pounds	Multiply by 2 then add 10 per cent.
Length	Meter	Feet	Add 10 per cent. then multiply by 3
Surface	Square meter	Square feet	Add two 10 per cents, then multiply by 9
Volume	Cubic meter	Cubic feet	Add three 10 per cents, then multiply by 27
Capacity	Liter	Quarts	Add one-half of 10 per cent. (or 5 per cent.)
Temperature	Centigrade	Fahrenheit	Multiply by 2; subtract 10 per cent., then add 32
Heat	Calories per kilogram	B.t.u. per pound	Multiply by 2, then subtract 10 per cent.
Heat	B.t.u per pound	Calories per kilogram	Multiply by 0.556 (or divide by 6 and then by 3)
Pressure	Kilograms per square centimeter	Pounds per square inch	Multiply by 14.223 or divide by 0.07
Pressure	Pounds per square inch	Kilograms per square centimeter	Multiply by 0.07
Evaporation	Kilograms per square meter	Pounds per square foot	Divide by 5
Evaporation	Pounds per square foot	Kilograms per square meter	Multiply by 5
Distance	Kilometers	Miles	Multiply by 0.6 and add 5 per cent. of the product
Distance	Miles	Kilometers	Multiply by 1.6
Capacity	Cubic centimeters	Cubic inches	Divide by 16 (or by 4 twice)
Capacity	Cubic inches	Cubic centimeters	Multiply by 16

The rules are so simple as to be easily carried in the head, but for accurate results more complicated factors must be employed.

⁂

Substation Loads in Lackawanna Collieries

On page 713, issue of May 10, the table of Connected-Load Factor at Substations, states that the per cent. for the largest station is 32 and the per cent. for the average station is 29. These figures should be reversed. The other figures, which all show an opposite tendency, are correct.

EDITORIALS

Gasoline-Locomotive Costs

The cost of operation of the gasoline mining locomotive varies considerably with the conditions under which the machine is called upon to operate. The price of fuel and supplies, the wages of the driver and brakeman, the condition of the track, the grades to be traversed and the loads handled, all have a direct influence upon the cost per ton-mile.

With these locomotives, as with other machinery, it is but natural to expect that the cost would decrease as the amount of work done increases, and that the best results would be obtained when the locomotive is operated up to its capacity all of the time. Recent experiments in Europe appear to substantiate this idea.

The Geyser at Equality

The phenomenon at the Gallatin Coal Co.'s mine has occasioned general interest and it is differently termed by everyone according to his belief in what constituted the originating cause.

The author of the article we published last week accepts the more usual interpretation of the forcible ejection of water at Equality. The view is that taken by F. Rosbottom, the inspector of the district in which the mine is located and by several others. He regards the emission of water as resulting from the compression of the pent-up air. This action, however, would not have been violent. The air would have slowly pushed out the water, as soon as the surging flood had lost the velocity head with which it entered the mine.

If, however, a large and seemingly impossible body of air had escaped and filled the shaft for almost its full length, the downward weight of the shaft content would have been almost nil and the upward pressure would have been large. If there were another point of entry from the surface containing all water and no air, the pressure would be that of a body of water 80 ft. deep and this upward pressure would be exerted on what little water might be over the top of the shaft, which was full of air. Under those circumstances the water would have been lifted 80 ft. in the air if all resistance to its motion were removed.

Had the whole main entry and shaft become filled with escaping air, a still more unlikely supposition, the water might have belched out to a height of 120 ft. This gives the maximum elevation which the air-lift theory would permit us to expect.

The witnesses declare this elevation was exceeded. Whether their view is justified is questionable because there were few objects high enough by which momentarily to measure such extreme elevations in that flat country. The height of the second effluent column was probably estimated with more accuracy and the estimate was accordingly lower, namely, 260 ft., and even that hardly accords with the illustration we show.

Some have thought that an explosion took place, the water driving the air in old chambers on to a light left burning in some part of the mine. While the author of the article does not say whether gas is found in the workings, he does give a strong impression that the danger of flooding had caused the complete abandonment of the mine for such a length of time that there could not have been any light burning. The inspector says there was no mine fire in the workings. Hence there does not seem a leg on which this theory can stand, though unlikely solutions are permissible where there is so much uncertainty.

Another solution remains. The mine had never caved; the pressure of the water in the measures when the surface was submerged may have weakened the roof, causing it to fall later. Had the overburden to the grass roots descended slowly in the lowest part of the workings, the water might have been thrown up to a height of about 324 ft. If the roof fell where a certain amount of free fall was possible, the effect of its energy of descent would have been to make an even more violent effluence.

The mine is ruined and closed and it may be months before it is opened. Meantime the roof may fall and changes take place. The problem of the aqueous outburst may continue to be as mysterious as the violent projection of water from the West Kentucky Coal Co.'s shaft in the same section of the United States.

The Crescent, a small shipping mine, and the Sunnyside and Clover, which produce coal for local consumption were also flooded but were otherwise undamaged. No such geyser-like ejections, however, took place at these mines

Appointment Not Confirmed

The recent appointment of John Mitchell, former president of the United Mine Workers of America, by Governor Sulzer, to be the head of the state Department of Labor, in New York, marks the earnest desire of the governor to reorganize this department. A better man for the position could not have been selected than John Mitchell, who is universally conceded to be better qualified to fill this important office than any other person in the country. The fact that Mr. Mitchell has only recently removed his residence to New York State forms no adequate excuse for the rejection of his appointment by the Senate.

When that body refused to confirm the appointment of Governor Sulzer, in this instance, it placed itself in a position to antagonize the strong labor vote of the state. Mr. Mitchell has few enemies and many friends, not only among the labor classes, but among the large majority of thoughtful people, regardless of politics.

Governor Sulzer's appointment, in this case, met the general approval of the people of the state, who are well pleased with his determination not to abandon the hope of having the appointment of Mr. Mitchell eventually confirmed, at a special session of the legislature to be called June 18.

To say that we heartily indorse the appointment of John Mitchell as the head of the Department of Labor, in

New York State, would be to express mildly our appreciation of the work done by this man. Perhaps no one has ever handled more successfully than Mr. Mitchell the aggravated conditions that have existed, from time to time, between the mine workers and mine operators. No one has won so high a degree of the confidence and esteem of all classes, as this advocate of equal rights and justice.

Whatever mistake Mr. Mitchell may have made that led to the disregard, by the organization of which he was president, of a judicial mandate, it is still a matter of deep regret that recently the Court of Appeals of the District of Columbia has refused to reverse the decision of the lower court, by which Mr. Mitchell was declared in contempt. A further appeal to the United States Supreme Court is contemplated; and, although, from the nature of the case, little hope can be entertained as to the result, it can hardly be expected but that final sentence will be suspended. By this means, not only would the majesty of the law be upheld, but due respect would be paid to one whose tireless efforts have always been at the service of his fellow workers.

The Miners' Union

Unions seem necessary evils like armies, for the workman needs to defend himself as much as the nation. But against whom is his defense mostly directed?

Ostensibly every strike is a quarrel between employer and employee. Practically it is a battle between workingmen. Other operatives having received an increase in wage, the miner finds everything which he has to buy increased in price. So he strikes to make his employer charge those operatives an increased price for coal. It is a continuous struggle for life and comforts between man and man. The operator is only the go-between, the much berated middleman.

The necessity for the union might be removed if the operator would adopt a sliding scale, based on the right of the laboring man to buy so much of the other man's labor for so much of his own. Let the operators and miners form a bureau of experts to ascertain the articles purchased by miners and the amount of each type of purchase. Then let the board ascertain as nearly as possible the labor involved in the production of such articles under present-day methods of manufacture. The result would show how many hours of other men's labor were equivalent to the year's work of the miner.

This figure should be kept constant year by year, the miner's power of purchase increasing with the increased output due to improved methods of operation. The result might not be exact. There are some factors too hard to weigh with precision, but any solution seems preferable to annual or at least frequent strikes which, like wars, destroy more than they create.

The method of calculation advocated is at least as scientific as the method of hunger-strike and violence, which is a purely arbitrary attempt to adjust matters. Though our courts are not perfect, no one suggests a return to the trial by ordeal and though a bureau might be wrong in some of its conclusions, the labor struggle is still more unscientific and does not recognize the point at issue.

In fact, the strike often terminates in the defeat of one party because in the past that party has been most unjustly treated, because the laboring man has been deprived of the power of saving, or the operator prevented from securing a bank account.

It is time that it was clearly understood that any rise in wage of one class of employees must be taken out of the pockets of other operatives. There can be no federation of labor; there can only be a truce between workingmen, an arbitration of the wage war between them and the plenitude which results from the blessings of industrial peace.

Crazy Legislation

That an undue and unwise influence is being exerted by the prime movers in the United Mine Workers Organization to control legislation in Pennsylvania and force the passage of certain bills at the present session of the legislature, has been evidenced in a number of instances, by the acts of the Lower House. In no case, however, has this been made more clear than by the passage, Apr. 29, of the bill, House File, No. 1219, presented by Mr. Lenker, of Dauphin County.

The bill is an act to amend Section 7, of the act approved May 3, 1909. By this bill, which has just passed the House, the number of mine inspectors in the anthracite region of the state would be increased from 21 to 31, or nearly 50 per cent., and represent an increase of $30,000 in the annual cost of inspection of these mines. There is no question but that the number of inspectors should be increased in that district. The Anthracite Code Commission in their report recommended an increase of four inspectors for the anthracite mines, which, in their judgment, would be sufficient to meet the present needs.

It will be remembered that only recently the House passed the Schaeffer bill by a vote of 157 to 0. This bill emanates from the same source—the Mine Workers Organization—and makes all holders of mine-foreman certificates eligible to candidacy for the position of mine inspector, without further examination. The Mine Workers made an unsuccessful attempt to have this provision adopted by the Mine Code Commission, and are now endeavoring to force its passage in the legislature. It is amazing that Pennsylvania legislators would lend an attentive ear to these appeals, coming as they do from an unauthoritative source, while the recommendations of the regularly authorized Code Commission are allowed to languish.

Fires at Coal Outcrops

We quote today a statement of the Geological Survey relative to the crop fires in the Grand Mesa. The Survey follows the popular idea that water normally aids coal to burn. There is little probability that coal containing all the moisture natural to it is likely to be caused to burn spontaneously by the addition of water. The heat of hydration cannot take place without previous dessication.

On those faces of the hills where the coal is likely to be deprived of much of its natural moisture, we would naturally expect the coal to fire on being wetted if hydration is ever sufficient to account for the ignition of coal. It is in such dry and exposed places that the Survey has found the most frequent ignition and while it may be reasonably ascribed to forest fires, the cause may be due to hydration of the dried coal, despite the reasoning of the monographer.

SOCIOLOGICAL DEPARTMENT

The First-Aid Muddle

By a Physician

SYNOPSIS—The author believes that first aid should be standardized. Variation of methods confuses and disgusts the trained men. The advisory board of the American Mine Safety Association is not well chosen and the schedule of discounts recommended at last year's conference is amusing but worthless.

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To anyone who has had much experience in first-aid work in this country, it is quite evident that something is radically wrong with the system of instruction. In studying the reports of the work already accomplished, the investigator discovers a deplorable condition of affairs, though the first glance seems to show that rapid strides are being made in the education of the men employed in hazardous occupations.

The inquirer finds that first aid is being taught in the United States by many different organizations, chief among which are the American National Red Cross, the Bureau of Mines, the Young Men's Christian Association, the many separate first-aid organizations and the various companies which have instituted the work independently. These bodies are not working in harmony. Their instructors are teaching different methods of treatment and are recommending the use of different appliances. From a purely local viewpoint, this may not seem important. To those of us who hope soon to have as efficient a first-aid organization in this country as the St. John's Ambulance Corps is in England, it is a cause of much alarm.

Variation in Training Methods

Those present at the National Mine Safety and First-Aid Exhibition, at Pittsburgh, in the summer of 1911, were struck by the many different methods by which the same injuries were treated. Teams from different companies used wholly unlike methods in dealing with their problems. This had a bad effect upon the members of the various corps. They had come to the meet representing all the teams in their section and believing that they had been trained in the best methods. They found that there were many ways of treating the same injuries and there was no way for them to discover which were best. Returning home, they reported their discovery to the other teams in that locality and each organization demanded that their instructor teach them the best methods.

Their physician found in turn that there was no way in which he could discover the best treatments and to retain the respect of his class, he was forced to teach several methods of treating the same injury. This, of course, resulted in making still more difficult a subject already too complicated for the untrained mind. As a result, many organizations disbanded and countless men discontinued the work because it was too hard. This is wrong. First aid can be made more simple and must be so rendered before we can hope to derive the benefits which it offers.

That there should be a uniform system taught is evident. What that system should be is not so clear. While it is true that there is one best way of dealing with any injury, the fact is that no one absolutely knows what that best way is. Many men think they know but they can have no legitimate assurance.

The Defects of the Conference on First Aid

Recognizing this condition, the U. S. Bureau of Mines called a conference on first aid to meet in Pittsburgh, Penn., on Sept. 25, 1912, for the purpose of standardizing the subject. The report of this conference was eagerly awaited, as it was hoped that some questions of moment would be decided. When the report was received, it was found to be merely an expression of opinion of a body of men, few of whom were known. No experiments had been performed, no opinions of men eminent in the medical profession had been secured but a lot of resolutions had been passed for our guidance, for none of which any reasons were given.

At this conference the American Mine Safety Association was formed and the recommendations that an Advisory Board be appointed to have the power to accept or reject any dressings that may be offered, was adopted. This board is to consist of two first-aid men, two operators, two physicians and a representative of the Bureau of Mines. Why operators and engineers should have a place on a board whose proceedings to be of any value must be surgically scientific, was not explained. We are sure that no surgeon would desire a place on a board, the work of which was purely engineering in character.

Some Strange Decisions

A glance at the report of this meeting will show why it has been and will be totally disregarded. The recommendation that the Sylvester method of artificial respiration be adopted was followed in a few weeks by a report of a commission of scientists of national reputation, in which the Schaeffer method was declared to be the best. As this report was substantiated by the records of many experiments, it must be believed.

The schedule of discounts, presented by the conference and intended to apply to all contests, is amusing but worthless. In it contestants are penalized ten points for failure to be aseptic in the treatment of a wound, probably already infected, when the results of such failure, in the average case, would but slightly inconvenience the patient. The team is penalized but two points for failure to perform artificial respiration properly, when upon the correct administration of this, the patient's life absolutely depends. The fact that a contestant is penalized the same two points for lack of neatness and for tying a "granny knot" adds to the humor, but not to the value, of the report.

The American Mine Safety Association announces in its circulars that in the future it "will fix the standards in rendering first-aid-to-the-injured and set the standards for the construction and use of devices and appliances

for first-aid work." Before it can do this, it must show itself to be worthy of the honor. Such proceedings as are on record from its first meeting certainly do not prove that it should be accorded so much authority.

The Need for an Authoritative Council

First aid must be standardized by a board of men of national reputation; conservative, scientific men who will prove which methods are best and recommend only the methods thus proven. These methods, supported by the records of experiments and the testimony of eminent surgeons, will be received with respect by the medical profession and will be taught as the best by them. In this way, the first-aid movement will gain the respect of the medical men, upon whom its success absolutely depends, and the methods thus proven will be taught as best by all men.

Following such standardization, let a committee of first-aid men so grade the work that all classes will be taught by the same system. The first course should consist of the best methods; in the following courses the best of the alternate methods may be taught. Let all the organizations now teaching first aid coöperate so that no effort may be wasted and no ground covered twice. Then and only then can we hope to see first aid take its rightful place and expect to reap the full benefits of the system.

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Pollution of Water by Mines

By a Pennsylvania Engineer

Among the new troubles of the operators and engineers of coal mines is to find streams in which to discharge the water from the mines without injury to the public. It is generally believed that the mines and coke plants injure farms to a certain extent and kill the fish. Where the waters formerly were clear as crystal, they are now yellowish brown with iron hydrate and made acid by the hydric sulphate formed in the mines.

Vegetation is killed by the dense smoke coming from the ovens, and as a whole the villages near coke works are not a desirable place in which to live. But these mines and coke plants are as necessary to the country as a boiler to a battleship. When these industries are closed down, the country cannot thrive. They are, themselves, the occasion and support of the very people and industries which object to their presence.

Pollution of Streams Illegal

A decision has been handed down in the Westmoreland courts forbidding coal-mining companies from polluting domestic water supplies by draining their "sulphur" water therein. James McCune contended that the Pittsburgh & Baltimore Coal Co. by draining the sulphur water from its mines into a stream of water, passing through his farm, which, prior to 1908 had been pure and suitable for agricultural purposes, had made the water of the stream unfit for use. Judge Doty decided against the coal company, and in doing so said: "It is clear that the defendant has no right to pollute the stream which flows through the plaintiff's farm; and being without right in the matter, the company must cease within a reasonable time to discharge the water of its mine into the said stream." Six months was suggested as a reasonable time.

The fact that the coal company owned the coal underneath the McCune farm did not, in the opinion of the court, give it any right to pollute the water supply of the surface owners. It is clear that the company must, at great expense, pipe this water through such farms.

An Injunction Granted, Forbidding Pollution

Several weeks ago the operators who desired to open mines along Indian Creek were stopped from further development by the Pennsylvania R.R., an injunction to prevent the pollution of the streams being obtained.

The Pennsylvania railroad corporation, through its subsidiary, the Mountain Water Supply Co., secured an injunction to prevent the pollution of Indian Creek in the Monongahela watershed. This stream is the source of the water used in filling the tanks of the locomotives in that section.

Some years ago the railroad company, finding that it could not get clear water to supply its engines in Pittsburgh territory, purchased rights along the Indian Creek valley and constructed a large dam. Over $15,000,000 was expended in providing for a pure-water supply, and the water was piped to the Union station in Pittsburgh and to other points in that section.

Indian Creek is now and was at that time the largest unpolluted stream in western Pennsylvania, as the coal mines and mills on the banks of nearly all the other streams had destroyed their purity by discharging large bodies of polluted water into them. Consequently the fish were destroyed and in the large streams they are almost if not quite extinct.

Along Indian Creek there are about 75,000 acres of undeveloped coal lands. The moneyed interests controlling these lands had been making tentative plans for the opening of this potential source of fuel. News of this reached the railroad company, and, as a matter of self-protection, steps were taken to preserve the purity of the streams, for if they were polluted by the coal mines, the huge investment made by the company would become worthless.

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A Model Coal Town

Contractors broke ground yesterday for a model village which is to be built for the Pennsylvania Coal Co., around the Underwood shaft now being sunk on the hills east of Throop. The village is to consist of 28 double frame houses which will be of unusually strong construction so that they may be able to withstand the settling of the mine, as the coal is removed. The houses will measure 28x40 ft.; their sills or under frames will consist of single sticks of Georgia pine 6 in. square. These will extend the full length and breadth of the houses. Several frame dwellings are also to be erected for the colliery foremen and their families.

The model village is to be plotted out in wide streets with roomy garden plots for all the houses. It will have a central plaza and part of its equipment will be two public concrete bathhouses, one for men and the other for women. Hower & Stender, contractors of Scranton, are in charge of the construction work.

The Underwood colliery is to be one of the most modern in the anthracite region. It will open up big tracts of hitherto untouched coal and will give employment to a large population for many years. It is expected that the colliery will be ready for operation in a few months.

DISCUSSION BY READERS

Education in Coal Mining

Letter No. 15—In my opinion, the use of textbooks at examinations would be a backward step. The examination of mine officials has reached a high degree of perfection in most cases where this system has been adopted. I have no desire to detract in any way from the glory of the old-time practical mine foreman. I have the greatest respect for the man who has gotten his education from the point of the pick and the ring of the shovel. These practical, hard-working fellows are surely the best men in our mines; but the mining game, like all things else, is progressive and the uneducated man who was foreman or manager in the mines a generation ago will not answer now.

I attribute this change largely to the fact that our examinations are getting more difficult each year, and they are providing more alert and better educated men to fill the positions of foreman, assistant foreman and fireboss. To uphold this standard in examinations and to advance it, if possible, let us do nothing to make the examination easier. Give a fairly well educated man a textbook in examination on mining, today, and he will pass that examination with flying colors and, perhaps, never have seen the inside of a mine. For example, give a candidate the textbook, Examination Questions and Answers, for use in the examination, and it will supply him all the information he needs to pass this part of the examination. Then, if he can show that he has had the necessary experience and has the required knowledge of the mining law, there need be no fear but that he will pass the examination.

Some writers claim, in advocating the use of textbooks at examinations, that many of the formulas are complicated and hard to remember. I have passed the examination several times, in Pennsylvania, and each year it seems to me that the desire of the examiners is to get away from complicated formulas and advanced theories, as far as is compatible with securing men who can run a mine in a scientific and uptodate manner. Permit me to add that most of the men now managing our uptodate collieries are largely those who have passed the examination without books. They had to study and study hard to remember the laws, principles of ventilataion, haulage, methods of working, etc. The result is that a man who remembers such data keeps uptodate and is proud when the inspector who made him pass the examination without the books, visits his mine.

The examinations for mine foreman and fireboss certificates, in Pennsylvania, are reasonable and fair. All questions asked are questions that relate specifically to the regular work these men must do in and about the mine, or refer to such work as may have to be done at any time.

I cannot understand how it is expected to make an efficient mine foreman out of a man, who, when an unusual condition arises in the mine that demands immediate attention, must rush to his library to look up the needed information. I believe a man should have this knowledge at his fingers' ends and understand the principles of mining, so that he can give an intelligent answer to every question liable to occur in daily work, without consulting a library or textbook.

Although many men went to work in the mine when they should have been in about the fourth room at school, there is practically little excuse today for their not being able to pass a rigid examination, because of the numerous correspondence schools, night classes, libraries and other facilities for learning open to them. I do not wish to convey the impression that, in my opinion, the best educated men are the best mine officials, as I have known many such men to make failures as mine foremen.

Some time since, I was on a train approaching Washington. The train stopped at the yards, some miles out from the city, for a second engine, when a fellow passenger inquired why they did so. The reply was: "Well, I'll tell you; it takes a mighty good pull to get into Washington." Many of us have the same view with regard to securing a position of responsibility in the mine. They think that if they can get a "pull" somewhere, they can have any position they want. I am glad to say the time when that is possible is fast going by. Mining companies today realize that efficiency rather than favor is what they require, and we must regard it in the same manner. Lawyers, doctors and men of other professions, study constantly to improve their minds and keep uptodate, and mining men must do the same or be relegated to the scrap heap. Let us make every effort possible to elevate the standard of mining; let us get the textbooks into our minds instead of taking them into the examining room.

SAMUEL M. MCMAHON, Supt.
West Virginia-Pittsburgh Coal Co.
Wellsburg, W. Va.

Letter No. 16—The question of educating the miner is one that needs and should be given more than a passing thought. The nature of his occupation; the duties that are required of him; the responsibilities that rest upon him in his relations to his fellow workman; these are some of the things in which he should be educated. No man who works in the mines works to himself alone. The safety of other workers depends on his ability and knowledge, which fact requires that he should be well informed in respect to his duties to his fellow workers and to himself.

In my opinion, the one question of educating the miner has not been given the consideration and attention, in the previous letters, that it should have had. The writers have dwelt more upon the education of mine foremen and firebosses. It is of equal importance to consider the question of educating the miner in respect to his duties in mining coal. The miner, today, is not the same as the miner twenty years ago. At that time, the English-speaking miner was the most prominent, while

now the majority of our miners speak a foreign language and in a large measure are ignorant of many of the conditions that govern the mining of coal. They need to be educated in more ways than one.

Many miners, today, are unable to read or write their own names and cannot make up the time sheet that they are required to turn in to the colliery office. They cannot write a danger signal or the word "dump" on a car, if need be. It is important that all mine workers should have some knowledge of reading, writing and arithmetic.

While the efforts put forth to educate the foreign-speaking miner have met with a measure of success, a very small number of these men are being reached. Greater efforts should be made to make them more efficient in their work. They should be properly instructed in respect to the best and safest methods of mining coal and made more familiar with the nature of the explosives they use and the proper handling of the same. It is true that powder companies give rules for the use and handling of powder; but, as most of the miners cannot read the English or any other language, they cannot understand, except as they are told by some other person. They should be made to know what they are handling and how to handle it with safety to themselves and others. They should be properly instructed as to the nature of the roof and other conditions about them. They should be taught how to properly timber their place, and be made acquainted with certain conditions that present themselves, and told what to do when these conditions are known to exist.

The anthracite mine laws are made for the protection of life and limb; but probably 90 per cent. of the foreign-speaking men who work in the mines know nothing of what the law contains; and it is important that they should be made acquainted with the mine law. Again, accidents happen to many as a direct result of their ignorance of the safety appliances that are provided for their welfare; and also from their inability to properly understand the directions and warnings given to them by the foreman or his assistant.

But this education, to have proper effect, must not be given with a rod of iron or lash of the whip. Treat these men kindly; show them their duties in a brotherly spirit; let them feel that you are interested in their welfare and are doing this for their good and not for your personal benefit. If all coal companies would make an earnest effort to educate their employees they would get better results from their labors and thereby increase their earnings, and there would be less suffering and loss of time through accidents.

The reason the foreigners do not get hold of the English language sooner is that they live, work and keep among themselves all the time; they talk only their own language and are slow to learn and understand what is required of them in the mine. Educate the miner and you have solved one of the most perplexing questions in the coal fields of today.

EDWARD SANDERS.

Scranton, Penn.

Letter No. 17—I am not in favor of the use of textbooks at a mine-foreman's examination as, in my opinion, it would have a tendency to create mine foremen who are not practical mining men. I believe a man who has a college education but has never worked a day in the mine could, with the help of textbooks, solve certain kinds of questions given in the examination, especially if the proper formulas were furnished by the board; and yet if similar questions came up in actual practice in the mine, the same man would not be able to reach a practical solution because he would not have the hint how to proceed or anyone to suggest what formula he should use.

On the other hand, the practical mining man who has had a fair education and studied hard to keep up to the times should be able to pass the examination and get his certificate without the use of a textbook. In the end, such a man will make a more efficient mine foreman, as he would have a better idea of how to apply the correct formula in practice.

Examinations for mine foremen should be conducted along practical lines; that is to say, questions given and the conditions should be similar to those that are met every day in the mine. All men who are seeking certificates of proficiency that would make them eligible to the position of mine foreman or fireboss should be equipped to solve practical questions that call for good judgment in regard to safety, workmanship and economy. I do not think that they should be given the use of textbooks or formulas in examinations.

JOHN H. KELLY.

Seanor, Penn.

Two Useful Devices

I noticed a sketch for a safety block for inclines, in COAL AGE, of Mar. 29, p. 487, which was interesting, but I believe we have one in use at our mine No. 9 which is much more simple. It has been now employed for several years and has never failed. The angle of the incline to the tipple is 36 deg.

All that is necessary in making one of these stops is a piece of rail about 7 ft. 8 in. long, an old mine-car axle

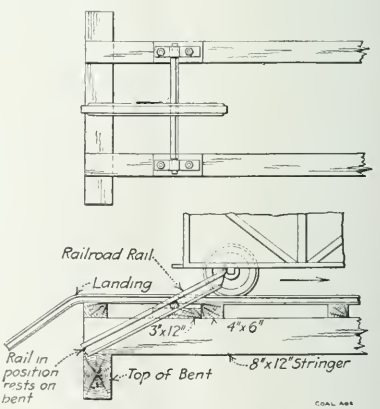


FIG. 1. CAR STOP AT HEAD

and two small clamps which any blacksmith can make. Add to this 4 long bolts to fit existing timbers and the list is complete.

I believe Fig. 1 is self-explanatory. We use the device shown, on the track for loaded cars. On the empty track we use a similar stop, but have a lever attached to the axle so that the block is lowered when cars are let down the slope. It is always best to have the lever so arranged

that the safety block is in position unless held forcibly down.

Fig. 2 is a sketch of a device for switch-backs from slopes where there is much liability to derailment. The sketch shows plan of tracks at bottom of shaft No. 8 of the Osage Coal & Mining Co.

The cast-iron plate at *A* was arranged so that no frog point would be necessary. The main rail *E* is laid exactly

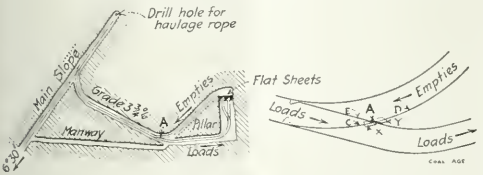


Fig. 2. Frogless Rail Crossing

flush with the part *Y* of the plate *A* and also with part *X* except that a groove is left for the wheel flanges to run in. The two rails *C* and *D* are laid just the height of the wheel flange above the plate *A*. Rail *D* is laid so that the outer rim of a passing wheel will just clear.

George M. Brown, Engr.,
The Great Western Coal & Coke Co.
McAlister, Okla.

A Geyser from an Anthracite Mine

In the issue of May 3, page 693, you speak of the geyser-like action of the water in a flooded mine. During the recent high water in the Wyoming Valley, when the river broke into the old workings of the Enterprise Colliery, old railroad cars and baled hay were thrown in to try to fill up the opening, and when the water was forced out, evidently in the same manner as in the mine referred to, the hay was thrown high into the air. As the foreman in charge of the work expressed it: "It swallowed everything until we began to feed it baled hay, and then it threw up."

E. C. Lee.

West Pittston, Penn.

Loss of Life in Coal and Metal Mines

Referring to the article on the meeting of the Institute of Mining Engineers, May 2, line 7, top of page 730, should read 282 days instead of 300 days, that being the average time worked at all mines other than coal mines. In the accompanying table below the correct figure, 282 days is given.

Referring to the financial loss due to accidents, the totals are correct. The time loss resulting from serious accidents only is calculated on a 30-day basis at $3 per day for metal miners alone.

You do not state, however, that coal miners and quarrymen are figured on a basis of only $2 per day. The loss due to slight injuries is based not on 30, but on 5 days off duty with wages as above stated.

Taking the serious and slight injuries for the quarry and mining industry as a whole; their relative ratio is approximately 14 to 49; in other words, the slight injuries amount to about 3½ times the serious injuries as actually reported.

A. H. Fay.

Bureau of Mines, Washington, D. C.

Drawing Post Timbers

I was interested in reading the article on the Recovery of Mine Timber, by J. W. Powell, Coal Age, Apr. 5, p. 529. I have seen a great many posts drawn with the Sylvester machine, and consider this the best way to recover timber from worked-out places. I want to make one suggestion:

It is dangerous to anchor the machine to a post, unless that post is properly set for the purpose. Mr. Powell mentions this as a precaution that should always be taken when drawing timber, but does not state how such a post should be set. It is important to set the post leaning toward the one that is to be drawn, as I have indicated in the sketch, Fig. 1. The anchor chain is fastened near the foot of this post, and the pull on the chain only tightens the post. This anchor post is moved back as the work progresses. I have often seen men spend much time in attempting to draw a post, without a machine and finally lose it under a heavy fall. A machine would have saved much time, and the post would not have been lost.

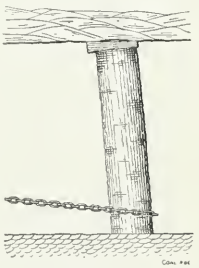


Fig. 1. Anchor Post Set for Drawing Timbers

Referring to the article, Waste of Mine Timber, Coal Age, Apr. 26, p. 653, the form of timbering described where a single stringer is used in the roof and the side struts or rafters are made to bear against this stringer is what we used to call the "herring-bone" system of timbering. It is a good system to use in certain roofs and is shown in Fig. 2, which is a cross-section of the entry.

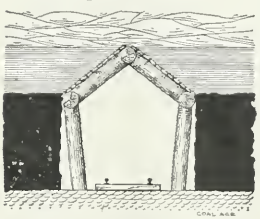


Fig. 2. A Herring-Bone Timber Set

Charles Waine.

Marianna, Penn.

Removing Powder Smoke from Mines

Some time ago the question of reducing ventilation at the time of firing was discussed in Coal Age. Many of those who took part in the discussion seemed to think that to reduce the ventilation at firing time, will minimize the dangers of an explosion. The only reason given by the advocates of this practice worthy of any consideration was that the supply of oxygen being reduced combustion would cease. I consider such a theory practically impossible in mines where men must work. These advocates argue that there are more explosions in new and undeveloped mines having an abundance of air, than in old and more extensively worked mines where ventilation is not good. They point to the fact that the intake air current, in a mine, is more subject to explosion than the return; and that there is more danger of explosion in the winter than in the summer time; and they attribute these facts to the greater supply of oxygen.

While I do not wish to be understood as believing there is nothing in the arguments advanced; I must contend, nevertheless, that any results obtained by reducing the ventilation at firing time cannot be attributed to the lack of the supply of oxygen. In order to make myself clearly understood, permit me to relate the following experience of my own: Assuming the management of a new and undeveloped mine, May 1, 1910, I double-shifted all the work; and, to give the men every advantage possible, I permitted the firing of shots at midshift.

Two shafts had been sunk but were not connected below, and the only means of ventilation was through an air compartment made by carrying a brattice down the shaft. A steam jet, placed on one side of the shaft, gave sufficient ventilation to remove the powder smoke from the face of the entries in from 15 to 20 min. After a few weeks connection was made between the two shafts, the steam jet taken out and the brattice removed. While there was a great improvement in the ventilation, it still required from 15 to 20 min. to remove the powder smoke from the face of the entries. A little later I had completed the erection of a 16-ft., double-intake fan, which produced between 80,000 and 90,000 cu.ft. of air per minute, running at a speed of 80 r.p.m. With this large supply of air it still required from 15 to 20 min. to remove the powder smoke from the entries.

One afternoon in September, the temperature dropped from 90 deg. to about freezing point. On arriving at the shaft the next morning, I was informed that the night shift had to discontinue work, owing to the powder smoke, which was not removed from the face of the workings.

This experience teaches me that the rate of diffusion of the powder smoke into the air does not depend on the quantity of the air in circulation, but rather on the density of the air. I believe what is true of powder smoke is true also of marsh gas (CH_4). My conclusion is, supply enough air in the mine to render the atmosphere harmless after diffusion has taken place. This quantity of air should be sufficient to make the mine air safe. In my opinion, any excess of air will do no harm, but a deficiency of air may cause a dangerous mixture to form and result in a disastrous explosion.

I believe if it were possible to heat the intake air current so that its temperature would be the same as that of the mine workings, there would be no more danger of explosions in the intake than in the return airway; and no more danger in undeveloped than in developed mines; and no more danger in the winter than in the summer season.

WM. HARTMAN, Mine Manager,
Southern Coal, Coke & Mining Co.

Belleville, Ill.

Study Course in Coal Mining

BY J. T. BEARD

The Coal Age Pocket Book

Example—If a difference of pressure between the two ends of an airway, of 8 lb. per sq.ft., produces a velocity of 600 ft. per min., what will be the velocity in the same airway when the difference of pressure is only 2 lb. per sq.ft.?

Solution—In this case, calling the required velocity x

$$\frac{x}{600} = \sqrt{\frac{2}{8}} = \sqrt{\frac{1}{4}} = \frac{1}{2}$$

$$x = 600 \times \tfrac{1}{2} = 300 \text{ ft. per min.}$$

Pressure Producing Circulation—In mine ventilation, the word "pressure" generally refers to the pressure that moves the air. It is the difference between the intake pressure and the discharge pressure. Since the pressure of the atmosphere is equal at both ends of the airway it may be disregarded, as far as the movement of the air is concerned.

The Blowing System of Ventilation—To move the air or cause it to circulate in an airway or a mine, an extra pressure must be created at one end of the airway, so as to overcome the resistance of the mine due to friction. This is called the "blowing" system of ventilation, because the air is blown through the airway by the pressure created.

The Exhaust System of Ventilation—The same difference of pressure may be caused by decreasing the atmospheric pressure at one end of the airway, when the full pressure of the atmosphere at the other end will cause the air to move toward the point where the pressure is less. The principle is that commonly called "suction"; but this system is known as the "exhaust" system of ventilation.

How Pressure Is Produced—Various means have been used to cause a circulation of air in mine airways. The wind cowl, waterfall and steam jet are useful under favorable conditions and where a limited air supply only is needed. The mine furnace, built in the mine near the bottom of the upcast shaft, is often used in nongaseous mines, especially in deep shafts (see Furnace Ventilation). The most reliable means of creating pressure in mine ventilation, however, is the mine fan, which is generally erected at the surface, either at the top of the downcast shaft, as a blower; or at the top of the upcast, as an exhaust fan (see Fan Ventilation). The blowing fan creates a pressure above that of the atmosphere, while the exhaust fan reduces the atmospheric pressure.

How Pressure Is Estimated—In mine ventilation, the pressure producing circulation is estimated in height of air column, as in natural ventilation and often in furnace ventilation. The more common method, however, is to state the pressure in pounds per square foot or ounces per square inch. Pressure is also stated in inches of water gage.

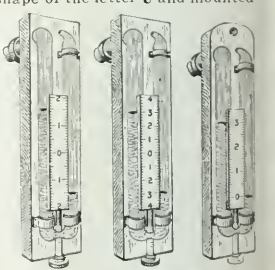
Atmospheric pressure is given in pounds per square inch, or, as barometric pressure (which is the same as atmospheric pressure), in inches of mercury

1 in. water gage = 5.2 lb. per sq.ft.
1 in. mercury = 0.491 lb. per sq.in.
1 oz. per sq.in. = 9 lb. per sq.ft.
1 in. mercury = 13.6 in. water gage

The Coal Age Pocket Book

How Pressure Is Measured—In mine ventilation, the pressure producing circulation is commonly measured by means of the water gage; or, in case of high pressures a special form of manometer is sometimes used. The manometer differs from the water gage in having one end of the bent tube closed so that the rise of the water level in that arm of the tube compresses the air above the water, which lessens the rise of water level and gives a greater range of readings.

The Mine Water Gage—This consists of a glass tube of about ¾-in. bore, bent to the shape of the letter U and mounted on a solid base. Three styles of water gage are shown in the accompanying figure. These differ only in the kind of scale. The first two on the left have the zero at the center of the scale and read up and down to the respec-water levels. The first of these scales is graduated to full-length inches, and to obtain a correct reading it is necessary to add the two readings together, or double either of them, as they are equal. To avoid this necessity the second scale is made of half-length inches, so that either the upper or the lower reading gives the full gage required, which, in this case, is 3 inches.



THREE FORMS OF WATER GAGE

When the zero of the scale is at the middle and the scale reads up and down, it is evident that the scale must be adjusted so that its zero will correspond with the two water levels, before the pressure acts on the gage. When the pressure acts it depresses the water level in one arm while that in the other arm rises an equal amount. The difference between these two levels is the actual water column supported by the difference in the pressures acting on the water in the two arms. As will be explained later, one arm of the gage when in position is open to the intake pressure and the other to the return. The difference between these two pressures is the pressure that circulates the air between these two points.

The scale shown on the right has its zero at the bottom and reads upward. This scale must evidently be set, after the gage is in position, so that the zero will correspond with the lower water level, which is always that in the arm open to the intake pressure, as that pressure is always greater than the return pressure. The reading of the scale at the upper level is then the required gage.

The reading of each of the three gages shown in the figure is 3 in., which indicates a ventilating pressure of $3 \times 5.2 = 15.6$ lb. per sq.ft.

EXAMINATION QUESTIONS

Bituminous Mine Foremen's Examination in Pennsylvania, May 6-7, 1913

(*Selected Questions*)

Ques.—Why is it necessary to have larger pillars in some mines than in others?

Ans.—The dimensions of pillars, both length and width, are determined by such conditions as depth of cover, character of the roof, floor and coal, thickness and inclination of seam, width of opening, and the presence of gas or water in the roof or floor. All of these conditions affect the required dimensions of room pillars. As these differ in every mine, it is necessary to make the dimensions of the pillars, in every case, conform to the conditions as they exist. The size of shaft pillars depends mostly on the depth of the shaft and the inclination and character of the strata and method of working the seam.

Ques.—(a) What would be the minimum amount of air required in a split in which 70 persons were employed? (b) How would you determine the quantity of air passing, the airway being 8 ft. wide, by 5 ft. high; where would you take measurements, and how and when would you enter them in the daily report book?

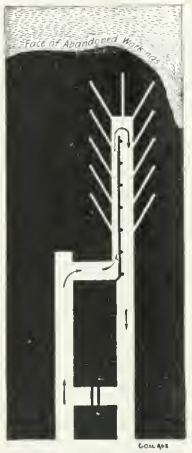
Ans.—(a) The bituminous mine law (1911) specifies a minimum circulation of 150 cu.ft. of air per minute, for each person employed in nongaseous mines. This would require for 70 persons, $70 \times 150 = 10{,}500$ cu.ft. per min. If the mine generates gas in such quantity that it can be detected by an approved safety lamp, the minimum quantity of air shall be 200 cu.ft. per min. for each person employed in the mine; or, in this case, $200 \times 70 = 14{,}000$ cu.ft. per minute.

(b) To determine the quantity of air passing, select a place in the airway where the road is straight and the section uniform, and measures the velocity of the air current at this point, with a good anemometer. An average reading for the entire section of the airway should be obtained by moving the anemometer from point to point in the section, exposing the instrument to the air current an equal period of time at each point. The final reading of the anemometer divided by the time of exposure, in minutes, will give the velocity of the air in feet per minute. This velocity multiplied by the sectional area of the airway, in square feet, will give the volume of air passing, in cubic feet per minute.

The bituminous-mine law requires that the mine foreman shall measure the air once every week, at or near the main inlet and outlet airways and at the last cut-through in the last room, and in the entry beyond the last room turned, such measurements to be taken on days when the men are at work. The mine foreman must also enter plainly and sign with ink, in a book provided for that purpose, a true report of all air measurements taken, designating the place, the area of each cut-through and entry separately, the velocity of the air in each cut-through and entry and the number of men employed in each separate split of air, with the date when the measurements were taken.

Ques.—In driving entries or rooms that are approaching inaccessible old workings, known to contain a body of water, what precautions must be observed?

Ans.—When approaching old workings, a single entry only should be driven ahead, as shown in the accompanying figure. This entry should not be over 12 ft. in width, and a borehole should be kept at least 20 ft. in advance of the face of the entry, and other flank boreholes should be driven an equal distance, at an angle of 30 deg., in the rib of the entry, at intervals of 12 or 15 ft., as the face advances. This single entry should be ventilated by means of a brattice erected 2 ft. from one of the ribs of the entry, as shown in the figure. A close watch should be kept for any increase of water or gas in the strata. Plugs should be kept in readiness to stop any boreholes that may penetrate the old workings. If there is danger of gas, only safety lamps should be used.



Heading Approaching Abandoned Workings

Ques.—If a volume consisting of 100,000 cu.ft. of air per minute is passing through a mine, how will this volume divide itself between two splits of the following dimensions: Split A, 8x10 ft., 10,000 ft. long; split B, 8x10 ft., 5000 ft. long?

Ans.—The cross-section of these two airways being the same, the perimeters and areas are equal. In splitting, the quantity of air passing in each split is proportional to the split potential $a\sqrt{\frac{a}{lo}}$. In this case, the area (a) and the perimeter (o) being the same for each airway can be ignored and the expression for the potential becomes $\frac{1}{\sqrt{l}}$, which gives, using the relative values 2 and 1, for the actual lengths 10,000 and 5000 ft.,

Split A, $\frac{1}{\sqrt{2}} = \frac{1}{1.411} = 0.7071$

Split B, $\frac{1}{\sqrt{1}} = \frac{1}{1} = 1.0000$

Sum of potentials 1.7071

The quantity of air passing in each split is then

Split A, $\frac{0.7071}{1.7071} \times 100{,}000 = 41{,}420$ cu.ft.

Split B, $\frac{1.0000}{1.7071} \times 100{,}000 = 58{,}580$ cu.ft.

Total 100,000

BOOK REVIEW DEPARTMENT

COAL AND THE PREVENTION OF EXPLOSIONS AND FIRES IN MINES. By John Harger, 176 pp. with index 5½x8⅝; 4 ill.; Cloth boards. Longmans, Green & Co. 443 Fourth Ave., New York. Price, $1.25.

No book on coal mining has excited more comment in the present year than this little volume. John Harger is a man of great originality. We may not agree with him but he stimulates thought and is never dull. He introduces his volume with a fierce attack on the British equivalent of our bureau of mines which he says is conducted "mainly by amateurs." This comes with poor grace from an Englishman in view of the fact that the present safety lamp is a development of the unpractical Sir Humphry Davy, that a predominant type of fan, which revolutionized mine ventilation in its day, was introduced by a clergyman Capell, that our knowledge of mine explosives is largely the outcome of Sir Frederick Abel's investigations and that J. S. Haldane and Leonard Hill have done a great work in discovering means of reducing the unhealthiness of mines under certain untoward conditions. None of the three last-mentioned can by any stretch of a versatile imagination be regarded as practical coal-mine experts. The helmet, also, which has probably the most extensive sale in England was invented by Heinrich and Bernard Draeger neither of whom were mining men. But even more astounding is the coolness with which Doctor Harger overlooks the work of W. E. Garforth in his introduction. Surely this is not because the latter is a mere theorist.

Mr. Harger frequently surprises us with his theories. "In spite," he says, "of its attractive simplicity, we can no longer hold "the peat-to-anthracite" theory which has, in text books at any rate, held such long sway." He is even disposed to accept the bacterial theory of the formation of methane by coal.

Mr. Harger argues in favor of occasional reversals of the air current to remove such dust as is sheltered by projecting ledges of rock and would be unsheltered on reversal. Now W. E. Garforth has declared that coal dust will not rise into a ventilating current unless a velocity of 18 miles per hour is attained. If that is correct for really fine dusts, Mr. Harger's suggestion is not to be regarded seriously especially as he does not say whether he has experimented on the practice he advocates.

The reader will be anxious to see how the author proposes to fill the air of the mine with carbon dioxide and to reduce the percentage of oxygen as suggested in his celebrated address before the British Institute of Mining Engineers. It is probable, if a speedy and effectual devitalization of the atmosphere can be obtained at reasonable cost that the system will be adopted for shotfiring from the surface. Mr. Harger proposes either to use Bone's flameless surface combustion or to pass the waste gas from a boiler fire still heated over bog-iron ore so that the catalytic action will aid combustion, and then over cupric oxide and copper to effect a yet more perfect purification. He also asserts that the discharge of a gas engine can be easily freed from carbon monoxide and might be available.

The book may contain some false conclusions but it is well worth reading. A few original thinkers like Mr. Harger are needed to ferment the mass of stagnant thought.

There has been a disposition to use Mr. Harger with like impatience with that which he has exhibited toward Messrs. Dixon and Wheeler. Because G. A. Burrell and other authorities have shown that his statements relative to gas explosions need qualifications, we should not therefore assume that there is no basis of fact in his statement that under practical conditions explosions especially of coal dust, will not occur if the percentage of oxygen, is reduced to 17 per cent. Let us be reasonably sure, that he is wrong and unentitled to public recognition before we excoriate him.

BIENNIAL REPORT OF THE INSPECTOR OF COAL MINES OF THE STATE OF MONTANA FOR THE TWO YEARS ENDING OCTOBER 31, 1912. Jos. B. McDermott. 66 pp.; 6x9; paper.

The report gives the usual statistics of the production of coal and accidents in mining, together with valuable recommendations and suggestions in reference to permissible explosives, the use in mines of gasoline motors, and the smoke test as applied to illuminating oils used in the mines.

THE COAL TRADE IN 1913. Frederick E. Saward. Cloth, 6¼x8 in., 200 pp. The Coal Trade Journal, 20 Vesey St., New York City.

The fortieth consecutive issue of this bright little book, covering the trade and market statistics for the year of 1912 is again out. As in the case of the previous issues, the book is full of pertinent and useful information to those interested in the coal trade and market conditions. The data included is of a very comprehensive nature, covering temperature statistics, prices, productions, transportation, etc. The book is not, of course, of any particular originality, but it is certainly a handy and quick reference work on the subject covered. In common with previous editions, the most grievout fault to be found is the total absence of any attempt at segregating the different topics into one department. Thus selecting a page at random, say 64, at the top of the page, we find the Baltimore & Ohio R.R. freight rates on coal, which is fololwed by shipments of anthracite according to sizes, and finally the utilization of coal mined in the United States. It would be difficult to conjure up three more irrelevant subjects. Why could not the matter of freight rates all be segregated into one department or one chapter, and likewise the statistics governing the anthracite production and shipments and also that portion relating to the utilization of coal?

GEOLOGIC MAP OF ILLINOIS: Prepared by the State Geological Survey. Size, 34x56 in. Colored; Paper and mounted on cloth.

The State Geological Survey of Illinois, Frank W. DeWolf, director, has recently published a handsome provisional geologic map of Illinois. This map has been compiled from data furnished by the survey staff, and is said to vary in accuracy only with the degree of detail shown.

The map is drawn to a scale of practically eight miles per inch and the several geologic areas are marked in colors. It is stated that since practically the entire state is mantled with drift and associated deposits, the boundaries may be considerably out of place except where detailed surveys have been made, as in Jo. Daviess, La Salle, St. Clair and Monroe counties. The map shows the location of the coal mines of Illinois, and these have been revised by the state mine inspectors under the direction of the State Mining Board. Besides these, there are marked on the map the location of the fluorspar mines, the zinc mines and the petroleum and gas fields, now or formerly active.

There are marked on the map, in different places, the limits of glaciation or, the border of driftless areas. Columnar sections for northern, central and southern Illinois are given to a scale of 1 in. = 500 ft. There is also given on the map an outline of the geological history of Illinois, including a brief history of the several rock formations underlying the state. A brief résumé of the economic features of the state is given, showing the quantity and value of the mineral productions, such as coal, petroleum, clay products, pig iron, portland cement, sand, gravel, etc. It is claimed that the mineral wealth of Illinois is practically $150,000,000 annually, and that the state held the third rank among the mineral-producing states in 1911, with coal, petroleum and clay products as the chief items.

Two cross-sections, one in the northern and the other in the southern part of the state, show the general surface to be 500 ft. above sea level. In many cases the altitude above mean sea level, expressed to the nearest foot, is indicated by small figures immediately following the name of the town. These elevations are taken from the U. S. Geological Survey, the Coast and Geodetic Survey, the Army Engineers, and the Mississippi River Commission, all reduced to the 1907 adjustment. The figures refer to the permanent bench marks established by the engineers. Other figures without decimals are derived from railroad profiles and give the approximate elevation above sea level, at railroad stations.

The map is one of which the State Geological Survey can well be proud and shows great care in its compilation. A copy of this map, on heavy paper, will be sent on receipt of 15c., in stamps, to cover cost of mailing. A similar copy, mounted on cloth and sticks, will be sent if, in addition to 16c. postage, there is inclosed money order for 29c. payable to A. J. Nystrom & Co., Chicago. Remittances should be sent to the Director, State Geological Survey, Urbana, Ill.

COAL AND COKE NEWS

Washington, D. C.

Former Secretary of the Interior Walter L. Fisher has discussed with the senate committee on territories the coal question in Alaska during hearings that occurred in the course of the past week relative to the two bills now pending before the committee to authorize the construction of railroads by the Government in that territory. Mr. Fisher said in part:

Now I do not care what the views of members of Congress may be as to the proper way of handling the coal fields. I undertake to say that not one of them, if he will sit down and consider the facts, will conceive that it is possible to open them under existing law. It would be merely offering a premium to the larger financial interests to go in and absorb the existing coal fields and absolutely control them.

For instance, today we know that there are two, and only two, great coal fields in the territory—the Bering coal field and the Matanuska coal field—and we know relatively the area and extent and character of them. Suppose you should open them up to development today; what would happen? You would simply have the men who have the money, and who have the familiarity with the conditions, putting persons in the field to enter these coal lands, so far as they had not been entered, at once. There is no other possibility.

Nobody would do anything so far as the actual development of them is concerned that would be of any value to the country. If the little work which is necessary, even under instruction of the Department of the Interior and the General Land Office with regard to opening mines, were done so that the entrymen were really complying with that provision of the law, it would not put coal commercially on the market. It would merely enable the people who make the entries to acquire title, so they might sit down and wait until a sufficient time had elapsed when they would turn this property over to other people.

Mr. Fisher Favors Leasing

You may have differences of opinion about the leasing system as compared with the ownership of the coal land in fee, but you will find that in Alaska, just as in this country, the inevitable economic tendency will appear, and we will find happening there what has already happened in the rest of the country, namely, the greater portion of the coal lands operated under a leasing system.

Whether we like it or whether we do not, there is no choice between the fee and the leasing system because coal developments in the older states have demonstrated conclusively that private interests prefer to operate under the leasing system, whether the Government does it or not, and your only choice is whether the Government will lease, and lease on terms that will encourage development under effective public control or whether it will turn it over to private interests who will lease, and lease upon the purely financial considerations that will control.

This is capable of demonstration. Mr. Jones or Mr. Smith enters upon a certain tract of coal land, and he gets his title; he complies with the law and gets his patent. Now what does he do? In the great majority of cases he does not operate the coal mine. The statistics are given in the document to which I have referred, and you can have it readily brought down to date by the Bureau of Mines. What he does is to turn it over to a lessee, corporate or individual. It may be that the property will pass through a succession of transfers before the coal is finally commercially operated. If it does, each transfer means that the party who sells exacts a profit from the party who buys, and, finally, when the lease is made and the operator begins to take out coal he does so upon a royalty basis which pays the carrying charges upon the profits made in the whole series of intermediate transactions.

The result is, as has happened in the bituminous coal fields throughout the Central West that many of our coal mines are being operated upon terms that leave the operator just a chance to make a living. Many of our coal fields are being operated under existing private ownership by a private lease system, under which the operator can just work through. And what happens? The trade itself is utterly and hopelessly demoralized, because every time there is a falling off in the demand for coal, there is a decline in our general prosperity, so that there is less manufacturing and less use for coal. These coal lessees who have taken over these properties upon terms which just give them a chance to live, usually have notes at the bank, or have to meet their obligations to their lessors, and they must sell coal. They put their coal on the market. They rush in the market and the result is that there are times of plenty and times of scarcity, with the miner being thrown out of employment, and with all of the evils that associate themselves with our coal development, and to a certain very considerable extent, with our lumber development in this country.

The system does not work properly, and if men in the coal business both in Pennsylvania and in the Far West will talk to this committee as they have talked to me, there would not be any real difference of opinion as to what ought to be done.

They will all be agreed upon the proposition that the way to handle these fields is to have the Government lease them, and lease them upon terms which will encourage development, will protect the operator, and will give him a far better chance in the practical operation of the coal mines than he can possibly get under the existing system. You do not propose to throw this coal land open under the present law except in very small quantities, so small that it is not profitable, so small that certainly if there is any operation it is upon the most uneconomic basis.

The Question of Economy

We want to have our coal mined so as to prevent waste. Talk to operators as I have talked to them, and they will tell you "we would like a law of this kind to prevent waste, but here is a vein where the physical conditions are such that if we go in and take that coal out now it is going to cost us a whole lot of money. The coal market is low; there is a glut. We cannot afford to do it. It is theoretical. We ought to take out all the coal from the mine and we ought to take it out as we go, but practically we cannot do it. We could not meet commercial competition and do it."

We have already parted with the greater portion of our coal land in this country. Fortunately, we have still a considerable area in the West. Fortunately, many of the western states have considerable areas of coal land belonging to them, and it is significant that all of those states are operating under a leasing system, some of them prohibiting the disposal of their coal land under any other than the leasing system. If you will take the state laws throughout the West and examine them, and see what the states believe they ought to do with their coal land, you will observe that there is a practical unanimity of opinion that it ought to be handled under the leasing system.

Of course, the object of the whole law ought to be to get coal to the consumer as cheaply as it can consistently be done with a proper return to the people who are developing the mines and making the investment. You ought to offer to those people such a return upon their money as will be a sufficient inducement to them for the development of the property, whatever it is. If you offer them any more than that it is gratuity.

There is going to be very litle pioneering about any of this coal land, especially in Alaska, and this is true practically of all the coal land that we have left in the hands of the Government, either the Federal Government or the state governments. It is not the ordinary case of the prospector who starts out with a pick and shovel and goes out through the wilderness and finds a vein containing precious metal.

The difficulty with our coal laws is that they proceed upon the theory that coal land is just like precious-mineral land. We have tried to make the laws the same, and we have modified the mineral laws just as little as possible so as to meet conditions in the coal fields.

Concerning a Government Railroad

I think the Government can afford to build a railroad in Alaska, which perhaps private capital could not afford to construct, because of the difference between the rate of interest that private capital would have to pay and the rate of interest which the Government would have to pay. I think that is a sufficient reason for the Government building this road.

PENNSYLVANIA

Anthracite

Scranton—Two thousand mine workers at the Sterrick Creek colliery of the Temple Iron Co., in Jessup, are on strike because the hoisting engineers and a number of others have not joined the union. The union officials say that the strike is not authorized.

Shamokin—Between 7000 and 8000 men and boys, who have been idle at the collieries in this region have returned to work. The strike caused a general tie-up in the various collieries.

Bituminous

Harrisburg—Ten additional mine inspectors are provided for the anthracite field in a bill which has passed the House by a vote of 135 to 5. The bill was presented by Mr. Lenker, of Dauphin, who declared that, in view of the fact that 614 men were killed in the mines during 1911, he believed that there was a need for more inspectors.

Monongahela—The old Domestic coal tipple which has been a landmark on the East Side for a number of years has been torn down. Only a little coal has been run over the tipple during the past five years.

Washington—A large barn at the Vigilant mine of the Pittsburgh Coal Co., at Coal Center, was destroyed by fire May 6. All the mules and horses were rescued. The cause of the fire is a mystery. The loss is estimated at $5000.

Uniontown—The magazine of the Sunshine Coal and Coke Co.'s mine exploded at 1 o'clock, in the afternoon of Saturday, May 10, killing 3 persons and injuring 40, of whom 22 were seriously hurt. The plant is three miles from Masontown, Fayette County. The magazine contained 500 sticks of a dynamite powder. The general store, the home of Francis Rocks, an official of the company and 25 small dwellings were made uninhabitable. The magazine was about 25

yd. from the store and the Rocks home. Two men, both killed were in the magazine. The loss is $75,000.

Du Bois—The miners at the Buffalo & Susquehanna Coal & Coke Co.'s mines Nos. 1 and 2 are on strike to secure better wages for the firemen who work 12-hour shifts for $2.42 per day. Superintendent James Harvey has refused to accept a checkweighman as representative of the men, claiming he is not an employee. A commission composed of J. S. Forsythe for the operators and W. Broad for the miners will hear the arguments relative to the checkweighman's elegibility to the pit committee.

WEST VIRGINIA

Charleston—A special train in charge of a representative of Governor Hatfield has transported many miners from tents along Cabin and Paint Creeks to various mines throughout Kanawha County, where employment awaited them. The men and their families have been living in tents since the beginning of the strike, in April, 1912.

The Governor has announced that he would place a number of special guards in the former strike zone to do police duty, but that no mine guards would be permitted to act as police. He added, however, that he could not and would not attempt to prevent property owners from employing persons to guard their own properties.

VIRGINIA

The one most serious obstacle to the mining industry in Virginia is the difficulty experienced by the operators in getting sufficient men to work the mines. The West Virginia and Pennsylvania mines absorb nearly all the foreign-born workers, and those states give special attention to provisions for the welfare of the miners by providing hospitals for them where they may be cared for at the State's expense in case of serious accident or illness. In Virginia, while some of the mining companies are strong enough to provide and maintain hospitals for their men, many of them are not; and the lack of such, prevents many from coming to this state who would otherwise prefer to work in the thick, gasless mines of the southwest counties.

KENTUCKY

Louisville—Traffic officials of the Louisville & Nashville R.R. Co., with a number of interested business men as their guests, took an inspection trip last week over the Louisville & Eastern region. They were especially interested in the new operations of the Consolidation Coal Co. in that section. The trip was made in a special train, which left Louisville on the evening of May 9.

Hartford—Five men were killed May 6 in a deserted shaft of a coal mine belonging to the Taylor Mining Co. The men were exploring an abandoned portion of the mine, when one of their number fell into some water. The four others went to his rescue, but were overcome by blackdamp before anything could be done.

TENNESSEE

Chattanooga—The reunion of the United Confederate Veterans will be held at Chattanooga, May 27 to 29. Great preparations are being made to properly entertain the survivors of the great struggle, whose ranks are thinning so rapidly. Owing to the low railroad rates local manufacturers expect that many of their distributors and suppliers, as well as many coal operators, will pay the city a visit about that time.

OHIO

Bridgeport—The strike of 2000 miners of the Lorain Coal & Dock Co. which started two weeks ago was settled May 6. The men demanded pay for all roll cutting where the stone is more than 10 in. thick and gained their point. The strikers resumed work at once.

Martins Ferry—The fan house at the Florence mine, two miles west of this place, was burned May 9, causing a loss of $2000. Four hundred miners will be thrown out of employment for two weeks. The origin of the fire is unknown.

MISSOURI

Jefferson City—Governor Major has announced the appointment of deputy mine inspectors as follows:

For the coal mines of the state—Benjamin B. Fischer, of Lexington, and Evans Jones, of Higbee.

FOREIGN NEWS

Halifax, N. S.—The miners of the Acadia Coal Co. at Stellarton have left work to interview the management concerning the reinstatement of one of their number. They claim that he was asked to vacate one of the company's houses while sick in bed.

Vancouver, B. C.—A strike of the coal miners in the Nanaimo area has been ordered by Frank Farrington of Seattle, representative for the Pacific Northwest of the United Mine Workers of America. The collieries affected employ a total of 2500 men.

PERSONALS

C. P. Ludwig, general manager of the Alabama Iron Co., has tendered his resignation, to take effect May 31.

Willis S. Holloway, who has had 15 years' experience in designing and installing coal-handling and conveying machinery with various firms is now associated with the Roberts & Schaefer Co., of Chicago.

The Hisylvania Coal Co., which has offices in the Capitol Trust Building, announces the appointment of Thomas D. Jordan as the Western sales agent of the company, with office at 1255 Old Colony Building, Chicago.

Robert Leitch, chief chemist at the Scottdale furnace of Corrigan, McKenney & Co., has been transferred to Charlotte, N. Y., to become superintendent of the company's furnace at that place. E. Guy Wentsluer will take his place at the Scottdale plant.

E. P. Laughrey, who has been chief clerk at the Scottdale furnace of Corrigan, McKinney & Co. for the past several years, has been promoted to the position of superintendent. Mr. Laughrey succeeds W. H. Everhart, who has been made superintendent in the Cleveland works.

Paul W. Holstein has recently been appointed by the Roberts & Schaefer Co., of Chicago, to have charge of its coal tipple and washing plant construction and contracting business in the West Virginia field. He has had several years' experience along these lines for other companies.

Mine Inspector Richard Maize, Jr., of Somerset, has been appointed superintendent of all the operations of the United Coal Co. in Somerset County, including those in Boswell, Jerome and Orenda. He succeeds John Gibson, Jr., who has been made general superintendent for Pennsylvania, Maryland and West Virginia.

W. C. Redfield, formerly vice-president and director of the American Blower Co., has been appointed a member of President Wilson's cabinet. Mr. Redfield has deemed it advisable to terminate his business connections with the company and has retired from active participation in its management.

W. H. Burke, formerly purchasing agent of the Illinois Traction System, and for the past year and a half fuel agent for that system and general manager of the Kerens Donnewald Coal Co., has resigned to accept a position as secretary and treasurer of the Roberts Motor Co., at Sandusky, Ohio. He is succeeded by J. A. Jeffries, formerly of the Williamsville Coal Co., of Williamsville.

TRADE CATALOGS

Draeger Oxygen Apparatus Co., 422 First Ave., Pittsburgh, Penn. The Draeger Pulmotor. Ill., 32 p., 6x9 in

The B. F. Goodrich Co., Akron, Ohio. Pamphlet, "Longlife" conveyor belt. Ill., 5½x8½ in.

Department of Mines, British Columbia. Preliminary Review and Estimate of the Mineral Production, 1912.

Otis Elevator Co., 8th Ave. & 26th St., New York. Catalog. Incline railways and skip hoist machines. Ill., 28 p. 6x9 in.

C. W. Hunt Co., West New Brighton, S. I. Catalog No. 12-9. Hunt noiseless gravity bucket conveyor. Ill., 64 p., 7x9 in.

The C. S. Card Iron Works Co., 1601-1679 Alcott St., Denver, Colo. Catalog No. 16. Coal handling machinery and equipment. Ill., 72 p., 6x9 in.

The Electric Service Supplies Co., Philadelphia, Penn.; booklet illustrating and describing the automatic trolley guard, a new specialty which it has recently added to its broad line of electric railway equipment.

Guarantee Construction Co., 140 Cedar St., New York. Pamphlet. Economic Handling and Storage of Coal and Ashes in Power Plants. Illustrated, 40 p., 6x9 in. Pamphlet. Retail Coal Pockets and Mechanical Screening Plants. Ill., 36 p., 6x9 in.

National Tube Co., Pittsburgh, Penn. New edition, Matheson Point Pipe Booklet. 40 pp.; numerous illus. The various advantages of this pipe are enumerated as follows: Reduced weight, greater bursting strength, saving in lead per mile, adaptability to vertical curves and the advantages of National coating.

The Witherbee Igniter Co., Springfield, Mass. Booklet on Wico Safety Electric Lamps. 12 pgs., 3x6 in., illustrated.

This is an electric head lamp operated by a storage battery carried on the belt. The accumulator, it is claimed, is the lightest and most compact device of its kind and capacity known, weighing but 2 lb. 4 oz. and giving a continuous light for 12 to 14 hours at one discharge.

NEW PUBLICATIONS

U. S. Bureau of Mines. Bulletin 46. An investigation of explosion-proof motors. By H. H. Clark, 1912. 44 pp., 6 pls.

U. S. Bureau of Mines. Technical Paper 28. Ignition of gas by standard incandescent lamps. By H. H. Clark, 1912. 4 pp.

Western Society of Engineers, Journal for April, containing paper on, "The Cause of Floods and the Factors that Influence their Intensity," "Investigation of Flood Flow on the Watershed of the Wisconsin River," "The Desirability of revising the Rating and Methods of testing Electrical Apparatus," etc.

"The Electron Theory of Magnetism." by E. H. Williams, has just been issued as Bulletin 62 of the Engineering Experiment Station of the University of Illinois.

This is a mathematical discussion of the new theory of magnetism. The bulletin traces the experimental evidence leading to the development of this theory, defines its present status, and points out certain phenomena which the theory in its present form fails satisfactorily to explain.

Copies of Bulletin 62 may be obtained upon application to W. F. M. Goss, director of the Engineering Experiment Station, University of Illinois, Urbana, Ill.

CONSTRUCTION NEWS

Minneapolis, Minn.—The Sullivan Coal Co. is planning to erect a 5000-ton automatic coal elevator on the Milwaukee tracks at Lyndale Ave. and Twenty-ninth St. The cost is to be in the neighborhood of $16,000.

Gary, W. Va.—The U. S. Coal & Coke Co. has let a contract for an annex of 8 rooms to be added to the Gary clubhouse. The dining room will also be enlarged to have a seating capacity of 60 at the tables.

Bellaire, Ohio—The contract for rebuilding the power house of the plant of the Franklin Coal Co. at Stewartsville, Ohio, has been awarded and the work will be rushed to completion. The power house was destroyed by fire recently.

Lorain, Ohio—The Baltimore and Ohio Railroad Co. has started the work of rebuilding the coal docks at Lorain. The docks, especially No. 1 was badly damaged by the recent flood. Repairs will be made to dock No. 2 which was also damaged by the high waters.

Battle Creek, Mich.—Twelve new coal sheds, 200 ft. long and having a capacity of 960 tons, will be erected in the near future by the J. O. Davis & Son Coal Co. It is understood that the company will not let any contract for the work but will undertake the construction itself.

Sparrow's Point, Md.—The Maryland Steel Co. has just placed contracts for additions to its byproduct coke and gas plant. The new ovens will be of the Koppers' type and will be constructed at once. When this work is finished the company will be equipped with sufficient coke capacity to supply its needs for fuel and give it abundant byproduct gas as well.

Wyandotte, Mich.—The Eberts Bros. Co., dealers in fuel and builders' supplies, has purchased the entire block of river front property between Poplar and Walnut streets. A dock, almost a block in length, will be erected, which will be equipped with modern devices for unloading vessels, including a large steam crane. A mammoth fireproof storage building will be erected at one end of the property.

Pittsburgh, Penn.—Plans for the new cofferdam to be erected in the Ohio River at Dam No. 9 have been received at the offices of the Pittsburgh Coal Exchange. There will be 435 ft. of open channel for navigation between the outer face of the cofferdam and the river wall of the lock. For spillway purposes there will be 100 ft. opening off from the lock chamber. The contract has been awarded to the National Contracting Co. and the work will be completed by Oct. 1.

Duluth, Minn.—The new steel plant at Duluth is to build an immense storage yard for coal and limestone in the near future. The yard will be 1000 ft. long by 600 ft. wide and will have sufficient capacity to store all the necessary supplies. It has been officially announced that three additional open-hearth furnaces will be constructed at a cost of $760,000, together with another reheating furnace. There will be 90 coke ovens in the new plant with a capacity of 1000 tons of coke per day. These are now in the course of construction.

NEW INCORPORATIONS

Cheyenne, Wyo.—The Cedar Grove Coal Co. has recently filed articles of incorporation. Capital stock, $300,000.

Austin, Tex.—The Sherman Gas, Light & Fuel Co. of Maine; capital stock, $200,000. Permit granted to do a business in Texas.

Youngstown, Ohio—The Brier Hill Coal Co. has filed papers with the secretary of state increasing its capital stock from $50,000 to $500,000.

Dayton, Ohio—The Service Coal Co., of Dayton, has filed papers with the secretary of state decreasing its capital stock from $50,000 to $5000.

Brazil, Ind.—The West Side Coal Co.; capital stock, $5000; to mine coal. Incorporators: C. H. Zellar, Lena Zellar, B. F. Schrepferman and M. D. Schrepferman.

Louisville, Ky.—The White Oak Coal & Coke Co. of Kentucky; capital stock, $25,000. Incorporators: C. S. Maddis, W. H. Kurk, C. A. McKamey and H. S. Phillips.

Youngstown, Ohio—The Reserve Metal & Coal Co.; capital stock, $10,000; to deal in junk, old iron, coal, etc. Incorporators: Mary Roland, Minnie Sussman, A. B. Calvin, H. G. Bye and B. L. Smith.

Woodward, Tex.—The Farmers' Coal, Grain & Elevator Co.; capital stock, $5000. Incorporators: I. J. David, G. A. Stuart, J. I. Carpenter, D. P. Thacker, W. A. Campbell, W. R. Smith, and J. H. Hamilton.

Clinton, Ind.—The West Clinton Coal Co. has been incorporated here, with $150,000 capital stock, to mine coal. The directors are John Shirkie, Steward Shirkie, S. P. Hancock, G. H. Bridges and Henry Adamson.

INDUSTRIAL NEWS

Sullivan, Ind.—The Princeton mine, owned by the Consolidated Indiana Coal Co. is to be reopened. The machinery has been removed from the Keller mine.

Blairsville, Penn.—It is rumored that the Buffalo, Rochester & Pittsburgh R.R. is about to be extended from Josephine, through Blairsville to Latrobe and perhaps further.

Manilla, P. I.—E. Randolph Hix states that the Philippine Coal Consumers' Association has just been formed and is about to ask for bids on $1,000,000 (gold) worth of coal.

Punxsutawney, Penn.—The H. C. Frick Coke Co. has ordered the firing of more ovens at Dorothy. This will make a total of 210 ovens in operation in the Westmoreland region.

Altoona, Penn.—The Altoona Coal & Coke Co. is preparing to place in operation its coking plant of 100 ovens at Coupon, Cambria County. The plant has been out of commission for some time.

Evansville, Ind.—Fire at the Ingle coal mines, near Evansville, destroyed the boiler rooms at the power plant, with a loss of more than $15,000, and also did considerable damage to the mine shaft.

Cincinnati, Ohio—The directors of the Mahoning Coal R.R. Co. have declared a dividend of $25 a share on the common stock, payable May 15. The majority of the stock is owned by the Lake Shore R.R.

New Lexington, Ohio—The Common Pleas Court, of Perry County, has ordered the sale of the property of the Saltillo Coal Co. at auction, June 7. The property consists of several tracts of coal land in Perry County.

Connellsville, Penn.—The Indiana Coal Mining Co., whose operation is located at Lockport, on the Westmoreland County side of the Conemaugh River, is now working a new operation on the Indiana County side of the river.

Lexington, Ky.—Colonel Tierney, head of the Elkhorn Coal Co., has just purchased a large tract of coal land on Pond Creek and will soon open 15 mines there. These mines will have a capacity of about 15,000 tons a day.

Brazil, Ind.—The Indiana Clay & Coal Co. has filed a petition for a receiver in the Circuit Court. The company operates a coal- and clay-stripping pit near Patricksburgh, but this has not been in operation for two months.

Belleville, Ill.—The county mine examiner has ordered the Little Oak Mine closed because the wood work of the mine was decayed and the tipple in a dangerous condition. Three hundred miners are thrown out of employment.

Joliet, Ill.—The Joliet Coal Products Co. is considering the expansion of its operations at a cost of $375,000. The plant now consists of 35 byproduct ovens. The plan is to build an additional 36, thereby more than doubling its capacity.

Johnstown, Penn.—Negotiations have practically been closed for the purchase of about 6000 acres of virgin coal in Green and Cherryhill Townships, Indiana County. The identity of the purchasers is being kept secret. An average of $60 an acre has been offered for the coal and the deal means the transfer of $360,000.

Reading, Penn.—The Reading Coal & Iron Co. is still storing coal at Abrams and Landingville. The mines, however, are working full and are likely to continue during May. It is reported that the eastern and western states are storing large quantities of anthracite, and this accounts for the activity at the mines.

Birmingham, Ala.—The New Orleans & Northeastern R.R. and Alabama & Vicksburg R.R. have placed together with the Corona Coal & Iron Co. probably the largest individual coal order in the history of Alabama. The order calls for 600,000 tons to be shipped at the rate of 25,000 tons per month over two years, beginning July 1, 1913.

Johnstown, Penn.—It is said that the Berwind-White Coal Mining Co. is about ready to purchase the holdings of the Jed Coal & Coke Co., near Welch, W. Va., for $300,000. This property has been in the hands of a receiver for a year. Should the court confirm the sale, it is said that the Berwind company will spend $200,000 on improvements.

Lorain, Ohio—The American Ship Building Co. has arranged to launch the new freighter, "A. C. Dustin," which was built at the Lorain yards of the company in the near future. The vessel is named after A. C. Dustin, of the firm of White, Dustin & Kelly, admiralty attorneys, of Cleveland. The "A. C. Dustin" is 545 ft. long, has a beam of 58 ft., and a draft of 31 ft.

Shenandoah, Penn.—The Philadelphia & Reading Coal & Iron Co. is experimenting with a new carbide gas lamp for use in its mines. It is expected that this new lamp will do away with the old oil-burning lamp. The miners who have used the new lamp say that it is far superior to the old-style lamp. It gives a much brighter flame, in addition to being cleaner and safer.

Manhattan, Kans.—The Rocky Ford Power Co. has devised a scheme for getting its coal across the river from the Blue Valley R.R. track to its plant. Large iron pipes, supported by cables, will span the river. The coal is fine and is washed through the pipes under pressure.

The Rocky Ford company is abandoning its water-power machinery for steam power.

Pottsville, Penn.—The Philadelphia & Reading Coal & Iron Co. is preparing to reopen the old Anchor mine at Heckscherville. The mine was abandoned 40 years ago and has remained full of water since that time. It is now planned to install pumps and drain the mine. When in operation the output will be hauled by motor to the Thomaston slope and conveyed on the main line to the Pine Knot breaker.

Spottsville, Ky.—The work of pumping the water from the coal mines at Spottsville, Ky., on the Green River, which were flooded during the high water last month, has been started and it is hoped to get the workings cleared in time to resume work before long. It is said that many of the men formerly employed in the mine have left the town, being under the impression that work would not be resumed in the mine.

Scranton, Penn.—The plant and business of the Scranton Steam Pump Co. was recently purchased at a receiver's sale by a committee representing 98 per cent. of the creditors. The total price paid was in the neighborhood of $400,000. This firm was forced into receivership by a combination of financial difficulties and not by any inferiority of its product. The business will be continued and it is believed that in a short time it will again be on a paying basis.

Alliance, Ohio—Mayor B. F. Hennacy has been taking options on coal lands in this vicinity. At present he has 2000 acres in Elkrun Township and more than 3500 acres in Salineville.

Tests have shown that there are rich beds of coal underlying the land in Elkrun Township, and it will probably not be long before mining operations are begun there. It is understood that Mayor Hennacy's purchase is merely an investment.

Pineville, Ky.—The Continental Coal Corporation, operating extensive properties in southeastern Kentucky, especially in the vicinity of Pineville, has moved its Louisville offices into new and commodious downtown quarters at 217 South Fifth St., between Market and Jefferson. All of the business of the company in Louisville will henceforth be handled from the office referred to, only a yard manager being left at the yards, where the office was formerly located. The central office will be in charge of L. A. Powell, who has been local manager for some time, and the company's branch offices will remain as before.

Connellsville, Penn.—Beginning with May 1, the output of Vesta No. 5 mine of the Vesta Coal Co. is to be shipped by rail. The new arrangement has been caused by the closing for repairs of one of the locks at Lock No. 4 on the Monongahela River. The other mines of the Vesta company will ship by river as at present. A siding has been placed to hold 50 cars at the Vesta No. 5 mine.

The tipple at this mine was designed for river as well as rail shipments. For this reason the contemplated change will mean but little additional expense. The mine is turning out about 3100 tons a day.

Winchester, Ky.—Coal and timber lands in Tennessee to the extent of about 41,800 acres have been sold by H. C. Thompson, of Winchester, to J. A. Smith, Roger E. Miles and W. A. Odell, representing Cleveland and New York interests. The price paid is said to have been about $400,000. Mr. Thompson also holds an option on 50,000 acres of coal lands on the South and Middle Forks of the Kentucky River, which he may sell to the same parties. The latter will make an investigation of the property, and, if favorably impressed, will close the deal, and immediately arrange for the building of a railroad through it to open up mines.

Indianapolis, Ind.—After long working of the coal fields of Greene, Clay and Sullivan Counties, it is reported capitalists are planning to push further south into Knox, Pike, Gibson and Warrick Counties and electric roads are being promoted. The most promising looking one at present will extend from Boonville to Lynnville and thence through Petersburg and Washington to Indianapolis. It is further said the Pennsylvania and Monon contemplate building into the new fields, the American Coal Co., supposed to be closely associated with the Monon, having leased several thousand acres of coal land in Knox County, near Wheatland.

Connellsville, Penn.—Steps are being taken to wind up the affairs of the Great Lakes Coal Co., which operates in Butler and Armstrong Counties. The company went into the hands of receivers some time ago, following a strike of its miners for a union wage scale and working rules. The property is now advertised for sale at auction in the Allegheny County court house, May 29. It consists of 22,133 acres of coal in Butler and Armstrong Counties, together with 685 acres of surface land, mines, tipples, etc., and 20,000 shares of stock of the Allegheny & Western R.R., at $50 par. It is likely that some effort will be made to reorganize the property and develop it.

Birmingham, Ala.—The Maryland Coal & Coke Co., recently organized, owns 15,000 acres of coal land in the Warrior field, about 30 miles west of Birmingham, which is being developed for a daily output of 2000 tons. The Frisco system is extending its Empire branch a distance of 7 miles to reach the scene of operations. A model mining town, consisting of 250 houses, is in the course of construction. Electric locomotives and mining machines will be used.

The seam which is being developed is known to the Warrior field as the Black Creek seam. It is 3 ft. thick, and is very hard. It is expected that shipments will begin between July 15 and Aug. 1.

COAL TRADE REVIEWS

GENERAL REVIEW

A distinct feeling of uncertainty pervades the hard-coal trade. May shipments, at some points, are falling behind those for April, with the result that there is not so much free coal offered as when the spring circular went into effect; requisitions at such points and for certain grades are subject to indefinite delays. On the other hand, rumors are current that some producers are experiencing difficulty in obtaining sufficient orders to cover their production, although such rumors are indefinite and have not been established. A period of mild depression during the mid-summer seems probable, but the situation is not to be regarded as serious, providing there is no pronounced cessation of industrial activity. Troubles between operators and miners has acted as a balance and tended to keep production down to the consumption.

In the coastwise bituminous trade, the larger buyers are beginning to lose hope of compelling the operators to recede from their higher prices on contracts and a few have signed up for a short period, evidently in anticipation that there will yet be a break in the market a little later. However, the trade, generally, is in better shape in all directions; less is heard about deferred buying, and operators, as a rule, continue withdrawing their bids, probably believing that they would rather curtail production for the time being, and have some free tonnage available when the higher prices prevail.

The Pittsburgh market is becoming steadily stronger with producers asking for substantial advances over the season's prices, although the regular circular is being maintained on contracts with old customers. The car supply is good, the lake shipments are steadily increasing, while production is at the highest point of the year, and would be still greater were labor conditions more favorable. It is seldom that buyers have ever been so eager, and there is nothing to check the heavy consumption except some highly adverse legislation is enacted by the new administration.

The accumulations at Hampton Roads are still about normal, but have been considerably reduced by a heavy movement into both the foreign and coastwise trade. Steam grades in the Southern market have become still heavier, with sales of small tonnages being reported at remarkably low figures; business such as this reflects adversely on the market. The domestic trade has become a trifle more buoyant, on the strength of a stocking up movement on the part of the dealers.

The Eastern producers are moving a heavy tonnage into the Middle West, where the dealers are anxious to acquire stocks while the summer circulars are still in effect. On the local coals, there has been a slight letup on domestic, with steam grades about normal; many contracts for the latter are being renewed. Dealers are pushing business while prices are low, and consumers are responding about as usual. Chicago has experienced some price cutting, with the result that quotations have fluctuated over a large range. There has been considerable contracting for Eastern fuels.

BOSTON, MASS.

Bituminous—On the whole the market is perceptibly firmer than a week ago. All reports are that Pocahontas and New River are being firmly maintained at $2.85 f.o.b., and this notwithstanding large accumulations at the Hampton Road piers. Corporation buyers are coming into the market for a share at least of their annual purchases, and there is a tendency to buy enough now to carry over into the season when concessions will be made, if there are to be any. The market is in much better shape in all directions, and it bids fair to continue so for the present at least.

The Pennsylvania coals of the better grade are well supplied with orders, and shippers are still withdrawing quotations left out a fortnight or more ago. Georges Creek is also firm on the season-contract basis; in fact, there are few weak spots all along the line. All-rail, and for inland shipment from tidewater points there is a decidedly better tone. Less is heard about deferred buying than was current a few weeks ago.

Water Freights are also somewhat firmer than when last reported; 75c. and 80c. have been paid this week for large vessels, Hampton Roads to Boston.

Anthracite—May shipments are so far very much behind those of April, and it looks like a month of relatively small tonnages. Loading is slowing up and the companies are not as free with the various sizes as they were at the opening of the season. Stove is notably short, and schedules calling for much of this size are entered subject to indefinite delay. Pea is also hard to get and New England dealers, especially those with relatively small storage, are getting apprehensive with such reports thus early.

Current bituminous quotations at wholesale are about as follows:

	Clearfields	Cambrias Somersets	Georges Creek	Pocahontas New River
Mines*	$1.00@1.35	$1.25@1.45	$1.67@1.77	
Philadelphia*	2.25@2.60	2.50@2.70	2.92@3.02	
New York*.	2.55@2.90	2.80@3.00	3.22@3.32	
Baltimore*	..	..	2.85@2.95	
Hampton Roads*				$2.85
Providence†				$3.73@3.78
Boston†				3.78@3.90

*F.o.b. †On cars.

NEW YORK

Bituminous—The soft-coal market continues in a rather lifeless condition without, however, any appreciable loss in strength. In view of the rather unfavorable conditions, operators are maintaining prices remarkably well. There appears to be a uniform restriction in production on the part of all large producers and a firm determination to obtain profitable figures for their product; when such prices cannot be obtained the business will not be accepted. Consumers are showing a disposition to buy for their current needs in the spot market in anticipation of being able to contract at lower figures later in the season.

Production at the mines appears to have fallen off slightly during the week, but this is probably only a temporary depression. Car supply, as usual, in times of light demand, is more than sufficient to meet requirements. Stocks at tide are about normal. Some odd tonnages of low-grade coal can be picked up in the market at very low prices, but such conditions are the exception rather than the rule, being due to some unusual features, such as demurrage. The market is not quotably changed from last week, which prices we continue as follows: West Virginia steam, $2.55@2.60; fair grades, Pennsylvania, $2.65@2.70; good grades of Pennsylvanias, $2.75@2.80; best Miller, Pennsylvania, $3.05@3.15; Georges Creek, $3.25@3.30.

Anthracite—Well defined rumors are current to the effect that some of the hard-coal producers are about caught up on their orders and will have to curtail production shortly unless more business appears. These conditions have not assumed definite or tangible proportions as yet, and, as a matter of fact, most companies have sufficient business on hand to keep them going steadily at maximum capacity up into July or August. Nevertheless, it is clear to all that there is not the customary activity on the part of the buyers, and there is a distinct undertone of uncertainty over the future of the summer business, but of not sufficient proportions to create any serious alarm over the situation.

Mines continue working up to full capacity, and the "button strikes" seem for the time to be less frequent. Monday of the current week was generally acknowledged as a holiday throughout the mining regions, and another occurs on the 30th of the month, which is Friday; this virtually means two days lost time since Saturday will doubtless see a very light force out, and the consequence is that production for the month will probably fall off below that for April.

The New York hard-coal market is quotable about on the following basis:

	Individual		
	Circular	Lehigh	Scranton
Broken	$1 60	$4 45	$4 50
Egg	4 85	4 80	4 85
Stove	4 85	4 80	4 85
Chestnut	5 10	4 95	5 00@5 10
Pea	3 50	3 30@3 35	3 35@3.50
Buckwheat	2 75	2 00@2 45	2 50@2 75
Rice	2 25	1 85@1 95	2 25
Barley	1 75	1 10@1 70	1 70

PHILADELPHIA, PENN.

The coal trade in this vicinity had a slight impetus early this week because of the weather which was the coldest experienced in this vicinity and at this time during the last forty years. It caused many anxious eyes to turn toward coal bins, and resulted in the consumption of considerable coal, which was supposed to be in the nature of a nest egg for next winter. The current business, however, still continues about the same as last week. There is no unusual call for coal, and dealers are being supplied regularly with all of their requirements. From the present indications, however, May is likely to absorb all of the production of the prepared sizes; steam grades still continue to be piled up in the storage yards of the large operators, the demand having fallen off considerably.

Taking it altogether, however, the month of May thus far has been as good as anyone expected, and possibly a little better, with the prospects of continuing so for at least the balance of the month. Up to the present, there has been less reports of concessions by the individual operators than has been the case in many years. The production continues on about a parity with May, 1911, and the little difficulties occurring between the operators and miners, mostly on account of some trivial difference, has had the effect of a balance wheel, in keeping the production within the demand. Considerable coal is still being diverted from the Eastern market into the Northwest, from the Lake shipping ports, and this in measure lessens the strain on the Eastern selling forces.

The bituminous market in this vicinity does not seem to improve as rapidly as was expected. The low ebb reached some weeks ago, was not followed by any appreciable increase in prices, but the demand is good. Optimistic views are expressed that the tangled market of the last two or three months, is the precursor of summer conditions at variance with the customary market at that time. Slack coal seems to be the most erractic, declining in some cases anywhere from 15 to 25c. per ton, and the demand not particularly active at that.

PITTSBURGH, PENN.

Bituminous—The market is still stronger. While the majority of operators are asking an advance of 10c. over season prices to buyers not their regular customers, as noted a fortnight ago, prompt lots are frequently quoted at as much as 20c. advance. On regular contract trade, however, the circular prices continue to be done with favored buyers. Production is on a slightly heavier scale, and is at the best rate of the year, but would be still greater if labor were in a more equable mood. There is much unrest, which is growing and promises unusual difficulty for the next scale settlement, for the period beginning Apr. 1 next, while the occasional local outbreaks do not become less frequent. Car supply is fairly good, there being complaint in a few quarters. Lake shipments are increasing week by week. We quote: Slack, 90c.; nut and slack, $1.05; nut, $1.25; mine-run, $1.30@1.40; ¾-in., $1.40@1.50; 1¼-in., $1.55@1.65, per ton at mine, Pittsburgh district.

Connellsville Coke—The trade is remarkably steady, having shown no definite change for three or four weeks, which is quite unusual with so mercurial a market. The majority of operators have their minds set on $2.25 for prompt furnace coke and $2.50 for contract. There being light demand for prompt, this has resulted in slight shading, generally to $2.10 to $2.20, with only occasional sales at $2 and few, if any, at the regular asking price of $2.25. The contract asking price might be similarly shaded if consumers were forced to act, but they are not. No contract business needs to be placed for delivery beginning earlier than July 1, and furnaces expect more than a small concession from the asking price. Prompt foundry coke has weakened slightly by operators not usually making this grade offering limited quantities at cuts from $3, which has been the minimum asking price of regular markets, some adhering to $3.25. We quote the market: Prompt furnace, $2@2.25; contract furnace, $2.50 asked; prompt foundry, $2.85@3.25; contract foundry, $3@3.25, per ton at ovens.

BALTIMORE, MD.

There has been a great demand for gas coals in the local market, particularly the better grades and shipments to the West have also been unusually heavy with the result that a scarcity has developed in the Eastern market. Operators having loose tonnages available for this Western demand have been obtaining a much better profit and the indications are that this has become a permanent feature of the local trade. This condition has brought about a much freer buying movement which is being further stimulated by the general belief that there will be a tremendous car shortage the coming fall. Screened gas coal is quoted at $1.25@1.40, mine-run $1@1.30, with slack at 80@90c. per ton.

The lower grade gas coals are in poor demand and are as weak or weaker than the same grades of steam fuel. The better quality steam fuels are in short supply; the majority of these have been contracted for and consumers who buy in the spot market may find themselves in difficulty before long. Big Vein Georges Creek is now selling around $1.60 with the next better grades, such as Tyson and Quemahoming being quoted at $1.25 to $1.35.

Reports are generally to the effect that practically all of last year's contracts have been signed up again. Coastwise and export shipments from the local piers were unusually heavy during the week. Coke is weak and the output further reduced.

BUFFALO, N. Y.

There is a good demand for all grades and sizes of bituminous coal. Mindful of tariff agitation and the uproar of strikes, in Buffalo at least, the members of the coal trade are much pleased at the activity in the local market. Slack, which often begins to show weakness as summer approaches, is fully as strong as sizes. But for the weakness in coke there would be a uniform strength in the trade. There is a difference of opinion as to the reason for the lack of activity in coke. Some say there is an over-production and others that the iron trade is not in a satisfactory condition. There is iron enough in consumption, but the price is not satisfactory.

Another reason for a good bituminous demand is the continued shortage of miners. Scarcely a mine represented here has men enough to satisfy its needs and in some instances where an operator has a good many contracts he has difficulty in filling them.

There seems to be a general belief that politics or disturbances of any sort are not going to reduce the general consumption and so long as that remains the coal must be provided. Buffalo, for instance, is building as never before and the locomotive works at Dunkirk reports a large order of locomotives just taken and so on. The tariff bill as passed by the House is detrimental to the local trade but business goes on as before and it is seldom that buyers are so eager for shipments unless they are trying to stock up. The trade sees no likelihood of a dropping off in demand.

Bituminous prices are, therefore, strong at $2.80 for Pittsburgh lump, $2.65 for three-quarter, $2.55 for mine-run and $2.15 for slack. Coke is plentiful and weak at $5 for best Connellsville foundry. There is no change in the price of smithing or cannel.

The Anthracite Trade is still quiet. Shippers speak of it as healthy but they do not look for a brisk demand again till fall. Consumers feel easy and are mostly well supplied with coal bought late last winter. The week's shipments of anthracite from Buffalo by lake were 132,000 tons.

COLUMBUS, OHIO

With an expanding lake trade and a good demand for steam grades, the coal trade in Ohio has been firm and active during the past week. Prices with the exception of the fine grades, have been well maintained and coal men generally believe the business will continue active for some time to come. No price cutting of any consequence is reported.

One of the best features is the larger requisitions from manufacturing concerns. Business generally shows improvement and this is reflected in larger orders from many lines of manufacturing, especially iron and steel mills. Railroads are also taking a larger tonnage since the troubles resulting from the flood are passing away. Some congestion is still reported at junction points but the movement of freight is now prompt.

A number of the railroad fuel contracts were made during the past week and they were generally at a marked advance over the quotations of last year. In some cases the contracts were awarded with a provision for an increase of 5c. on the ton toward the latter part of the year. All steam contracts renewed at this time are at higher figures than last year.

The lake business is one of the most active branches of the trade. Outside of some congestion at the upper lake ports, no trouble is experienced. The congestion, which it is believed will only be temporary, was caused by the movement of dozens of boats at the opening of navigation and consequently a lack of unloading machinery at the head of the lakes. When the movement becomes more uniform the congestion will be relieved.

There is practically no demand for domestic grades, although dealers are making preparations for an active consumption somewhat earlier than usual. This is due to the

fact that the flood caused dealers to sell out stocks closer than usual.

The output in Ohio fields during the week has shown a good increase. This is especially true in Eastern Ohio where the production is up to normal and about capacity. In the Hocking Valley district it is about 90 per cent. of the average. In the Pomeroy Bend field where the greatest damage was done by the flood, the output is about 65 per cent.

Quotations in the Ohio fields are as follows:

	Hocking	Pittsburgh	Pomeroy	Kanawha
Domestic lump	$1 50	.....	$1 50	$1 50
¾-inch	1.35	$1 20	1.35	1.30
Nut	1.25	.....	1.25	.....
Mine-run	1.15	1.10	1.15	1.10
Nut, pea and slack	0.70	.....	0.70	0 70
Coarse slack	0.60	0.70	0.60	0.60

HAMPTON ROADS, VA.

The movement of coal from tidewater during the past week has been very satisfactory; there have been some large shipments both coastwise and foreign and the accumulation of cars in the railway yards has been considerably reduced, although there still remains more than the normal quantity. Quite a fleet of vessels remain at anchor off Lamberts Point and at Newport News, waiting berth, and these, together with others now due, should keep both piers working to their full capacity during the coming week. Shortage of labor has somewhat delayed loadings at Newport News and the large number of bunker steamers arriving at Lamberts Point have kept the berths occupied, coastwise tonnage suffering accordingly.

Prices for the week have remained firm with some small sales at $2.80 for prompt shipment. The Government has loaded into colliers during the past week approximately 15,000 tons from various shippers which is, of course, all contract coal. Dumpings at Sewalls Point have been good and there is no accumulation of tonnage in the stream.

BIRMINGHAM, ALA.

Not much can be added to our last week's report on conditions obtaining in the coal trade in Alabama. Steam coal business is still depressed to the extent that some extraordinarily low prices are being quoted, and while this tonnage is not large the entire steam market is suffering from the effect.

A shortage of coal cars on one of the largest railroads in the district is growing more serious daily, a number of the mines on that line having lost from 20 to 35 per cent. time during the past two weeks. This condition is not quite understood by the operators as the railroad in question is in a financial position to secure all the equipment needed. A slight improvement is apparent in the domestic coal market. Prices are firmer and dealers are taking in a normal supply of stock coal.

LOUISVILLE, KY.

Indications point to a general easing up in the situation here. Local prices have fallen off to the customary summer level with the better grades of domestic lump selling at $4, but this general reduction has failed to bring about any responsive demand. Dealers themselves are doing but little stocking. In view of the curtailed work at the mines it is rather surprising to note that the shortage of screenings has at last been overcome and this in spite of the fact that the demand continues rather brisk.

The customary summer circulars are in effect which means that consumers buy at practically their own figures. It is a notable fact, however, that prices are almost invariably held at an advance of 10c. over last year's figures; the steam grades are showing even more substantial advances than this. The better grades of eastern Kentucky block are quoted at $1.85 f.o.b. mines, although this figure would be rather high in the larger competitive centers. The poorer qualities are from 25 to 40c. below this figure. Nut and slack are heavy at 70 to 90c. for the better grades with western Kentucky selling at 75 to 85c., and pea and slack are 35 to 45.

INDIANAPOLIS, IND.

Coal operators see some slight let-up in industrial activity, apparently, but not enough to excite comment. Sales of steam grades are not materially smaller than usual in May; mines are working about half time and their shipments of the domestic grades are practically nil.

Eastern mines are moving domestic into this state, retailers wishing to take advantage of the summer schedule of prices. This is particularly true of anthracite and Pocahontas and some Virginia splits that rise in price monthly. Other Ohio and Virginia coals that hold to about one level from April to September are not moving so freely at present. Indiana domestic can be shipped to the retail points in a day from the mines, and retailers do not stock up until fall, October usually being the best month. Freight rates are a handicap to steam grades from other states, but to those points in the state where the home rate runs 60 to 80c., considerable shipments of steam grades come from nearby states.

Screenings are selling around 90c., with a range of 10c. for quality and urgency of demand. Indianapolis retailers are pushing business while prices are low and customers are responding better than usual, following their experience of the last winter when prices were at record marks. While the buying will not be large in May, which is usually a breathing spell for the consumer after the winter's drain on his finances, there are indications that the succeeding months will find the retail trade active. Mine prices are unchanged.

Local dealers came down May 1 to their summer schedule, though they would not guarantee the present level to last longer than June 1. The new prices are:

Anthracite, chestnut	$8 00	Hocking Valley lump	$4 50
Anthracite, stove and egg	7 75	Luhrig lump	4 50
Anthracite, grate	7 50	Luhrig washed egg	4 75
Pocahontas, forked lump	5 50	Cannel	6.50
Pocahontas, shoveled lump	5 00	Linton No. 4 lump	3 25
Pocahontas, mine run	4 00	Linton No. 4 egg	3 25
Pocahontas, nut and slack	3 50	Indiana washed egg	3.50
Blossburg	5.50	Brazil block	4.00
Jackson (Ohio)	5 25	Indianapolis lump coke	6 00
Kanawha lump	4 50	Indianapolis crushed coke	6.00
Kanawha egg, nut	4 50	Connellsville lump	7.00
Pittsburg lump	4 50	Citizens' egg coke	6 00
Raymond lump	4 50	Citizens' nut coke	6.00
Winifrede lump	4 50		

DETROIT, MICH.

Bituminous—The local market is rather quiet, and, while spot prices continue unchanged, the trade is undeniably weak and liable to sharp break should there be any unusual overshipments. There is no change in the contract situation, buyers still holding off in the hopes of a break in the new high prices of the year. Operators are equally determined in their position in the matter, and just what the outcome will be is difficult to anticipate at the present moment.

It is stated at some points that dealers are slow about closing for smokeless coal for domestic purposes, because of the particularly high prices demanded on contract. Some buyers, however, report that they have signed up for as much of this grade as they require.

Market quotations are as follows, f.o.b. mines:

	W. Va. Splint	Gas	Hocking	Cambridge	No. 8 Ohio	Pocahontas	Jackson Hill
Domestic lump	$1.50	....	....	....	....	$2.25	$2.00
Egg	1.50	....	$1.35	....	....	2.25	2.00
1½-in. lump	1.25	....	....	....	....	....	....
¾-in. lump	1.20	$1 20	$1.20	$1 20	$1.20	....	
Mine-run	1.10	1 10	1 10	1.10	1 10	1.50	
Slack	1.00	1.00	1.00	1.00	Open	Open	

Anthracite—The hard-coal market in this vicinity has been heavily over-shipped, and the trade is dull. The large movement in March and April, which was succeeded by an almost unprecedented spell of mild weather, restricting consumption down to the smallest minimum in all the contiguous territories, has left the dealers and consumers overstocked almost without exception. Some dealers are buying sparingly, but the tonnage is light; the stimulation which ordinarily follows the reduced circular, has not been felt at this time.

Coke—Connellsville coke is quoted at $3.10, Semet Solvay, at $3 f.o.b ovens, with the trade comparatively active and strong.

CHICAGO

There is a wide range of prices prevailing in the Chicago coal market due to a variety of reasons. One of the chief factors has been a marked increase in competition which resulted in deep cuts in selling prices by a number of operators and dealers. In the Franklin County domestic trade the larger producers are demanding $1.35 for spot shipment and from $1.35 to $2 on contracts. Other operators are offering a much lower series of prices. There are some producing companies selling Carterville coal at $1.40, the mines, for domestic lump and $1.65 for No. 1 washed coal. On the other hand, a few of the operators in this field will accept prices ranging from 25c. to 35c. a ton lower.

A large number of contracts are being let for Eastern coals. Prices, generally, are good. A comparatively small volume of smokeless is reaching the Chicago market owing to a light demand. On account of a curtailment in production, the supply of coke at present is scarce and the market for this commodity remains firm. There is a strong demand for steam coal. Announcement has been made of an advance in the price of screenings of about 5c. a ton.

Coke—Connellsville and Wise County, $5.25@5.50; byproduct, egg, stove and nut, $4.55@4.75; gas house, $4.65@4 75.

Prevailing prices in Chicago are:

	Springfield	Franklin Co.	Clinton	W. Va.
Domestic lump	$1.97@2.07	$2.30@2 40	$2 27	
Egg		2.30@2 40		$3.65
Steam lump	$1 82@1 87		2 07	
Mine-run	1 77	2.20@2 30	1 97	3.30
Screenings	1.57	1.95	1.57@1.62	

MINNEAPOLIS—ST. PAUL

The all-rail business is extremely light at this time. There is not an over amount of coal pressing the market as many mines have been closed more or less of late, owing to floods. Prices on Harrisburg are quoted at $1.30 to $1.40 for lump and egg; the price for mine-run is $1.20. Screenings are scarce, and the price now is $1 at the mines, with contract price at 80c. Other grades of Illinois screenings are hard to get and, at the docks, it will be some time before enough screenings can be worked through.

ST. LOUIS, MO.

The usual dullness in the spring trade prevails in St. Louis and adjacent territory. There are a few calls for contracts in steam lines, but other than that very little is doing, and contracts are not looked upon with favor by shipping interests.

There is a slight increase in the prospects for the anthracite movement this month, and some inquiries for smokeless. The coke market, however, is dull. Screenings, still sell for 80c. at the mines and Carterville at $1. The washed coal market seems to be holding its own, with No. 3 and No. 4 in extra good demand. There is also some call for Arkansas anthracite, but not to the extent as in former years.

The prevailing circular is:

	Carterville and Franklin Co.	Big Muddy	Mt. Olive	Standard
2-in. lump				$0.90
3-in. lump			$1.20	
6-in. lump	$1 15 @ 1.20		1.25	1.05
Lump and egg		$2 25		
No. 1 nut	1 05 @ 1 15			
Screenings	0 90 @ 0.95			0 85
Mine-run	1 00 @ 1 10			0.80
No. 1 washed nut	1 35			
No. 2 washed nut	1 35			
No. 3 washed nut	1 35			
No. 4 washed nut	1 35			
No 5 washed nut	1 10			

St. Louis prices on May anthracite are: Chestnut, $7.50; stove and egg $6.80; grate $6.55. Smokeless lump and egg is $4.45 and mine-run $4. By product coke is $5 and gas house $4.75.

OGDEN, UTAH

The Utah operators seem to have been the prime factor in reduction of price f.o.b. mines. They have either solved the secret of cheap mining and wish to give the public the benefit or are endeavoring to force their coal on the market.

No dealer cares to store coal in May for three principle reasons: First, because there is no demand while there are a lot of unpaid accounts on the books covering winter coal, which means money tied up; second, the depreciation on the coal and interest on the money invested is greater than the reduction in price f.o.b. mines; third, because there is no reason for buying coal in May when it can be obtained at the same price in July and August. Consequently, during May, about the only coal bought will be for current demand and, of course, will be sold at the storage price.

PORTLAND, ORE.

Utah mines have announced the reduction of 25c. per ton for coal during the storage season and the delivery price here in five-ton lots or over is now $9.50 per ton. Dealers expect that Wyoming mines will announce a similar reduction within the near future. There has been no change in Australian coal quotations here since last fall. This is the quietest time of the year in the coal business here and no great amount of business is anticipated for some weeks. The market is steady, however, and values fully as high as at the corresponding time a year ago.

PRODUCTION AND TRANSPORTATION STATISTICS

SOUTHWESTERN TONNAGE

The following is a comparative statement of the southwestern tonnage for February and the first two months, 1912 and 1913:

State	February 1912	February 1913	Two Months 1912	Two Months 1913
Missouri	305,759	260,586	587,212	566,411
Kansas	501,121	414,413	1,039,049	938,018
Arkansas	176,210	130,888	431,876	313,536
Oklahoma	267,731	297,004	616,713	663,863
Totals	1,250,821	1,102,891	2,574,850	2,482,82

ANACONDA COPPER MINING CO.

The following is a comparative statement of this company's coal production over the last three years:

	1912	1911	1910
Coal produced	837,815	800,073	828,531
Shipped to other departments	514,208	508,913	449,421
Sold	244,685	316,647	309,242
Used at coal mines	78,922	74,513	69,868

THE CAR SITUATION

American Ry. Association reports surpluses and shortages of coal equipment for two weeks ended May 1, as follows:

	Surplus	Shortage	Net*
New England Lines	75	150	75
N. Y., New Jersey, Del.; Maryland; Eastern Penn	4,036	451	3,585
Ohio; Indiana; Michigan; Western Pennsylvania	230	1,340	1,110
West Virginia, Virginia, North & South Carolina	779	1,369	590
Kentucky, Tenn.; Miss.; Alabama, Georgia, Florida	222	295	73
Iowa, Illinois, Wis., Minn ; North & South Dakota	1,519	35	1,484
Montana, Wyoming, Nebraska	592	0	592
Kansas, Colorado, Missouri, Arkansas, Oklahoma	1,788	89	1,699
Texas, Louisiana, New Mexico	297	0	297
Oregon, Idaho, California, Arizona	2,591	4	2,587
Canadian Lines	114	0	114
Totals	12,243	3,733	8,510
Greatest surplus in 1912 (Apr. 25)	94,692	2,144	92,548
Greatest shortage in 1912 (Oct. 10)	6,491	14,897	8,406

*Bold face type indicate a surplus.

FOREIGN MARKETS

GREAT BRITAIN

May 2—The miners at several collieries have not yet resumed work after the May-Day labor demonstration, but the general impression is that these stoppages will not last for long. The prevailing market is as follows:

Best Welsh steam	$5.10@5.22	Best Monmouthshires	$4.56@4.68
Best seconds	4 92@5.04	Seconds	4.44@4 50
Seconds	4.74@4 86	Best Cardiff smalls	3.48@3.60
Best dry coals	4.74@4 92	Seconds	3.48

The prices for Cardiff coals are f.o.b. Cardiff, Penarth or Barry, while those for Monmouthshire descriptions are f.o.b. Newport; both exclusive of wharfage, and for cash in 30 days—less 2½%.

COAL SECURITIES

The following table gives the range of various active coal securities and dividends paid during the week ending May 10.

Stocks	Week's Range High	Week's Range Low	Week's Range Last	Year's Range High	Year's Range Low
American Coal Products	87	87	87	87	87
American Coal Products Pref	109¼	109¼	109½	109¼	109½
Colorado Fuel & Iron	32	31¼	31½	41½	31
Colorado Fuel & Iron Pref	....	....	155	155	150
Consolidation Coal of Maryland	102¼	102¼	102¼	102¼	102¼
Lehigh Valley Coal Sales	225	210	215	..	..
Island Creek Coal, com	52	51	51	....	..
Island Creek Coal Pref	85	84	84	..	..
Pittsburgh Coal	18⅜	17⅛	18	24⅛	17⅛
Pittsburgh Coal Pref	83	83	83	95	79¼
Pond Creek	22½	19½	19½	23⅜	19½
Reading	162¼	159½	160½	165⅛	152½
Reading 1st Pref	91	90	90	92½	89½
Reading 2nd Pref	89½	89½	89½	95	87⅛
Virginia Iron, Coal & Coke	45	43	43	54	43

Bonds	Closing Bid	Closing Asked	Week's Range or Last Sale		Year's Range	
Colo. F. & I. gen. s.f.g. 5s	95	98½	95	April '13	95	99½
Colo. F. & I. gen. 6s			107½	June '12	..	..
Col. Ind 1st & coll. 5s. gu	78¼	80	78¼	78¼	78⅛	85
Cons. Ind. Coal Mc. 1st 5s	75	80	85	June '11	..	..
Cons. Coal 1st and ref. 5s	..	94	93	Oct '12	..	..
Gr. Riv Coal & C. 1st g 6s	..	100	102½	April '06	..	..
K. & H. C. & C. 1st s f g 5s			98	Jan. '13	98	98
Pocah. Con. Coll. 1st s f 5s		87½	87⅛	Mar. '13	87⅛	87⅛
St. L. Rky. Mt & Pac. 1st 5s	76	78	76	Mar '13	76	80
Tenn. Coal gen. 5s		101½	100	100	100	103
Birm. Div. 1st consol. 6s	101½	103½	101	April '13	101	103
Tenn. Div. 1st g 6s	..	103½	102	Feb. '13	102	102
Cah. C. M. Co. 1st g 6s	..	104	110	Jan. '09	..	..
Utah Fuel 1st g 5s						
Victor Fuel 1st s f 5s	80	Sale	80	80	79½	80
Va. I. Coal & Coke 1st g 5s	93	97	93	May '13	93	98

No Important Dividends were announced during the week.

COAL AGE

Vol. 3 NEW YORK, MAY 24, 1913 No. 21

THE coal industry has many members with axes to grind.

Some men are flatterers by constitution. They have no real conception of the true meaning of such words as wonderful, magnificent or marvelous. Due allowance must be made for all they say, and criticism of their effulgent praise should be governed by a generous recognition of their innocent and unassumed but unfortunate fault.

There are other people interested in some phase of coal mining, however, who are not flatterers by nature, and who sweeten their tongues with a motive always in view. They are like the fox who wanted the morsel of food which was held in the crow's bill. He expressed regret that the bird should have a poor voice coupled with such beautiful plumage. The crow, intending to refute the charge, released the prize, which the fox picked up, remarking: "Your voice is all right, but your wit is wanting."

The wisest man in ancient history once remarked: "He who flattereth his neighbor spreadeth a net for his feet." When a man commences an interview with the gift of a choice cigar, or hands out a fraternal grip, you can feel fairly certain there's to be a swapping of favors, in which transaction the other fellow intends to be sole referee as to the nature of both articles exchanged in the trade.

It's more decent to present your cigar or hand out your fraternal grip at the close of a business interview. Clubs, lodges and mining institutes are essential to good fellowship, rapid progress and business convenience; but the man who joins such an organization *simply and solely* to exploit his brother man is lacking in those principles which command success through personal merit or individual worth.

Here and there we can point our finger at some man high in the councils of coal men, who gained his undeserved success through influential friends or unworthy and shameful affiliations; however, there is no doubt but that the best pull is that of our own right arm. Only when it is weak do we need a lodge grip at the end of it.

Although we live in the most commercial age history has ever recorded, and are a part of the most commercial nation the sun ever shone on, there is still room for friendships not built on a money foundation with the single idea of promoting the transaction of business.

Personal pride, if nothing more, should compel us to refrain from insincere flattery to gain a point; and natural vanity in our own strength and ability to accomplish things should cause us to refuse an advantage coming only through the avenues of pull or social affiliations.

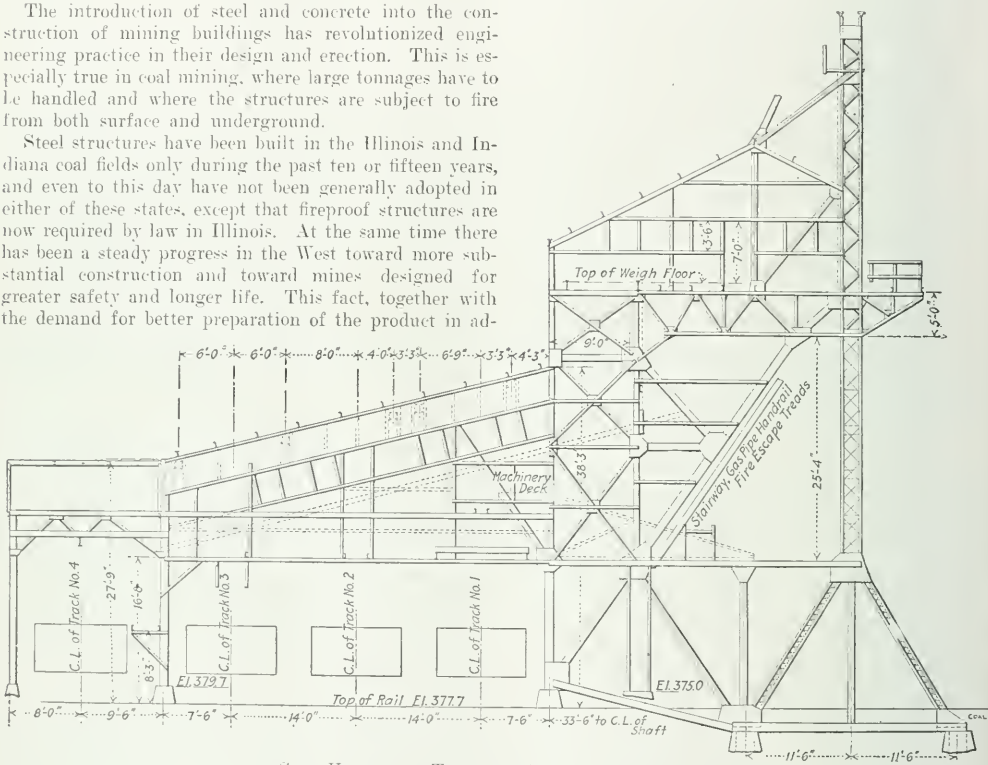
Modern Steel-Tipple Design

By John A. Garcia*

SYNOPSIS—The steps of evolution leading up to the introduction of an improved construction of headframe and screening plant are here delineated. This new design is only about one-half the weight of its predecessors and yet so rigid and firm that an independent screen-supporting framework is unnecessary.

The introduction of steel and concrete into the construction of mining buildings has revolutionized engineering practice in their design and erection. This is especially true in coal mining, where large tonnages have to be handled and where the structures are subject to fire from both surface and underground.

Steel structures have been built in the Illinois and Indiana coal fields only during the past ten or fifteen years, and even to this day have not been generally adopted in either of these states, except that fireproof structures are now required by law in Illinois. At the same time there has been a steady progress in the West toward more substantial construction and toward mines designed for greater safety and longer life. This fact, together with the demand for better preparation of the product in addition to the more recent requirement of law, has led to an interesting development in this line of engineering.



Side View of a Typical "A. & G." Steel Tipple

Importance of Shaft and Tipple

The keystone of a mining installation is the shaft and tipple. These are the connecting links between the underground workings and the commercial market, and it is natural that the best efforts of engineers have been devoted to securing permanence and safety from accident in these most important parts of a mining plant.

In the old days the shaft was put down in the cheapest possible manner, small, cramped and timber lined, and the tipple was placed immediately on the curbing or in some cases just outside of it. This structure usually consisted of six heavy, vertical timbers placed at the corners of the two hoisting compartments, braced laterally by batter braces and carrying the sheave wheel on cross timbers at the top. A heavy timber brace was then framed between the sheave deck and the engine foundations. The weighhouse was supported by similar bents placed between the tracks, and the screens were hung or supported underneath and covered by a loading shed.

When shaker screens began to come into use, it was found necessary to support them on an independent interior structure, as it proved difficult to produce and maintain a timber frame of sufficient rigidity to prevent the vibration of the screens from affecting the scales and seriously damaging the main building. On this account also, it became common practice to carry the screens on various systems of rollers, instead of hanging them as formerly, in order to avoid the great heights of the necessary overhead structure.

The first steel tipple followed almost exactly the lines of the accepted design in wood. At least six steel columns were placed on or adjacent to the curbing, the screens were carried on an independent structure and the batter braces connected as formerly, and the whole structure interwoven with a network of light angle bracing.

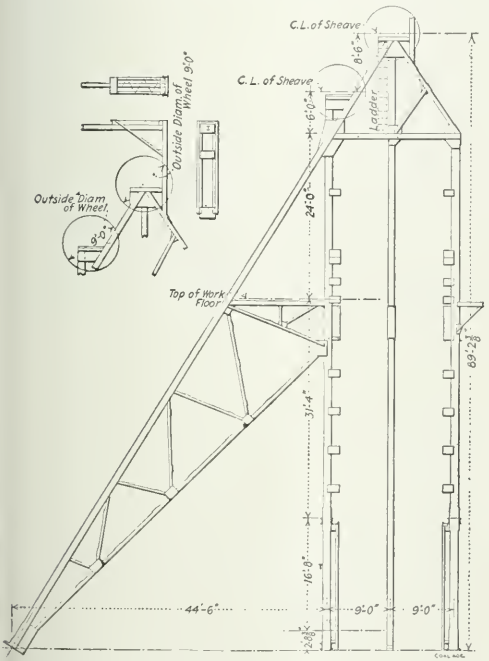
The actual working stresses in the tower were found

*Of Allen & Garcia Co., Chicago.

to be surprisingly small, and the required sections were made correspondingly light. The first designers did not realize that steel is an elastic material and that a structure of sufficient theoretical strength would lack entirely the rigidity necessary for satisfactory operation under the shock of hoisting and dumping and the constant vibration of the screens.

It is not surprising, therefore, that the first steel structures were distinctly less rigid and satisfactory than their wooden predecessors. They had just one advantage—they were fireproof. The freedom from shrinkage and rotting was offset by the rusting of the metal and the extreme liability of the light members to damage from accident.

Any damage to the shaft, any settlement around it, or fire in the curbing, had almost as destructive an effect



Front View of Hoisting Tower, Showing Simplicity of Construction

on the tipple as if it had been built of wood, and the operators rightly began to wonder whether even the small increased cost of steel over wood was worth while.

The First Superior Steel Tipple

The first step toward the construction of a steel tipple distinctly superior to wood was in the adoption of the "A-frame" design, in which the legs of the tower are carried onto firm ground well away from the shaft. Another improvement introduced about the same time consisted of crossing the tracks with a clear span and carrying the screens on a bridge so as to avoid the inconvenience and danger of columns located between the tracks.

The "A-frame" tipple, while a distinct improvement over previous designs, and greatly superior to the wooden structure in strength, permanence and rigidity, had some serious drawbacks. The guides had to be carried inside of a widely spreading tower by means of substantial horizontal frames, which, even if of sufficient strength, were particularly liable to damage and corrosion. Even at the best they added greatly to the cost of the structure. In this respect the old form of six-column tower, when the footings are carried a sufficient distance outside the shaft, still has an advantage over the "A-frame," although this advantage is entirely neutralized by the greater complexity of the structure.

In all these designs the independent screen structure was a uniform feature. The effect of the vibration of the screens was so little understood and so inadequately analyzed that none of the designers appeared to be brave enough to break away from the prevailing practice and plan a structure that should be stiff and strong and with the unavoidable vibration so localized that no damage could come to the structure or inconvenience to the operation of the scales.

In the meantime, there came a development in the direction of concrete or concrete-lined shafts. Such construction not only removes the danger of fire, but makes the shaft curbing, in most cases, the best and most substantial as well as the least expensive foundation on which to place the tower. The principal advantage of the "A-frame" structure was thus removed.

The Introduction of a New Design

About two years ago, the Allen & Garcia Co., of Chicago, took up the problem of building a tipple over a concrete shaft and decided to place the main column members directly on the curbing. A system of construction was evolved and protected by patents, which seemed to be a distinct improvement over any previous construction. So simple was it that the only wonder is that it was not devised long before; in fact, the only reason that can be assigned is found in the gradual steps outlined above, from which the steel tipple was evolved.

Instead of putting uprights at the corners of the shaft, two main columns are placed in the middle of the curbing at either end, just back of the guides, these members themselves being carried directly by, or bracketed from, these columns. The center guides are also carried by a vertical column directly between them, it being hung from the main structure so as not to rest on the buntins and bracketed at several points so as to have ample lateral and longitudinal stiffness.

When adapted to an end-hoist tower, the sheaves are carried directly on an "A-frame" of the same width as the column, the forward leg of which is carried down to the ground in a line outside of the resultant of the cable stress. All columns are made of such width as will insure sufficient lateral rigidity when unsupported throughout their length, and also carry the journal bearings of the sheaves.

The main structure carrying the weighhouse and screens is built over the tracks at right angles to the hoisting frame and designed so as to give the greatest possible rigidity to the tower and to carry the shock of dumping directly to the ground.

With this tower of extreme rigidity, it is an easy matter to design a screen structure so stiff that the vibration of the shakers will have little or no effect upon it and the screens can then be hung on properly journaled, rigid hangers so as to operate with only a small part of the friction and wear incident to roller supports. The

eccentrics or other operating mechanism for the screens may then be supported on cross members, so that any vibration arising from them will be entirely absorbed before being communicated to the main structure.

The advantages of this construction are many. In the first place, the main tower is composed of three heavy and substantial members, which can be incased in concrete, so as to protect them entirely against accident or corrosion. Second, the weight and cost of the main tower, in spite of its great strength and rigidity, is scarcely half that of a properly designed "A-frame" tower. Third, the shaft is left entirely clear at the bottom of the tower, so that rails and other material can be easily loaded on the cages. Fourth, the foundations are cheapened and cut down in number. Furthermore, a screen house of sufficient stiffness can be rigidly connected to the main structure. Fifth, the guides are attached direct to the tower columns and form a stiff, rigid slide for the cages from shaft to dumping point; all at a less cost than the former style of construction.

In working out the details of this new type of structure, which has been christened "the A. & G. Patent Tipple," it became necessary to make a careful analysis of the action and operation of the screens. The first requirement is to design the shakers so that they will be as nearly balanced as possible under the varying conditions of load. This can usually be accomplished by making the upper section of the screen which receives the coal somewhat shorter and lighter than the lower section.

In studying the forces acting upon the screen through the driving rods, it became evident that it was possible to devise a much better operating mechanism than the time-honored eccentric, which is, as all engineers know, an inefficient and troublesome appliance for transmitting power. We have, therefore, substituted a bell-crank device, operated by driving rods from two large flywheels, which have been found to perfectly balance the two sides of the screen.

The power factor is thus made so constant that the motor or engine can be direct-connected to this shaft and as the whole mechanism is self-contained, the resulting vibration is small. The driving rods have brass journal bearings of ample size, arranged for thorough lubrication, and the ratio of lever arms is such that the forces are greatly reduced before reaching the driving rods and the flywheels.

While it is admitted that these changes are somewhat revolutionary, they are based on established mechanical principles, and are only a beginning of what can be done in transforming the old-style coal-mining plant into a simple, efficient and economical machine.

Adaptation to Timber-Lined Shafts

The next step was to adapt the "A. & G." construction to a timber-lined shaft, and this has proven to be unexpectedly easy. It is only necessary to carry the two main columns on a low "A-frame," or even on steel beams to any desired distance from the shaft curbing. Next comes the adaptation of this construction to the "side hoist," which may be required under certain conditions, and here it is also possible to use two main guide columns instead of the old-style six-column construction or the "A-frame," and to obtain the same advantages with a little economy.

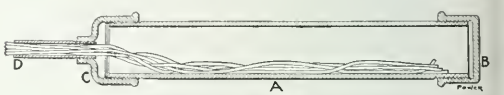
The perfect balancing of the screens and the accomplishment of proper separation for large tonnages especially, can be greatly facilitated by the introduction of an automatic feed hopper, which allows the coal to flow to the shakers at a uniform rate, thus avoiding the rush of imperfectly screened coal, so common when large amounts are dumped directly on the screen from the weigh-pan.

Space will not permit of the discussion in detail of these important questions, but the advantages of scientific designing are such that the sales department will find it increasingly difficult to market coal and show a yearly profit in competition with the operator who has taken advantage of the latest improvements in tipple construction and screening equipment.

Torch for Boiler-Inspection Work

The following description of a home-made torch, written by J. F. Mowat, of Joliet, Ill., appears in a recent issue of *Power*:

Some time ago there appeared in *Power* a description of a holder for a lamp to be used inside boilers. This ingenious arrangement brought to my mind a torch (by no means a new one) in use for the same purpose, which, possibly, does not require the care necessary with the lamp, as this torch burns equally well in any position.



Section of Home-Made Torch

One advantage of this torch, aside from the great convenience in inspecting boilers and in working in any dark restricted place, is the ease with which it may be made. Its great simplicity puts it within the reach of any handy man who has access to a hacksaw, a set of pipe dies, a vise and a few pipe fittings.

The illustration shows probably the most convenient size. A piece of 1¼-in. brass pipe *A* has a cap *B* on one end and a 1¼x⅜-in. reducing coupling *C* on the other. Into the coupling is screwed a ⅜-in. nipple *D*, about 2 in. long. A few strings of lamp wicking long enough to reach the bottom, complete the torch. Unscrew the coupling from the pipe, fill with kerosene oil, and it is ready for use.

British Coal Statistics

According to advance proof sheets of government statistics (the figures in which are subject to correction), the largest coal production of any county in England for the past year was for Yorkshire with 38,491,000 tons. Durham was second in production with 37,890,000 tons; Glamorgan was third, with 33,727,000 tons. Northumberland produced 13,381,000 tons.

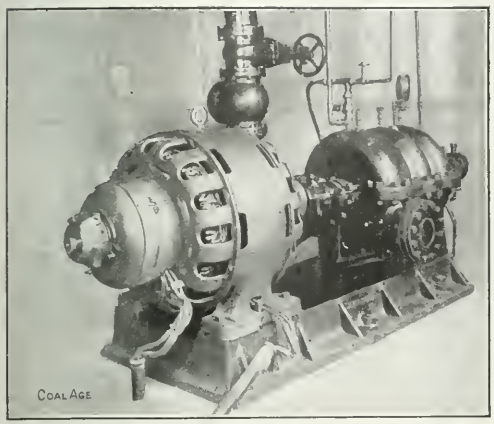
Each of these districts showed a decrease in yield from the previous year, due, of course, to the strike, but this falling off is less than might be expected when the duration of the stoppage is borne in mind.

The number of miners in Yorkshire slightly exceeds 161,700; Durham has 169,600 and Glamorgan has over 151,700 miners.

A Relay System of Pumps

The accompanying illustration shows an underground pump house of the Homestake Mining Co., at Lead, S. D. In this mine the arrangement of pumps is what might rightfully be termed a relay system, since the water is removed in a series of lifts.

The shaft is 1400 ft. deep and is supplied with pumping stations placed approximately 300 ft. apart, each station being equipped with two units, one of which is held constantly in reserve.



One of the Units at One of the Lower Stations

The amount of water handled by each pump is 1000 gal. per minute, and the head is approximately 325 ft. for the 1400-ft., 1100-ft., 800-ft. and 500-ft. levels, while this amount is reduced to 200 ft. for the pump placed nearest the surface. Each level is provided with a sump from which the respective pumps draw their supply.

Each of the four lower pump stations contains two Jeansville multi-stage centrifugal pumps of the double-suction type. These are direct-connected to 125-hp. Westinghouse, 3-phase, 60-cycle, 220-volt motors, operating at 1745 r.p.m., while the station at the 200-ft. level has pump units similar to the others in capacity, but with fewer stages and operating against a lower head.

Coal-Mine Accidents Report

(U. S. Bureau of Mines)

The coal-mine accidents occurring in the United States during the year 1912 have been compiled by the United States Bureau of Mines under the direction of Frederick W. Horton. The publication, which is now ready for distribution, is a résumé of the accidents from 1896 to 1912, inclusive, together with monthly statistics for the year 1912.

Mr. Horton, in reviewing the year, says: "During the calendar year 1912, there were 2360 men killed in and about the coal mines of the United States. Based on an output of 550,000,000 short tons of coal produced by 750,000 men, the death rate per 1000 employed was 3.15, and the number of men killed for every 1,000,000 tons of coal mined was 4.29. The number of men killed was the least since 1906; the death rate per 1000 employed was the smallest since 1899; the death rate per 1,000,000 tons of coal mined was the lowest, and the number of tons of coal produced in proportion to the number of men killed, the greatest on record. These facts offer indisputable evidence that conditions tending toward safety in coal mining are actually improving and that coal is now being mined with less danger to the miner than ever before.

"The general improvement in 1912, as compared with 1911, is shown by the following facts: In 1912 the number of men killed in the coal mines of the United States was 359 less than in 1911—2360 as compared with 2719—a decrease of 13.2 per cent., and this in spite of the fact that there were more men employed in the mines and more coal mined than in any previous year. The death rate per 1000 men employed in 1912, was 3.15 as against 3.73 in the previous year, a decrease of 15.5 per cent. During 1912, for every 1,000,000 tons of coal mined, 4.29 men were killed, as compared with 5.48 men in 1911, a decrease of 21.7 per cent. There were 233,000 tons of coal mined, for each man killed in 1912, as compared with 183,000 tons in 1911, an increase of 50,000 tons or 27.3 per cent.

"Although the improvement in 1912 was greater than in any previous year for which accurate statistics are available, partly due, perhaps, to the exceptionally mild weather during the last few months of the year, which decreased the likelihood of disastrous coal-dust explosions, there has been an annual improvement for a number of years, as indicated by the accompanying table:

NUMBER OF MEN KILLED IN AND ABOUT THE COAL MINES OF THE UNITED STATES, IN THE CALENDAR YEARS 1907 TO 1912, INCLUSIVE, WITH DEATH RATES

Year	Number Killed			Production per Death, Short tons
	Total	Per 1000 Employed	Per 1,000,000 Short Tons Mined	
1907	3197	4.88	6.93	144,000
1908	2449	3.64	6.05	165,000
1909	2668	4.00	5.79	173,000
1910	2840	3.92	5.66	177,000
1911	2719	3.73	5.48	183,000
1912	2360	3.15	4.29	233,000

"It will be noted from the foregoing table that the death rate per 1,000,000 tons of coal mined has decreased annually; that the production per death has increased each year since 1907, and that the death rate per 1000 men employed has steadily decreased during the last four years.

"This general improvement has been brought about by a combination of causes, the principal one of which has been more efficient and effective mine inspection on the part of the state mining departments and state mine inspectors throughout the country, supplemented by greater care on the part of both the operators and the miners. The investigative and educational work of the Bureau of Mines has kept both the operator and the miner alive to the various dangers connected with coal mining and has shown what precautions should be taken to avoid these dangers.

"Although there has been an annual improvement in mine-safety conditions since 1907, and a particularly notable one in 1912, a still greater decrease in the death rate can be effected. Whether or not such an improvement will be made in 1913 depends largely on the care exercised by the operators, superintendents, foremen, and all others in authority, and by the miners as well.

Copies of this report, Technical Paper 48, may be obtained by addressing the Director, Bureau of Mines, Washington, D. C.

"Safety First" the Slogan Cry

By J. W. Powell*

SYNOPSIS—The writer advocates the employment of a practical linguist at each mine to talk to the men and explain their work. He deprecates reliance on printed rules, and the use of the naked light. He points out that with telephones and refuge stations many lives could be saved.

The prevention of mine accidents has been the foremost thought of all conscientious mine owners and managers from the beginning of the industry to the present day; and prevention of accidents will continue to be the first aim of every careful official charged with the responsibilities of coal mines for all time to come. With this idea in view I offer the following suggestions.

A Mining Instructor in All Languages Represented.

(1) Thirty-five years ago, the mine workers in Anglo-Saxon America were mainly of English, Welsh, Scotch, Irish, French, Belgium or German extraction, while today the major portion of the laborers employed in our mines are emigrants from central and southern Europe, who are very much inferior to their predecessors.

These men are foreign to our customs, do not understand our language and the majority never saw a coal mine before coming to this continent and securing employment therein, and a large percentage of our accidents today can be attributed to these facts.

I would suggest that in every mine employing this class of labor an official who thoroughly understands the language of the men employed be appointed by the management, this official to confine his whole attention to the instruction of these men in the different methods of working, the safe handling of explosives, drilling and tamping of holes, undermining of coal, placing of timbers, etc., and all the various things having reference to their own safety and the safety of their fellowmen and of the property in general. It would not be necessary for this official to be certificated because he would be acting under the direct supervision of the certificated mine officials. Nevertheless he should be a man chosen by the management after careful consideration as to his practical knowledge, carefulness and force of character so that he might thus be enabled to command the respect of the men under his instructions.

Danger Signals and Illustrations

(2) Danger signals should be placed at several conspicuous points throughout the mine; these should be flashed by electricity where the mines are non-gaseous or painted in large letters in the different languages if gas is encountered in the mine. In addition to these there should be large finger boards pointing the direction to the surface and placed at different points throughout the mine where men are liable to become confused.

At the entrance to the workings above ground, in addition to the rules and regulations required by law, large pictures or lithographs should be tacked up, these pictures depicting the different accidents which frequently occur in the daily operation of mines, due to the carelessness of the men. For example, a miner could be shown preparing a charge of powder with a naked light on his head, undermining coal and neglecting to use sprags, working under a dangerous roof and not placing timbers, tampering with a safety lamp or using a match to light his pipe in a gaseous mine.

That day is long past when extended, heavy matter written or printed was read with avidity. Today we must reckon with the hustle which is the spirit of the age. Business and like institutions no longer call attention to their products by the use of many words. Instead of that they grip the spirit or central idea that such words would convey and depict that leading thought so that it may be apprehended at a *single glance* and leave a lasting impression on the memory.

To attempt to interest the men in safety by a system of "rules and regulations," printed in small type and carefully framed, will in my estimation fall far short of accomplishing the desired end since men by reason of deficiency in education, dullness of comprehension, or lack of knowledge of the language may not be able to understand the words at all, and those who can, have neither the time nor the inclination to do so.

The Naked Light and Its Many Crimes

(3) Naked lights should be prohibited by law in all coal mines. The lives which have been sacrificed upon the altar of the naked light have been legion, if we add to the losses due to insufficiently diluted products of combustion, the disastrous fires which have been caused by open lights and also the various other accidents which can be attributed to them. Sparks from lights have ignited kegs of powder, and boxes of detonators have been exploded by the same cause.

I would suggest the use of some form of inclosed light. Electric lamps seem to be giving satisfaction to some of the companies which have installed them. Again, nothing but the most approved type of safety lamp should be used in a mine showing the least trace of explosive gas; the use of mixed lights as is practiced today in some mines should be prohibited by law.

Telephones and Rescue Stations

(4) Telephones should be established in every mine connecting the inside workings with the office on the surface, such telephones should be placed at different points throughout the mine so as to be easily accessible in case of accident. The lines should be securely laid in conduits underneath the tracks in such a way as not to be liable to injury in case of derailment of cars or an explosion.

(5) Refuge stations should be required by law in all coal mines where the number of men employed under ground exceeds 50, so that in case of an explosion of gas, or a mine fire or any serious accident which cuts off access to the surface, the men may find refuge within its walls.

These stations should be excavated in the solid coal and surrounded by large pillars. The entrances should be through long, narrow necks which are provided with 3 or 4 sets of massive iron doors constructed in such a manner as to be explosion proof. In heavy pitching

*Mine superintendent, Mount Carbon Colliery Co., Coalmont, B. C.

seams these chambers could be excavated in solid rock on the sides of the entries.

Equipment of Refuge Chambers

To be effective such stations should be provided for each district in the mine. These stations should be connected to the surface by a compressed-air line either carried through boreholes from the surface, or through indestructible conduits along the headings. These conduits should be constructed in such a manner as to be proof against fire and explosion. Each station should be provided with a complete telephone system connected with the office on the surface, also with first-aid cabinets, stretchers, medicine chests, water for drinking and supplies of concentrated foods in dampproof cases for use by men who might be cut off from the surface for an indefinite time.

Electric lamps and an adequate supply of safety lamps of the Wolf type should be provided, with material for recharging the same, also rescue apparatus, compressed-oxygen cylinders and pulmotors for resuscitating men overcome by deadly gases. Trained men should be constantly in charge of such stations so that in case of accident they could sally forth from such places and work in conjunction with the rescue parties from the surface.

They would be far more effective in my estimation, as they would be close to the seat of the disaster, and men would be rescued and resuscitated, and restored to anxiously awaiting wives, children and friends on the surface. These men would be irretrievably lost if they had to remain in the fouled atmosphere of the mine until relief came from the outside.

There would also be a great saving of human lives among the rescuers, numbers of whom are killed in modern disasters. With independent means, by which the entombed could take care of themselves, it would not be necessary for the rescuers to act with the same haste and intrepidity, for the telephone system would apprise them of the conditions in the underground workings of the mine.

How Previous Mine Disasters Testify to the Value of Refuge Stations

Let us take a retrospective view of some of the disasters which have occurred in our mines and we will be enabled to imagine what a blessing such stations would have been to many of our poor unfortunate brothers entrapped. The Courrières mine disaster in France was the greatest in mining history. There is evidence that hundreds of the men in this mine lived for days after the explosion, some of them for two weeks, devouring the bark of mine timber and the putrid flesh of horses.

At the Monongah disaster, Dec. 6, 1907, 361 lives were lost, quite a number of which could have been saved, as was ascertained by the conditions. Some of the men were found with their heads in the ditch seeking a breath of fresh air. At the Primero explosion, Jan. 31, 1910, 11 men must have lived for hours after the disaster, for one man who was found with them was finally resuscitated. At the Fernie disaster in British Columbia, 58 men lived for 48 hours but were finally overcome by the gas which leaked through the stoppings.

A Refuge Station Would Have Saved 26 Men at Bellevue

At the Bellevue explosion in Alberta, Dec. 9, 1910, 31 were killed, including one of the rescue party. This number would have been reduced to five if there had been a refuge station in the working district of this mine. I found 21 men lying along the ditch at a compressed-air charging station near chute 84, seeking fresh air. All these men could surely have been saved, as there were 8 men rescued on the same entry 10 hr. later and these were over 2000 ft. further inby. Had the other men retreated to the face the death list would have been greatly reduced.

At the mine fire at Cherry, Ill., Nov. 13, 1909, 256 lives were lost. Written messages, several very pathetic, addressed to their families, were found with the bodies. One message showed that some of the men were conscious for 48 hr. after the fire started. Several paddle fans had been constructed from parts of drilling machinery and pieces of board. These were made, as indicated by one message, with the forlorn hope of stirring up the air while making an attempt to reach the shafts. There were, however, 21 men who saved their lives in this disaster by erecting a barricade across one of the entries, building it with powder cans, stones and mud. These men were rescued seven days after the disaster occurred.

At Delagua, Colo., Nov. 8, 1910, there was a fire and an explosion in which 33 men were killed by noxious gases and 46 by the violence of the explosion. Quite a large percentage could have been saved had rescue chambers been provided. Four men were rescued seven or eight hours after the explosion. They were found behind a brattice which they had erected to keep back the afterdamp.

In the Price-Pancoast mine fire in Pennsylvania, Apr. 7, 1911, 73 lives were lost; all of which possibly might have been saved if sufficient refuge stations had been provided.

Industrial Provisions Have Lagged behind Civic Safeguards

We have our large standing armies prepared for war in times of peace. We have our life-saving stations for the protection of lives along our seashores and at our summer resorts. We have our fire brigades in our cities ever on the alert for the protection of lives and property. In our coal mines comparatively nothing has been done in this direction for the preservation of the lives of those who work in perpetual danger and who may at any moment be imprisoned deep down in the bowels of the earth. Germany and Austria are taking up the matter of providing safety stations for the protection of their miners, and I think it is high time that their examples be followed.

(6) It is essential for the safety of our mines that there should be efficient discipline, and in order to attain this end the management of the mines should be permanent. We do not appear as yet to have learned the value of efficient, permanent management as a factor of safety and economy. Management, as a general rule, cannot be efficient unless it is continuous.

To operate mines safely and successfully there should be a mutual feeling of interest between all officials and their employers, a feeling that their association together is of a lasting character. I do not think it good practice in the interest of safety and economy to make a habit of changing officials as seems to be the policy of some companies. As a general rule accidents occur and mines are destroyed where the mine officials are continually coming and going.

The Dangers in the Mine Must Be Met by Discipline

The mine managers and subordinate officials who are successful in securing safety in a mine are men who are not afraid to stand upon their conviction and insist upon the directorate of the company furnishing them with the necessary wherewithal to protect the men under their supervision, even if it does raise the cost per ton a cent or two. If they do not have the backbone to do this, they should at least be just to their fellow men and hand in their resignations, as they are unfit for the positions with which they have been entrusted.

If they find a man violating the rules and regulations laid down for the common safety, they should not discharge him. He should be turned over to the stern hand of the law. There is no punishment which brings results as quickly as that administered by the courts. You can reprimand a man or you may discharge him and he will forget it in a short time, but arrest him and you are assured that he will not be in a hurry thereafter to violate the mining law in your mine or in that of any other company.

Meet Your Accidents Midway

When you discharge him he simply leaves you and goes to some other place and secures employment and in all probability does the same thing over again. This possibly results not only in the loss of his own life but in that of many others. All subordinate officials should be given a complete understanding of everything required for the safety of the mine and a responsibility equal to their ability for the preservation of the safety of the mines and the lives of the workmen. If any member of the official family is found to be lax in his duties or is becoming indifferent in his work, he should be immediately dealt with accordingly, as the laggard is a very dangerous official in any mine.

The philosopher who said "Forethought will often save much afterthought" expressed a great truth. Superintendents and mine managers should consider, with the officials underground and above ground, the quickest and safest method to enter the mine in case of an explosion or fire. They should have all their plans outlined and discussed and all the officials should be acquainted with the result of the deliberations.

They should imagine a fire occurring in different parts of the mine and plan their action in such cases. Remembering that an explosion may occur in certain parts of the workings or may involve all the headings and destroy their system of ventilation, they should discuss the same carefully and decide upon plans for the different cases. It is far better to prepare plans and modify them as necessity points out than to meet the catastrophe without them.

Handy Apparatus for Testing Mine Air

Special Correspondence

SYNOPSIS—The author describes two apparatus, one for the measuring of methane and the other for determining all the impurities in mine air. A knowledge of chemistry is not needed to manipulate the apparatus. Even the gas ignition is automatic, taking place only when the mercury has cut off the required body of air.

The rules and regulations of the British Coal Mines Act of 1911, which came into force on Jan. 1 of this year, provide, that a place shall not be deemed to be in a fit state for working or passing therein if the air contains either less than 19 per cent. of oxygen or more than 1¼ per cent. of carbon dioxide and an intake airway shall not be deemed to be kept normally free from inflammable gas if the average percentage of methane found in six samples of air taken by an inspector in the air current in that airway at intervals of not less than a fortnight, exceeds ¼ per cent.

No Open Lights in 0.5 per Cent. of Gas; No Electricity in 1.25 per Cent.

Moreover, no lamp or light other than a locked safety lamp can be carried or used in any seam where the air current in the return airway from any ventilating district in the seam is found normally to contain more than ½ per cent. of inflammable gas, and further provisions are that if at any time, in any place in the mine, the percentage of inflammable gas in the general body of the air in that place is found to exceed 1¼ per cent., the electric current shall be at once cut off all cables. This, of course, does not apply to telephone or signal wires and instruments, so long as safe conditions for the use of such wires are provided.

In order to provide for such tests, Leonard Levy, of the engineering firm of Alexander Wright & Co., Ltd., of Westminister, has developed the instruments shown in the accompanying figures. The first is for the estimation of methane only.

The measuring tube A is surrounded by a water jacket and its narrow stem is graduated so that the percentage of methane can be read directly. It is closed at the top by a cock *B* containing an "L" shaped bore so arranged that it is impossible to put the oxidation tube *C* into direct communication with the atmosphere. The plug of the cock has a screw washer fixed on the back so that it cannot be accidentally withdrawn from the barrel.

Automatic Ignition of Gas

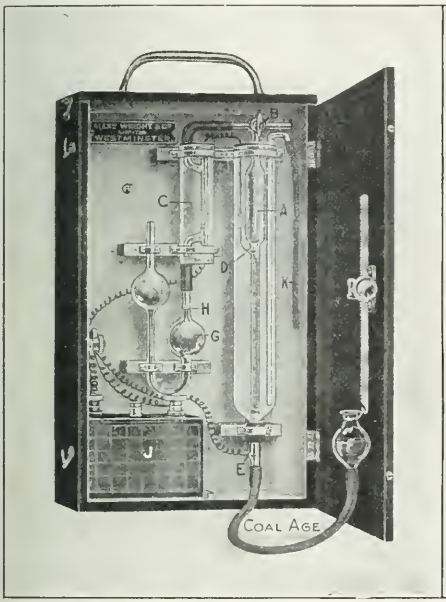
A new type of oxidation tube, *C*, has been devised by Dr. Levy. It consists of a fine quartz capillary tube through which a platinum wire runs axially. This wire is heated to whiteness by a current derived from the small storage cell *J*. The expansion of the wire on heating is taken up by a spring to which one end of the wire is attached. This oxidation tube is entirely surrounded by a water jacket.

The current passes through the platinum wire when the mercury in the measuring tube reaches the fused-in platinum contact *D*. Connection to the mercury is made through the fused-in contact at *E*. It is thus evident that the current only passes when the reservoir *F* is raised to drive the gas through the tube *C* and thus the oper-

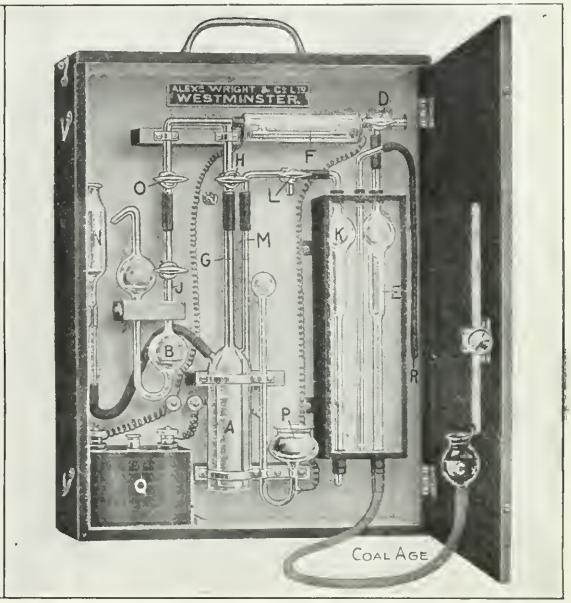
ation of passing the gas over the wire, automatically switches on the current.

During its passage through the quartz-platinum tube the methane present, no matter how small may be the percentage, is completely oxidized to carbon dioxide and water. The resultant contraction is equal to twice the volume of methane present and is observed on the fine stem of the measuring tube. The graduations at 0.25 per cent., 0.5 per cent. and 1.25 per cent., the three limits specified in the Act, are marked in red.

Two passages of the gas through the quartz-platinum tube are sufficient and an estimation can readily be effected in two minutes. An accuracy of 0.005 per cent. is readily attainable on the assumption than no combustible gases other than methane are present.



Apparatus for Determining Methane Only



Device Makes a Complete Analysis of Mine Air

Can Be Operated by Anyone Who Can Read a Scale

No caustic liquids or chemicals are employed and the necessary manipulation merely consists of drawing in a sample of the mine air by raising and lowering the reservoir *F*, and then effecting the estimation by turning the cock *B* to communicate with *C* and raising and lowering *F* twice. No knowledge of chemistry or gas analysis is required and the percentage of methane is read off directly from the position of the mercury in the graduated stem of the measuring tube.

As the make and break of the electrical circuit are entirely inclosed in the tube *A* which is surrounded by a water jacket there is no danger of any explosion being caused by the spark at the contact. The apparatus is very small and compact. The external dimensions of the base are 13½x8x3 in. and the total weight ready for use is 8 lb. A tripod is sometimes used for supporting the apparatus.

The main principles of the other apparatus which is designed for the complete examination of mine air are exactly the same as in the one first described and it contains precisely the same provisions for rapidity, accuracy and safety in use. However, in addition to affording a method for accurately estimating the methane, means are provided for the precise determination of carbon dioxide and oxygen.

A measuring tube *E* is provided into which the sample of mine air is drawn by raising and lowering the reservoir *C*. The gas is first passed into the vessel *A* which contains potash. The carbon dioxide is removed here and on drawing the gas back into the measuring tube, the percentage of carbon dioxide is observed directly on the finely divided stem. The wire in the quartz capillary tube *F* is now heated to whiteness by passing the current, supplied from a two-volt storage cell *Q*.

The circuit is completed by pressing on the leather top of the safety mercury switch *P*. This causes the mercury to rise in the tube and completes the circuit. As the make and break of this current are entirely inclosed, there is no danger of firing the atmosphere and should the apparatus be accidentally dropped, the circuit is immediately broken. The mine air is again passed through the tube *F* into the vessel *A* by raising the reservoir *C* and drawn back into the measuring tube *E* by lowering the reservoir *C*.

The percentage of methane is thus obtained by an observation of the level of the mercury in the tube *E*. The mine air is then passed into the vessel *B* where the oxygen is removed and its percentage determined by an observation of the position of the mercury when the air is passed back into the tube *E*. The complete analysis is thus effected by a simple manipulation. The apparatus requires no previous knowledge of chemistry.

The Superior Coal Co., Wyo.

By W. D. Brennan*

The operation of the Superior Coal Co. is located among the hills of southwestern Wyoming at an altitude of 7000 ft. It is at the terminal of an eight-mile branch line, running north from Thayer Junction on the Union Pacific R.R.

The growth and advancement of this camp since its opening, less than seven years ago, has been a marvel of Western industrial development. It has now a population of about 3000 people and a daily production of 5000 tons. The coal is semi-bituminous and among the best for steam purposes, mined in the Rockies.

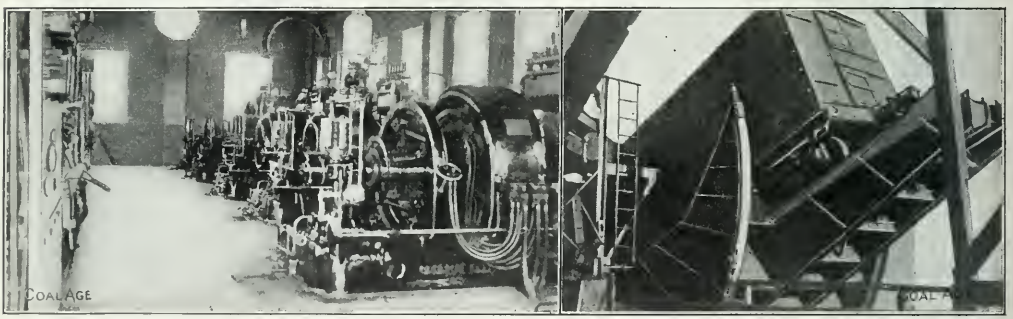
There are five mines in operation at present, working on three different seams, and two more are under development. The camp is electrically operated throughout, the coal being mined, drilled and hauled by electric machinery.

The main power-plant is centrally located, its equipment consisting of four 300-hp., and six 250-hp. marine boilers, and four 300-kw., 2300-volt, 60-cycle, 1800-r.p.m. turbo-alternators and two 300-kw., 250-volt direct-current turbines. Apart from this is an auxiliary gas producer plant, equipped with a No. 8 Wood Producer, an 18x24-in. tandem gas-engine, and a 150-kw. generator. The latter has proven quite successful, generating 1000 to 1100 kw.-hr. in an eight-hour run.

The "E" Mine, is a two-compartment shaft, equipped with a steel headframe, a double-drum, 200-hp. hoist, hung directly over the shaft, and self-dumping cages. There is also a steel cradle box-car loader, capable of handling 50-ton loads at an angle of 50 deg. Mine-run and lump may be loaded on two tracks at the tipple, or conveyed by belt to the adjacent rescreening bins having underneath and side chutes for loading either open or box-cars.

The modern tendency toward permanent construction is as prominently in evidence in the Rocky Mountain states as in East. Some typical examples of this are shown in the accompanying photos, the large central stack for the power plant, the steel headframe and the liberal use made of concrete. It is proposed to work out an extensive acreage with this plant, which partially accounts for the thorough equipment of the operation.

A Detailed and General View of the Surface Equipment at the "E" Mine



Interior View of the Turbo-Generator House and the Cradle Box-Car Loader

*General superintendent, Superior Coal Co., Cheyenne, Wyo.

Acme Plant in Pennsylvania

The Acme Coal Mining Co.'s plant at Rimersburg, Clarion County, Penn., while not of such large capacity as compared with some other electrically operated mines, it is a particularly interesting one. Before the installation of the new electrical machinery and other improvements this mine had an output of approximately 700 tons of coal per day, but it is expected that this will be doubled within the year.

A small direct-current plant was formerly the only power used, but when the new mine was opened some distance away, it was decided to put in an alternating-current machine so that current could be economically transmitted.

The selection of an alternating current was decided upon as being best adapted to the conditions to be met.

The present site of the plant is about in the center of distribution for the mines to be supplied, and accordingly the new installation was located there. This meant that it was only necessary to remove the old direct-current generating equipment and install the new machinery. Being centrally located, accessible to water and fuel, it will be possible to supply other mines in the future, should there be occasion for such.

The Electrical Equipment

It is intended to electrify what is known as the Shannon mine and preparations have already been made for this work. Energy will be sent from this plant to a substation, located near the mine, from which direct current will be delivered to the pumps and locomotives. The generating equipment in the main power plant consists of one 400-kv.-a., 60-cycle, three-phase, 2400-volt Westinghouse alternator, direct connected to a 700-hp. Ball engine, and a three-panel marble switchboard for control of same. A voltage regulator maintains a constant voltage at the plant.

The alternating current generated here is transmitted a distance of about three miles to a substation where it is changed to direct current for operation of the mine machinery which consists of three locomotives, pumps, lights, etc. The change to direct current is affected by means of a three-bearing Westinghouse motor-generator set consisting of a 300-kw. compound-wound, 275-volt direct-current generator direct connected to and mounted on a common iron base with a 450-hp., 60-cycle, 2200-volt, three-phase, self-starting synchronous motor. The speed of the set is 900 r.p.m. The motor is started by means of a three-phase auto transformer, thus obviating the trouble of synchronizing.

The direct current is carried into the mine by means of lead-covered cables through a bore hole located near the substation, thus rendering the liability to interruption on account of grounds very remote. The lead sheathing also materially increases the safety of employees, which is always a point of particular importance, especially in mine operations. The distance from the top of the seam to the surface at this point is 246 ft. From the bottom of the bore hole, the current is distributed to the different portions of the mine by independent circuits so that in case of any trouble on one of these, no portion of the mine will be affected other than that fed by the circuit on which the trouble has occurred.

With the completion of the electric equipment, it is said that the Acme Coal Mining Co. will have expended a total of $100,000 within a year on the plants in the neighborhood of Rimersburg. All of the improvements and additional equipment were installed in the best manner possible and are of a permanent nature. The entire work has been carried on under the direct supervision of W. G. Strachan, superintendent, and the electrical work was designed and installed under the direction of the company's chief electrician, J. A. Shaw.

The entire electrical equipment of the main and substation was furnished complete by the Westinghouse Electric & Manufacturing Co., East Pittsburgh, Pennsylvania.

Coal Production in Washington

Washington's coal production decreased from 3,979,569 tons in 1910 to 3,548,322 tons in 1911, a loss of 431,247 tons, or 10.8 per cent. The production for 1912 was 3,346,946 tons, a loss of 201,376 tons or 5.6 per cent. and a combined loss of 632,623 tons for the biennial period. This decrease is not encouraging to the coal-mining industry of the state and can be assigned to no other cause than the substitution of oil as a fuel on a percentage of the steamers running out of Puget Sound ports.

Two Westinghouse Motors at the Acme Mine and a General View of the Surface Equipment

Railroads and power plants are also using a large amount of fuel oil. Just how long oil can be sold in this state, at a price that makes it more economical for steaming purposes than coal, no one seems prepared to state, but it is to be hoped for the sake of the coal-mining industry that the time is not far distant when the price of oil will advance. The value of coal per ton at the mine was $2.43 for the year 1912.

The coke production for 1910 was 57,715 tons; 1911, 40,301 tons, and 1912, 48,889 tons. The value of coke per ton at the mine, increased from $5.50 in 1910 to $5.80 in 1911, but decreased again to $5.54 in 1912.

It is gratifying to report that the number of fatal accidents reduced from 43 in 1910 to 27 in 1911, and to 14 only in 1912. But the number of nonfatal accidents increased from 108 in 1910 to 115 in 1911, and in 1912 reached the high-water mark, numbering 455. This large increase of nonfatal accidents reported for the year may be ascribed to the compensation, paid through the State Industrial Insurance Commission to employees who lost time on account of injuries received while discharging their duties. The duty of this commission is to enforce the provisions of the Workmen's Compensation Act passed by the legislature of 1911. Previous to the passage of this act and following the rule of other states, only serious accidents were reported to this department; and many of these were not reported.

The Harlan Coal Field in Kentucky

By W. R. Peck and R. J. Sampson*

SYNOPSIS—A description of one of the subdivisions of the Cumberland Gap coal field. The coal lies level generally and is a high-volatile fuel possessing excellent coking properties. This district is one of the more recent ones to be opened up.

Harlan County lies in the southeastern part of Kentucky on the state line between Virginia and Kentucky, at the head waters of the Cumberland River. It is entirely cut off from Virginia and her railroads by the Cumberland Mountains and the Little and Big Black Mountains, along the crests of which runs the state line. On the western side of the county, the Pine Mountain also cuts off the main part of the county from the waters of the Kentucky River and the railroad that follows that stream. Therefore, all freight to and from the county must follow the waters of the Cumberland River.

General View of Harlan (Formerly Mt. Pleasant), the County Seat of Harlan County

Topography and General Geology

The county is very mountainous, the valleys narrow and there is only a small area of tillable land along the streams. The mountains vary in height from the innumerable low spurs to the main ridges, which in many instances rise more than 2000 ft. above the valleys. On the accompanying map are shown several elevations which give the general height of the ridges.

This district is a part of the Cumberland Gap coal field. The geological structure is that of a flat-bottomed syncline with its axis almost parallel to the Cumberland River. From this axis the rocks rise with slow dips until they are sharply upturned in the Pine Mountain on the northwest by the Pine Mountain Fault and in the Cumberland Mountain on the southeast, by the Powell's Valley Anticline. Between these two boundaries lie the Black Mountains and Martin's Fork Ridge.

The outcropping rocks in the last named mountains are sandstones, shales and coal beds. No continuous limestone beds have been found, although a bed of fossil limestone about 12 in. thick has been reported high up in the Big Black Mountain. The shales and sandstones are about equally developed, the sandstone probably predominating. The lower part is principally sandstone and contains some fairly coarse conglomerate.

The Lee conglomerate, called here the Lee sandstone, is the lowest division of the coal measures. It does not outcrop in the Harlan field, but is seen on the north flank of the Pine Mountain, where it is brought up by the Pine Mountain Fault. Above the Lee there is about 2300 ft. of sandstone and shale in nearly equal proportions.

In the Big and Little Black Mountains and Martins Fork Ridge and their spurs, occur the workable coals. The coal in the Pine and Cumberland Mountains is so badly split up and on such a heavy pitch that it is practically worthless at the present time.

The Coals

At the foot of the crest of the Black Mountains there are a great number of coal beds outcropping, but we will only attempt to describe those, which in some part of the district are of economic value, taking them in order and beginning at the bottom.

Harlan Seam—This seam, which is the lowest that is commercially workable, is the most regular and the most valuable. It lies between massive sandstone beds, the top one of which is usually less than three feet above the coal and in many instances, rests directly on it; there is probably an average of nine inches of shale between. Underneath the coal there is usually a shale bed of varying thickness, which is too hard to be cut by chain machines.

*Fox, Peck & Sampson engineers, Harlan, Ky.

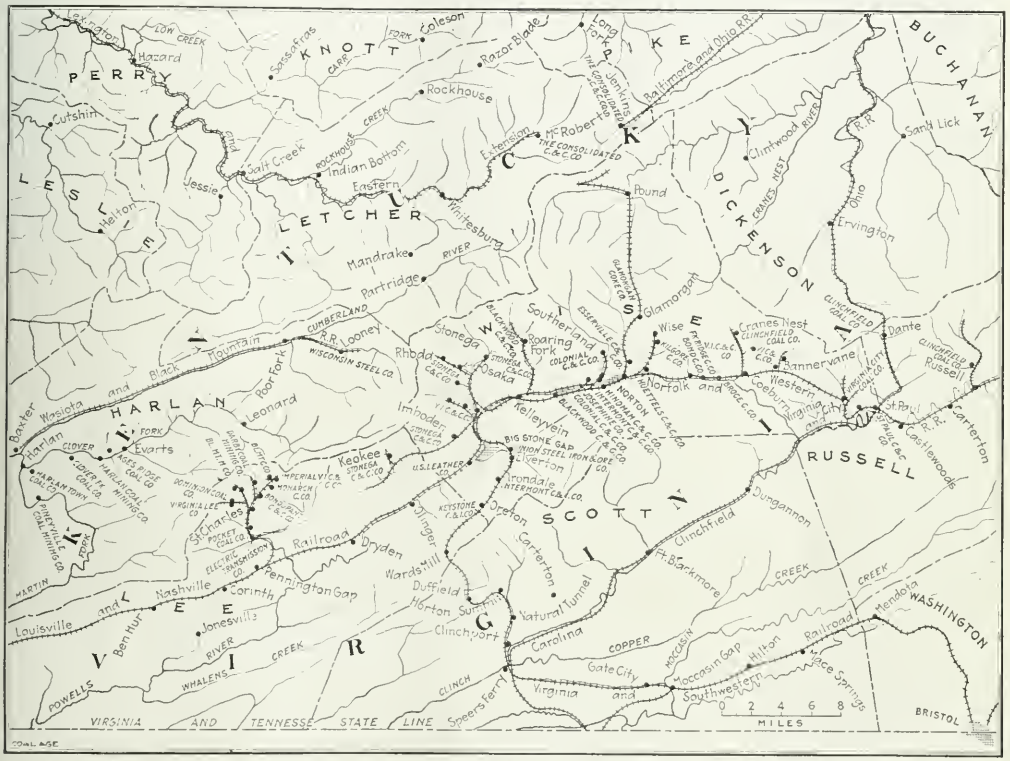
This coal is readily located by the fact that it lies 250 ft. above the Cawood sandstone, which outcrops all along the river bed, often forming prominent cliffs. It is generally known as a 4-ft. seam and has been opened in numerous places in the central, southern and western portions of the county. Eastwardly just above the mouth of Seagraves, a distance of about fourteen miles above the town of Harlan, the coal goes under the river; at this point there is 3 ft. 6 in. clean coal.

On Clover Fork, one mile above the town of Harlan, the Harlan Town Coal Co. has opened this seam. They have 50 to 56 in. of clean coal underlaid by a shale parting from 3 to 6 in. beneath which there is another 14-in. bench of coal. The seam at one place in this mine is 6 ft. 6 in. high with a 4-in. parting 14 in. from the bottom. The Clover Fork Coal Co., also operating on Clover Fork one mile above the last mentioned mine, has from 50 to 54 in. of clean coal. Between the two mines the bottom bench seems to have disappeared. Just across from the Clover Fork Coal Co., the Lynn Hollow Coal Co. has opened up this seam in the Big Black Mountain, where it shows a thickness of 48 in. of clean coal.

The Harlan Coal Mining Co. opening on Clover Fork in the Little Black Mountain, at a distance of three and one-half miles above the town of Harlan, has developed from 45 to 47 in. of clean coal, in a spur of the mountain; this is expected to be 54 to 56 in. in the main ridge, as has already been proved in an opening at the head of a hollow just west of their present operations. The Ages Ridge Coal Co. operating in the Big Black Mountain, on Clover Fork five miles east of Harlan, has found 42 to 46 in. of clean coal; this should thicken as they progress east to a maximum of 59 in. as shown in an old opening near the center of their property.

In general, the seam in the Big Black Mountain shows a uniform section of from 48 to 50 in. of clean coal on the outcrop. On the northeast side of Martins Fork there is 50 to 56 in. of coal in the upper bench with from 12 to 24 in. in a bottom bench, the two being separated by 6 to 18 in. of shale.

In the eastern part of the county this coal is under



Map of the Harlan County Coal Field, Showing Location of the Principal Mines

The seam, in general, dips slightly in a northeasterly direction. The following is an analysis of some crop coal from the Harlan seam: Volatile matter, 38.3; fixed carbon, 55.8; moisture, 1.7; ash, 3.5; sulphur, 0.9.

Bed or Seam "B" which has no importance in the western part of the county is the most persistent, though not the most valuable in the eastern portion. It lies about 140 ft. above the Harlan seam. In the extreme drainage. On Ewings Creek, in the lower end of the county, on the property of the Wilhoit Coal Co., there is a seam from 140 to 160 ft. under the Harlan coal. This seam is 36 in. thick and usually has some partings. This is the only place in the county where it has been found with this thickness, but it has not been thoroughly prospected for yet.

RETARDING CONVEYOR OF THE HARLAN COAL MINING CO. TAKEN BEFORE COMPLETED

eastern end of the county this seam attains a thickness of 3 ft. 6 in. of clean coal.

Kellioka Seam—This seam, which occurs about 200 to 250 ft. above the Harlan coal, has not been thoroughly prospected for in the lower or western part of the county; however, where opened it shows a section of 3 ft. 6 in. to 4 ft. It is mined at Keokee, Va., as the McConnell seam and is probably the Darby or No. 5 seam mined in the Pocket district of Virginia, as well as the Taggart seam mined at Rhoda, Va.

COMPARATIVE VALUES OF VARIOUS COALS

Note:—Due recognition must be given to the fact that all Harlan samples are taken from outcrop (weathered coal)—while others are taken from active mines, far from surface.

Seam*	Coal†	Rank	—Moisture— Plus	Minus	— Volatile — Plus	Minus	—— Ash —— Plus	Minus	Value
"Standard"	"Standard"...								100
	Fire Creek, New River, W. Va....	1	2.75				9.06		111.84
	Longdale, Sewell, New R. W. Va.....	2	1 94				1.46		103.40
	Pocahontas, W. Va. ..	3	2 54		1.90			1.30	103.14
	Georges Creek.	4	2 10		0.75			0 90	101.95
	Broad Top.....	5	2 80		3.25			4 30	101.75
	Clearfield.....	6	2 00					1 00	101.00
	Latrobe	7	1.80				3.25	3.50	95 05
	Connellsville..	8	1.50				5 25	2.50	93.75
Harlan.....		9	0 49				13 27 5 02		92.24
		10	1.16				12 12 3 10		92.14
	Elkhorn, Ky..	11	0.60				12 63 3.50		91.45
		12	0 59				11 26 1 94		91.27
Kellioka		13	0.44				13 51 4 31		91 24
Creech.....		14			1.57		12 34 3 86		89 97
	Fairmont.. .	15	1.40				11 50	0.50	89.40
	Thacker, W. Va. . .	16	1 24				10 54	1.68	89 02
		17			1.17		11 28 0 68		88 23
	Eastern Kentucky .	18			1 00		10.85 0 06		88 21
	Middle Kittanning, Pa. .	19	0 38				11 32	2 36	86 70
	Pittsburgh...	20	1 26				11 80	4 04	85 42
Wallin....		21			0 11		12 35	3.19	84.35
	Boyd County, Ky	22			2 54		8 77	5 82	82 82
	Upper Freeport, O. .	23	0 14				12 35	6 20	81.59
		24	0 71				11 15	11 07	78.49
	M Kittanning, Ohio	25			0 18		10 77	4 00	76 05

Based on Kent's suggestion (p. 51 "Steam Boiler Economy") that a standard bituminous coal be considered as containing not over 20% volatile matter, 2% moisture and 6% ash and be rated as 100. For each per cent. of volatile matter over 25%, a reduction of 1% in value is made, and for each per cent. of moisture in excess of the standard a reduction of 2% in value is made. Also a reduction of 2% in value is made for each excessive per cent of ash. By applying this method retrectively (the range from 20% to 25% in volatile matter being considered of equal value) the results above given are obtained.

*Name adopted by the state and U. S. Geol. Surveys 1902 and 1903. †Trade or geological names of various other selected coals in Pennsylvania, Ohio, West Virginia.

The Wisconsin Steel Co. is mining in this seam at Benham, Ky., 27 miles above the town of Harlan, where it has 5 ft. 6 in. of coal practically without a parting. There is also a seam in the eastern end of the county about 60 ft. above the Kellioka, which averages 3 ft. 6 in. of clean coal. The folowing is a typical analysis of the Kellioka coal: Volatile matter, 38.5; fixed carbon, 54.9; moisture, 1.8; ash, 3.8; sulphur, 0.96.

Wallins Creek Coal—This coal, named for Wallins Creek of Cumberland River, has a thickness of 9 ft. with a 6-in. parting, 18 in. from the bottom, leaving a top bench of 7 ft. of clean coal. It occurs approximately 600 ft. above the Kellioka. The Terry's Fork Coal Co., operating in this seam, on Terry's Fork of Wallins Creek, find a mining section of 7 ft. of clean coal. The following is an analysis of the Wallin coal: Volatile matter, 37.4; fixed carbon, 52.1; moisture, 2.3; ash, 7.6; sulphur, 0.88.

The Looney Seam, opened in several places in the high knobs of the Little Black Mountain, shows from 4 ft. 5 in. to 5 ft. of coal and usually has a small shale parting. The Lower High Splint coal lying from 300 to 350 ft. above the Looney seam in the Big Black Mountain, shows more than 3 ft. of minable coal. The Middle Splint averages about 3 ft. in the Big Black Mountain. The Upper High Splint occurs 400 ft. above the Looney and is the most valuable of the high seams in the Big Black Mountain; it varies from 4 to 6 ft. with practically no parting. In one place it shows 9 ft. 5 in. of coal with a 6-in. shale parting one foot from the floor.

HISTORY OF DEVELOPMENT

For several years past companies and individuals have been acquiring coal lands in this county. However, no move was made toward building a railroad until the early spring of 1907 when Mr. T. J. Asher began the construction of some thirteen miles up the Cumberland River, in Bell County, to reach the operations on his own property. This was known as the Wasioto & Black Mountain R.R. The Louisville & Nashville R.R. then acquired it and completed it to Benham some twenty-seven miles

THE CLOVER FORK COAL CO.'S MINING TOWN AND PRINCIPAL OPERATION

above the town of Harlan. When this line was completed, work began on a branch up Clover Fork to Ages Creek, a distance of five miles.

This branch was put into operation on the third of August. While the road was under construction leases were taken by mining companies and the installation of plants begun. At the present time there are six companies in the county shipping coal. These are the Terry's Fork Coal Co., operating in the Wallins coal on Terry's Fork of Wallins Creek, the Harlan Town Coal Co., operating on Clover Fork in the Harlan seam, the Clover Fork Coal Co., operating in the Harlan seam on Clover Fork, The Wisconsin Steel Co., operating in the Kellioka seam on Poor Fork at Benham, Ky., and the Stonega Coal & Coke Co., operating from the Virginia side in the Kellioka seam in the Big Black Mountain.

The Terry's Fork operation shipped their first car in the summer of 1911 and was the first to ship coal out of this district. They have recently installed an electric plant and their present output is from 600 to 700 tons per day. The total distance on the mountain side, through which they have to lower their coal, is about 6000 ft. This is divided into two parts, the lower end being an engine plane, the upper a gravity incline.

The Wilhoit Coal Co. began shipment in the early winter of 1911; their output is from 300 to 400 tons per day at the present time and is increasing. It is also very likely that they will install another plant on the opposite side of Ewings Creek from the present one. They have recently installed a Morgan-Gardner 150-kw. generator, belt-driven, and two Sullivan and one Morgan-Gardner short-wall chain coal cutters. Mules are still used for haulage but will eventually be replaced by electric locomotives.

The Harlan Town Coal Co. began shipment June 7, 1912. Their present output is from 500 to 600 tons per day, and is expected to reach 1000 tons in a few months. Their equipment consists of one Morgan-Gardner 250-kw. generator, belt driven, two 8-ton Morgan-Gardner, combination gathering and haulage motors and one Morgan-Gardner short-wall chain cutter.

The Clover Fork Coal Co. began shipment at practically the same time as the Harlan Town Co. Their machinery equipment consists of only a single engine to operate shaking screens. Their present output is about 600 tons per day.

The Wisconsin Steel Co.'s operation at Benham is at present by far the most important in the county. At present all of their coal is converted into coke for which purpose they have built 300 ovens of the beehive type, a breaker equipped with two crushers and flight conveyors driven by motors. The slack is conveyed to the ovens by electrically-driven larries. Their output is 20 cars of coke per day. A brick power house in which they have installed two 338-kw. and one 150-kw. generators, direct connected. There are two hundred modern mine houses of various designs and painted in different colors, a club house and handsome residence for the superintendent. A $20,000 Y. M. C. A. building has recently been opened and there is now under construction a large hotel.

The Stonega Coal & Coke Co.'s operation at Keokee, being really a Virginia mine, we will not attempt to describe it here.

The Lynn Hollow Coal Co. is installing a plant on Clover Fork. They will have no mechanical equipment but are developing for an output of 400 to 500 tons per day.

The Harlan Coal Mining Co. is working now on an installation on Clover Fork three and one-half miles above the town of Harlan. The equipment of this plant will be of peculiar interest in that they have departed from the customary gravity incline and will use a retarding conveyor of the rope-disk type. From center to center the length is 825 ft., the last 300 ft. across the river bending

on a curve of 600 ft. radius, 180 ft. of which is on a suspension bridge. At the foot the retarder discharges onto a belt conveyor 285 ft. long which carries the coal to the screens. The lump from these screens will be loaded by a boom loader. They have one Morgan-Gardner 250-kw. generator, directly connected to a Skinner engine, two Morgan-Gardner short-wall chain cutters, one 8-ton Jeffrey electric locomotive and motors for driving their conveyors and screens.

The Ages Ridge Coal Co. is now installing a plant at Ages, Ky. Their tipple will have shaking screens and eventually the mine will be equipped with gasoline locomotives.

It is reported that at least one operation will be started on Martins Fork in the immediate future. Whether this is true or not, it is only a matter of time until a railroad will be built up Martins Fork, which would tap what is really the best of the Harlan coal field. Also the road already started up Clover Fork will eventually be extended to a point opposite the town of Keokee, if it does not tunnel the Black Mountain and connect with the Virginia Southwestern R.R. at that point, or build into Appalachia, Va., there to connect with the Cumberland Valley division of the Louisville & Nashville R.R. itself.

Markets

All of the coke made in the county at present goes to the steel plants of the Wisconsin Steel Co., at South Chicago.

The coal from the other operations finds a ready market in the North, West and South, which it can reach over the Louisville & Nashville R.R. and its connections. The coal and coke from Keokee goes East and South over the Southern Railway. In general the fuels have an excellent reputation.

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Conservation and Commercial Advantage

By Francis S. Peabody*

SYNOPSIS—The pursuit of commercial advantage is opposed to conservation, and no one realizes this more than the miner who risks his life and reduces the coal bed to slack to increase his earnings and minimize his labor. On this subject legislation is silent. The waste of coal does not end in the mines. The railroads and the public generally are more wasteful than the coal operator.

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Conservation and commercialism are both concerned in the saving of our national resources. Where conservation would save human life, and maintain the worker in vigorous health, commercialism would save the energy of his labor by increasing its productivity. Where one would save natural resources, the other would reduce the waste of capital. It is strange that, while both seek the same end, which is the more perfect use of the endowments of nature, their work is, nevertheless, largely antagonistic.

Mine Safety

The State Legislature, in the interests of conservation, at its most recent session passed laws to promote the safety of life. No operator can deny that, on the whole, these laws are right. Criticisms may be directed at the mode of application provided for their enforcement, but not at the improvements demanded.

However, the natural attitude of the operator is to evade their operation, because they encumber him with a burden which is not imposed in other and rival coal-producing States. The new laws which were passed by the last legislature, especially those relating to the construction of shafts, tipples, surface buildings and fire appliances, have added at least 40 per cent. to the cost of developing a new mine, and these same enactments have increased by 10 per cent. the operating costs of old and new mines alike.

The operator is producing his coal as cheaply as he can. To do this he is taking the coal nearest to the shaft, that part which is most quickly reached and extracted, and which involves the least outlay of capital.

Under this method he is extracting less than 60 per cent. of the coal in the bed, leaving over 40 per cent. in the ground for the support of his roof, mine tipples, air courses, etc. He could mine the most remote coal first, but it would be years before he would receive a return from his capital. The profit of coal mining is, by my computation, less than 2c. per ton, and the operator does not feel justified in conserving the coal in the ground because such conservation would change this small gain into an absolute loss. Yet, by our mining methods, we are wasting money and making mining much more hazardous.

Although coal in place has doubled and even quadrupled in value in the last ten years, yet many of the largest operators in the State have become bankrupt. It is easy to obtain millions of dollars for the purchase of virgin coal land, but it is practically impossible to induce capital to invest in the coal-mining industry.

The Commercialism of the Workingman

Commercialism is frequently regarded as an attribute of large capitalists. But the miner has the quality as well as the operator. He tries to produce as large a number of tons of coal as possible with the least expenditure of labor. He rarely cares how much the coal is deteriorated in value by his careless methods of mining, how much he endangers his own life or that of others, and he is often regardless of the destruction of property.

The miner today, instead of mining by undercutting, shoots off the solid and shatters the coal, so that the fuel produced is almost unmerchantable. The percentage of screenings has increased from 20 to over 40 per cent. Not only does the miner thus destroy the coal, but he breaks the roof, knocks down timbers, makes windy shots probable, and thus endangers his own life and those of others, as well as destroys the mine in which he works.

The introduction of powder into coal mines has increased the dangers of mining. Despite the precautions

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taken, 17 men lost their lives by its use last year, and 28 were injured. The law should require undercutting, and thus reduce the danger of coal-dust explosions.

The Miner Shoots for Maximum Product

The depth of drillholes used to depend on the depth of the undercutting, but a 5- or a 6- ft. hole would require from 20 to 24 in. of powder. A cartridge of 2-in. diameter, such as is generally used, contains a little over one pound of powder to the foot, so that miners should use at most only 2 lb. of powder to the shot. Such a conservative use of explosive would make shot firers unnecessary. But the coal is now largely neither undercut nor sheared. The miner drills what he terms a "buster" in the center of the coal face. Then he follows this with two rib shots. The holes are drilled from 5½ to 6 ft. long, and are angled so as to give the shots a chance to fire the coal out from the face. The cartridge is from 40 in. to 48 in. long, and contains 3½ to 4 lb. of powder to the shot. The result of such methods has been already described.

The law requiring payment for all the coal mined, whether pulverized to slack, or in lumps, was one of the most lamentable pieces of legislation imposed on the coal operators in the state of Illinois.

The people of this state are as much to blame as the operator or the coal miner. By permitting this shooting from the solid they have made mining dangerous and wasteful. And there has been a disposition to overlook the protection of property for political reasons. The legislature has restricted the introduction of labor from neighboring states, and when trouble has arisen between operators and miners it has been loathe to interfere and prevent the destruction of property. Nor have laws been passed requiring a proper recovery of the natural resources.

How Coal When Mined Is Wasted

But not only the mine owner and his employee are censurable for waste. It has been estimated that the railroads, the largest consumers of coal, utilize less than 50 per cent. of the heat in the coal which they burn under their locomotives. If 60 per cent. is wasted by the operator, and 50 per cent. of that is lost by the railroads, only 30 per cent. is actually utilized and 70 per cent. is wasted, and not the railroads only, but all consumers are equally wasteful.

Our state is one of the most advanced in protecting human life, but as these laws cripple the industry we should endeavor to assemble an interstate commission of operators and miners from the states of Illinois, Indiana, Ohio and Pennsylvania, appointed by the several governors of the various commonwealths. It should be the object of this body to recommend uniform laws to be enacted in the various states. Such laws would reconcile conservation and commercialism.

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Alternating-Current Fan Motors

By F. B. Crosby*

SYNOPSIS—The amount of air required to properly ventilate a mine constantly increases due to the extension of the workings. To meet this condition it has been customary to install direct-current motors driving the fans. This paper describes in more or less detail the various methods that may be employed to obtain variable speed from alternating current.

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It is no longer necessary for the advocate of electric drive to dwell at length upon its many advantages. The superior qualities of the electric motor are thoroughly attested by its all but universal adoption. The question which confronts the engineer today is not that of relative merits of the several possible methods of transmitting energy to the point of application, but rather the intelligent selection of the most suitable electrical equipment with due consideration of all factors bearing upon the particular case in hand.

Recognizing the limitation of design and the physical impossibility of producing a universal motor, electrical manufacturers are giving more and more attention to the specific requirements of certain clearly defined classes of service. As a result of this specialization and the steadily increasing variety of forms manufactured, it is obviously of great importance that for any given duty the proper motor be selected, otherwise a motor which under conditions for which it is designed, would give entire satisfaction, may under different conditions prove an utter failure or at best needlessly expensive.

Induction motors can be readily designed to develop at reduced speeds:

a. Constant horsepower—increasing torque.
b. Constant torque—horsepower proportional to speed.
c. Torque decreasing with speed.

Moreover these motors can be given either a maximum or overload rating. The power required to drive a centrifugal mine fan varies approximately as the cube of the speed. Obviously to install for fan service a motor capable of developing constant horsepower at reduced speeds or with any considerable overload capacity, does not represent sound engineering, either from the standpoint of first cost or operating characteristics.

It is the purpose of this paper to indicate certain considerations which should govern the selection of the mine fan motor and describe briefly those types which have been adapted to this service. No attempt is made to discuss the relative merits of the several types of fan on the market or forced draft as compared with the suction draft fan. It is assumed that the type of fan and horsepower required to operate it have been determined for any given application.

Two general conditions arise requiring (1) constant speed drive, and (2) adjustable speed drive. Until recently, for adjustable speed drives, it was practically necessary to install direct-current motors. This necessity no longer exists. In laying out new installations

*A paper presented at the Pittsburgh meeting of the American Institute of Electrical Engineers, Pittsburgh, Penn., Apr. 18, 1913.

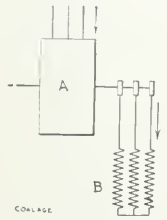


FIG. 1. INDUCTION MOTOR AND RHEOSTATIC CONTROL

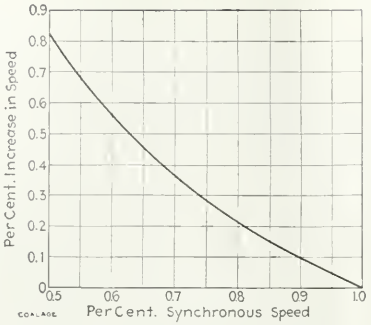


FIG. 2. INCREASED SPEED CORRESPONDING TO DECREASED TORQUE

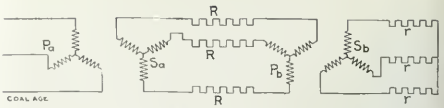


FIG. 5. CONCATENATED WINDING

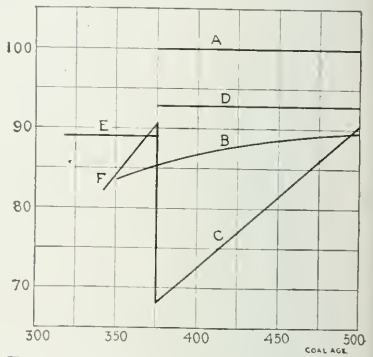


FIG. 4. EFFICIENCY AND POWER FACTOR, TWO-SPEED MOTOR

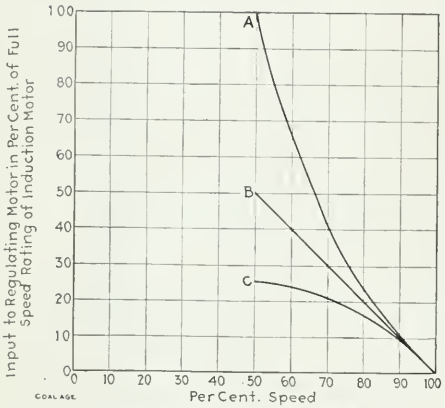


FIG. 8. INPUT TO REGULATING MOTOR

A. Constant horsepower.
B. Constant torque.
C. Horsepower proportional to speed squared.

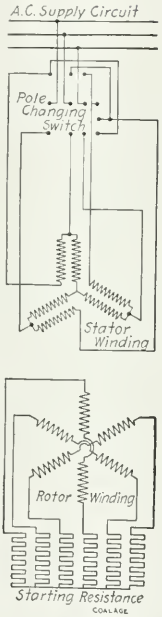


FIG. 3. MULTI-SPEED MOTOR WINDINGS

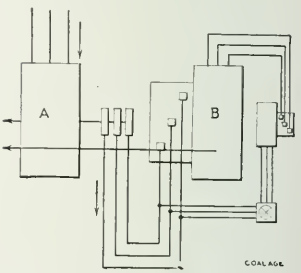


FIG. 10. DIRECT-CONNECTED COMMUTATOR MOTOR

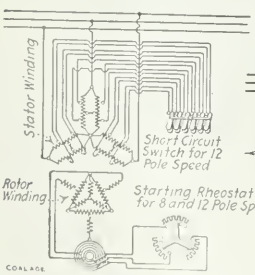


FIG. 6. SINGLE CASCADE WINDING

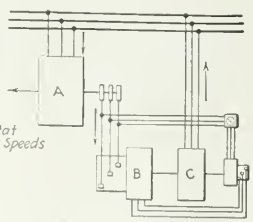


FIG. 7. INDUCTION MOTOR WITH REGULATING SET

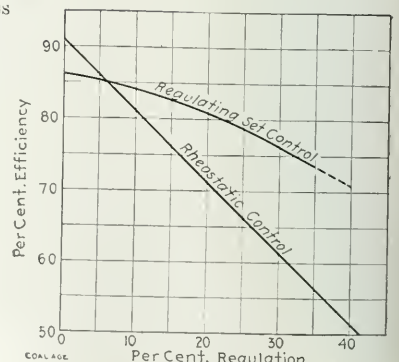


FIG. 11. EFFICIENCIES, 400-HP. MOTOR

not handicapped by an existing direct-current system, alternating-current motors only need be considered.

In the following discussion the term "constant speed" implies no appreciable change of speed from no-load to full load; "variable speed" implies speeds varying with the load, but constant at constant load; "adjustable speed" implies several independent speeds, each constant under varying load. In either case the polyphase alternating current motor in some one of its several forms meets all requirements.

I. Constant-Speed Drive

This is obviously the simplest condition met with and is found chiefly in connection with long railway tunnels, subways, and old mine workings in which the volume and pressure of air handled is practically constant twenty-four hours a day and every day in the year. For such service the standard polyphase induction motor is without a competitor. Properly installed, such a motor can be stopped or started automatically in emergency by remote control and will run constantly without attention other than occasional inspection of the oiling system.

II. Adjustable Speed Drives

The great majority of mine fan installations require an adjustable speed drive and for this reason, as stated above, until comparatively recently it has been practically necessary to install direct-current motors with shunt speed characteristics.

The average fan motor operates under practically constant load throughout long periods, consequently maximum efficiency is a consideration secondary only to the reliability of operation. The direct-current shunt motor shows a fairly high efficiency throughout its range of operating speeds but its installation is subject to the inherent disadvantages of the first cost, maintenance, and attendance of a direct-current generating and distributing system. As compared with these disadvantages the many desirable characteristics of the induction motor have frequently led to its installation even at the cost of a compromise between efficiency and desirable operating speeds. Numerous schemes for obtaining speed control for polyphase induction motors have been developed. Among those of chief importance are the following:

1. Constant speed motors with changeable pulleys.
2. Variable speed motors with rheostatic control.
3. Multi-speed windings.
4. Concatenation.
5. Single cascade motors.
6. Dynamic regulation.
7. Brush shifting motors.

1. *Changing pulleys* is obviously a make-shift method subject to annoying delays and limitations such as practical ratio of pulley diameters, and distance between center lines of shafts, etc.

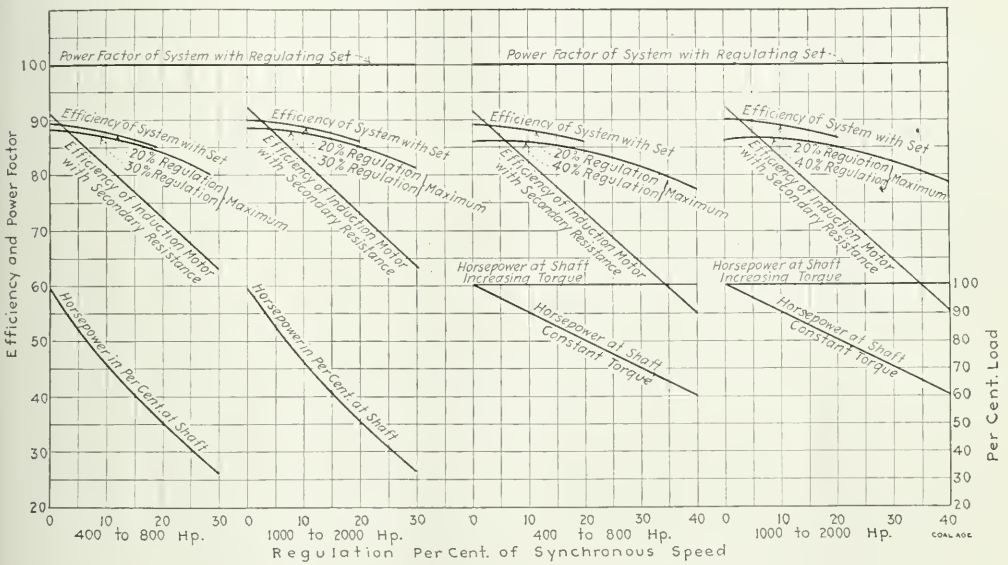

Power Factor of System with Regulating Set
Efficiency of System with Set
20% Regulation
30% Regulation
Maximum
Efficiency of Induction Motor with Secondary Resistance
Horsepower at Shaft Increasing Torque
Horsepower at Shaft Constant Torque
Horsepower in Per Cent at Shaft
40% Regulation
Efficiency and Power Factor
Per Cent. Load
400 to 800 Hp.
1000 to 2000 Hp.
Regulation Per Cent. of Synchronous Speed

Fig. 9. Overall Efficiencies of Induction Motors

2. *Rheostatic Control.* When operating with negligible secondary resistance the polyphase induction motor is inherently a constant speed machine. Continuous speed control can be had by means of an adjustable resistance in the secondary circuit but the efficiency falls rapidly as the range of operating speeds is increased. (Fig. 4). In Fig. 1, A is the main motor and B is the external secondary resistance. Assuming that 50 per cent speed reduction by rheotatic control is required, it follows that the shaft output, with fan load must be approximately $(\frac{1}{2})^3 = 12.5$ per cent, and an equal amount of energy must be dissipated in the rheostat in addition to the losses in the motor itself. The effect on overall efficiency is obvious.

Another vital objection to rheostatic control lies in the fact that with external resistance in the secondary circuit, the speed varies with the load, accelerating under light loads and dropping again, to a value determined by the secondary resistance when the load comes on. Since at

no-load the secondary current is negligible, no amount of resistance within reasonable limits will hold down the speed of the motor.

Fig. 2 shows increase in speed of motor corresponding to several initial speeds when the load is changed from 1¼ to ¼ times full load torque.

3. *Multi-Speed Windings.* Where two definite constant speeds are sufficient the induction motor can often be supplied with external connections by means of which the polar grouping can readily be changed to give the desired synchronous speeds.. The cost of such a motor is but slightly more than that of a single-speed motor provided a 2:1 ratio is employed for the high and low speeds. Where a ratio other than 2:1, or where three or four constant speeds are required, the condition can sometimes be effectively met by two separate windings in the same slots, one or both of these windings being arranged for external multi-polar grouping. Three separate windings are not permissible in practical design. Such motors are sometimes used with or without changeable pulleys and rheostatic control for intermediate speeds but at best are a compromise, since the number of constant speed steps is limited by characteristics of design and by prohibitive costs. Rheostatic control is always objectionable for reasons noted above.

Fig. 3 shows diagrammatically the arrangement of stator and rotor windings for a two-speed changeable pole motor.

Fig. 4 shows typical efficiency and power factor curves for a two-speed motor with rheostatic control.

4. *Concatention.* Another method of obtaining three or more constant speeds, particularly where low speeds are required, has been employed abroad for mine fan service. This scheme employs segregated electrical and magnetic circuits and is known as operating in "cascade" or "concatenation."

In general two single-speed motors, one of which at least has a polar wound rotor, are mounted on the same shaft. The primary of motor *A* is connected to the secondary of motor *B*. Each of these motors may have either single or multi-speed windings and may be operated independently of the other as well as in concatenation. The second motor may have either a phase-wound or squirrelcage rotor. In case phase-wound rotors are used, speed regulations by secondary rheostatic control may be obtained in the usual manner, and with the usual objections.

Two motors are connected in direct concatenation if they show a tendency to start in the same direction and in differential concatenation if they tend to start in opposite directions. The synchronous speed of motors in concatenation may be determined as follows:

$$Speed = \frac{cycles \times 120}{P_1 \pm P_2}$$

where P_1 = number of poles of first motor and P_2 = the number of poles of the second motor, the plus sign being used for direct and the minus for differential concatenation.

With the multi-speed pole changing motors it is necessary to open the primary circuit when changing from one speed to the other, this may be avoided in concatenated sets by introducing resistance in the leads between the two motors, the resistance being cut in or out step by step when changing speeds (Fig. 5).

As noted with a polar-wound rotor, any reduction in speed by rheostatic control is accompanied by a proportionate reduction in efficiency, the power factor remaining practically constant. With concatenated motors the efficiency remains approximately constant provided there is no external resistance in the rotor circuit of the second motor, while, at the lower speed, the power factor drops, due to the fact that as compared with their normal individual ratings, the motors are underloaded when in concatenation.

5. *Single Cascade Motor.* The single cascade motor offers still another method of obtaining two or three definite fixed speeds. This motor has an internally concatenated winding. The stator windings are of the usual full- and half-speed types. The single winding of the rotor is so arranged that its magnetizing effect is the same as would be produced by two separate windings. It is, however, a decided improvement over two separate windings, since all coils which, in such cases, would neutralize each other, are omitted in the concatenated connection

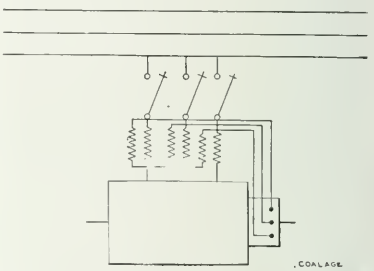


Fig. 12. Connections for Brush-Shifting Motor

and grouped together for connection to the slip rings for use only at other speeds. When the primary of the first element is properly connected with two circuits per phase in multiple corresponding to the number of poles, these circuits are in exact opposition for the number of poles in the second element and form a perfect path for short-circuiting the secondary of the second element. The stator winding, therefore, carries two currents simultaneously (1) a current from the line at full frequency and (2) induced current at a frequency corresponding to the slip. The general arrangement of windings is shown in Fig. 6.

By inserting a variable external resistance between certain points in the stator windings and open-circuiting the collector rings, variable-speed control can be obtained for the concatenated connection. Resistance across the collector rings gives ordinary variable-speed characteristics for the other two speeds.

This type of motor is particularly adapted to the three speeds corresponding to the polar ratios 1-2 and 3, for example 4-8-12, 6-12-18, etc.

6. *Dynamic Regulation.* As stated earlier in this paper, each of the foreging schemes possesses inherent disadvantages which until recently have made it practically necessary to employ a direct-current motor with shunt characteristics whenever close regulation was required for a large number of speeds each constant under varying loads.

Recently means have been perfected whereby shunt speed characteristics can be had with the standard poly-

phase induction motor, together with high-power factor and high efficiency throughout the range of operating speeds. The method employed is susceptible of several modifications and will be referred to inclusively as dynamic regulation. With rheostatic control the secondary energy is dissipated as heat whereas with dynamic regulation the major portion of this energy is returned to the system. Referring to Fig. 7, the external resistance *B* of Fig. 1 is replaced by the compensated commutator motor *B*, which forms one element of a two unit motor-generator set, the second element of which is a standard squirrel-cage induction motor connected to the supply mains. This machine is driven slightly above synchronism by the commutator motor and operating as an induction generator returns to the system energy proportional to the slip of the main motor, less the losses in the set itself. The commutator motor receives energy from the secondary of the main motor at relatively low frequencies and in general must have a proportionately small percentage of the main motor capacity. Assuming that *A* is to drive a fan at 50 per cent. of synchronous speed the horsepower delivered to the fan will be approximately 12.5 per cent. of the rated capacity of the motor and the same amount of energy will be delivered to the regulating set.

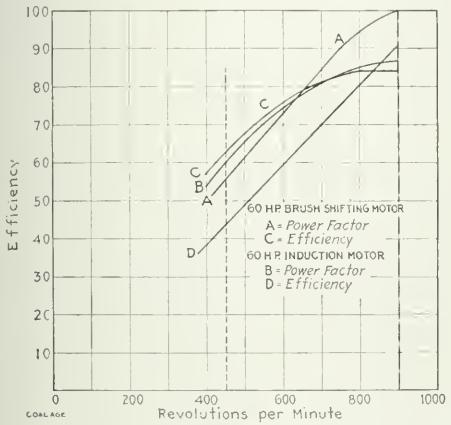


FIG. 13. POWER FACTOR AND EFFICIENCY FOR BRUSH-SHIFTING MOTOR

If the connected load required constant horsepower at the motor shaft, then neglecting losses, the motor input at 50 per cent. speed would be 200 per cent., the shaft horsepower 100 per cent. and the energy returned to the system 100 per cent.

If again the connected load required constant torque at the motor shaft, then neglecting the losses the motor input would be 100 per cent., the shaft output 50 per cent., and 50 per cent. would be returned to the system. This is shown graphically in Fig. 8. If *X* per cent. regulation is required the motor generator set must have *X* per cent. of capacity of the main motor: Fig. 9 shows typical curves of efficiency and power factor for the conditions indicated above with dynamic regulation and rheostatic control. Where standard regulating sets are employed they can be of relatively high speed and inexpensive design as compared with the slow-speed main motor.

Fig. 10 shows a modification of the above scheme in which the commutator motor *B* is direct connected to the main motor shaft. In this case the slip energy of the main motor is transformed to mechanical energy and the torque of *B* added to the torque exerted by the main motor *A*. This arrangement is especially desirable where constant horsepower must be maintained at the shaft. For fan service, however, the high-speed self-contained regulating set is usually cheaper and yields equally satisfactory results. Furthermore, the possibility of applying the standard regulating set to any standard induction motor with phase-wound rotor in event of future re-arrangement of equipment, is an important advantage.

In addition to the advantages of adjustable constant speeds under varying load and high operating efficiency the possibilities of power-factor correction are often of great importance. If desired, unity power factor can be maintained on the main motor with all the usual beneficial results in improved regulation and increased energy capacity in power-station and transmission system. Unity power factor correction naturally involves a somewhat more expensive set since the magnetizing current is supplied by the commutator motor instead of from the line. The standard sets should have sufficient capacity to raise the power factor of the main motor about 10 per cent., maintaining an average power factor of 95 per cent., or, in some cases, 100 per cent. without increased cost. In special cases it is possible to supply sufficient magnetizing current from the commutator motor to give the main motor a leading power factor, thus obtaining a certain corrective effect for low power-factor conditions on the external system. The kilovolt-ampere capacity, copper losses and first cost will be increased and the overall efficiency lower in this case.

The operation of the set with magnetic control is very simple. The induction generator is thrown across the line by means of a tandard compensator and brought up to speed as an ordinary squirrel-cage motor. The main motor is started by closing the primary oil switch and accelerated by automatic current limit control. The speed of the main motor adjusts itself to the tension determined by the setting of the exciter field rheostat. Any further speed adjustment is obtained by the manipulation of this exciter field rheostat.

The range of speed regulation obtained is limited by the maximum frequency impressed on the commutator motor. In general for good design this should not exceed approximately 20 cycles, which will give about 30 per cent. regulation on a 60-cycle motor. This limit varies somewhat with the size of the motor involved.

This system was developed in Europe and in the past four years about thirty equipments have been put in successful operation for mine fans and rolling mills. Three similar equipments have been sold in this country within the last six months.

Fig. 11 shows efficiency curves for two 400-hp motors driving a mine fan, with regulating set and with rheostatic control. Two of these motors were actually installed and operated continuously at 40 per cent. speed regulation by rheostatic control for nearly a year. Under these conditions the input to the fan would be 21.6 per cent., and the energy dissipated in the rheostat or delivered to the regulating set 14.4 per cent., of the full load rating of the motor.

From the curves the relative over-all efficiencies with

rheostatic and dynamic control are seen to be 51 per cent. and 70.5 per cent., respectively. The relative power consumption is therefore 169.5 hp. and 122.5 hp., or a net saving of 47.0 hp. per machine in favor of the regulating set. Assuming that power can be purchased for 1 cent per kw.-hr., the net saving due to the use of a regulating set with each fan 12 hr. per day, 300 days per year, would be $0.01 \times 47.0 \times 0.746 \times 12 \times 300 \times 2 = \$2525$, approximately. In many gaseous mines the fans must operate continuously 24 hours per day every day in the year, which would make the net savings $6160.

7. *Brush Shifting.* For fan installations requiring motors of 100 hp. or less capacity, in place of the regulating sets described above, the brush shifting polyphase motor can often be employed to advantage. Fig. 12 indicates the general arrangement of connections for this type of motor. The motor derives its name from the fact that it is started, stopped, reversed and controlled by merely shifting the brushes.

With a certain brush setting no torque is developed, consequently the motor will not start when the line switch is closed until the brushes are moved from this position. The speed of the motor is proportional to the brush shift. Reverse operation can be obtained by moving the brushes in the opposite direction from the zero position, but for best commutation two phases should then be reversed.

Brush shifting is accomplished by means of a suitable worm gear and handwheel conveniently located. Commutation is excellent throughout the entire speed range. Fig. 13 shows power-factor and efficiency curves for a 60-hp. brush-shifting motor and for an ordinary induction motor with rheostatic control designed for fan service. These curves were plotted from actual test data. The minimum permissible speed depends largely upon the torque requirements of the driven load. For fan service this type of motor will give stable operations at quite low speeds corresponding approximately to 70 per cent. slip below synchronism.

In conclusion it would appear to the writer that in the absence of an existing direct-current system, the advantages of the polyphase motor leave small ground for the application of direct-current motors for either constant or adjustable-speed fan drive.

Mine Inspectors' Institute, U. S. A.

The announcement has just been received of the fifth annual meeting of the Mine Inspectors' Institute of the United States of America, to be held June 10-13, 1913, at Birmingham, Ala. This is actually the sixth annual meeting, counting the conference of mine inspectors, held at Indianapolis, Ind., June 9-12, 1908. Following this first conference, annual meetings have been held at Scranton, Penn. (1909); Chicago, Ill. (1910); Charleston, W. Va. (1911); and Columbus, Ohio (1912).

All members of the Institute and all regularly commissioned inspectors of mines, in the United States and Canada, are urgently requested to attend the meeting at Birmingham. The purpose of the meeting, as stated, is to afford an opportunity to the mine inspectors of the states and provinces of North America to exchange ideas and discuss subjects relative to greater safety in mining.

All members are requested to furnish the secretary, at the earliest possible date, the title of any paper or subject they may desire to present for discussion. The following subjects are suggested as being of sufficient importance for presentation and discussion:

1. Compensation laws as they affect the miner and operator.
2. The phenomena of retarded ventilation at firing time.
3. The use of portable electric lamps by miners at the working face.
4. Need of uniformity of danger signals in mines.
5. Precautions to be observed in restoring ventilation after a mine explosion.
6. How to secure the coöperation of the miner in the reduction of accidents.
7. The use of mixed lights in mines.
8. Election versus appointment of State Mine Inspectors.
9. Ventilation in metalliferous mines.
10. Hardships imposed upon State Inspectors.

Members are earnestly requested to prepare papers on one or more of these or other subjects and to send a copy of the same to the secretary not later than June 1.

Birmingham and vicinity offers many opportunities to see coal and ore mining, blast furnaces, coke ovens, steel mills, mine sanitation, rescue stations and first-aid organizations.

If a member or a mine inspector, you are cordially invited to attend this forthcoming meeting. The State Mine Inspectors, the state and city officials, and the Chamber of Commerce of Birmingham will lend their assistance to make the meeting a success, and those who attend will have a touch of real Southern hospitality.

James W. Paul, Secretary.

A New Chapter of the Rocky Mountain Coal Mining Institute

By F. J. Mullen

A meeting was held at Koehler, N. M., on May 3, for the purpose of organizing a New Mexico Chapter of the Rocky Mountain Coal Mining Institute. The following members were present:

T. H. O'Brien, Allan French, Wm. McDermott, John W. Morris, Walter Kerr, J. B. Morrow, M. G. Smiglow, Frank Stafford, Frank R. Weitzel, Sebastian Frohmann, Archie French.

The following members were enrolled:

William Kilpatrick, Dawson New Mex.	H. B. Kerr, Van Houten, New Mex.
Tim Tinsley Dawson New Mex.	Alex Stewart, Van Houten, New Mex.
Wm. Hutchings Dawson New Mex.	Wm. Niel, Van Houten, New Mex.
F. J. Mullen, Dawson, New Mex.	James Stewart, Van Houten, New Mex.
Wm. Gordon, Dawson, New Mex.	T. W. Wallbank, Van Houten, New Mex
Warren Bracewell, Dawson, New Mex.	Frank A. Young, Raton, New Mex.
Moses Saul, Dawson, New Mex.	Walter Lovett, Raton, New Mex.
James Lees, Dawson, New Mex.	J. L. Caruthers, Raton, New Mex.
C. A. Mitke, Dawson, New Mex.	J. H. Willis, Gardner, New Mex.
Peter Gardner, Brilliant, New Mex.	J. Burkhalter, Gardner, New Mex.
James Bell, Brilliant, New Mex.	Adam French, Gardner, New Mex.
Joe Connor, Koehler, New Mex.	T. C. Harvey, Sugarite, New Mex.
John Evan, Koehler, New Mex.	Vincent Donati, Sugarite, New Mex.
Wm. Britton, Koehler, New Mex.	Adam Paghai, Sugarite, New Mex.
James Wallace, Koehler, New Mex.	A. H. Beamers, Sugarite, New Mex.
Menzie Wyper, Koehler, New Mex.	Wm. Langley, Sugarite, New Mex.

The following officers were elected:

President, Walter Kerr; Secretary-Treasurer, Wm. McDermott; Members Executive Board, Allan French, T. H. O'Brien, Wm. Kilpatrick, Peter Gardner.

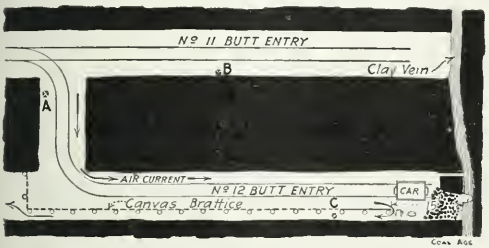
Owing to the short time at hand for the formation of the chapter, nothing else was attempted but the organization. However, at the next meeting, which will probably be held at Dawson, N. M., several excellent papers are promised for reading.

The Koehler "bunch" cannot be beaten on entertainment. A "swell" dutch lunch was provided for all those who desired to partake thereof, and added greatly to the sociability of the meeting.

The Cincinnati Mine Explosion

In addition to the meager accounts thus far obtainable in regard to the explosion that occurred in the Cincinnati mine of the Monongahela River Consolidated Coal & Coke Co., at noon, Apr. 23, 1913, in which 96 lives were lost, we have recently received a detailed sketch of the face of the heading, where the explosion is thought to have originated. This is No. 12 butt entry off No. 14 face entry.

According to the evidence given at the coroner's jury, which completed its work May 13, and whose verdict, in full, we append, the explosion was started by the ignition of a body of gas that had accumulated at the face of No. 13 butt entry. The No. 12 butt entries were being driven to open up a new portion of the mine. As shown in the sketch, one of these entries was being pushed ahead and was ventilated by a brattice, consisting of canvas nailed to a line of posts set about 2 ft. from the right-hand rib of the entry. The coal was drawn out from the face of the entry through the last cut-through, and the air current was conducted through the same cut-through to the face of that entry and returned behind the brattice.



Showing Face of No. 12 Butt Entry Where Explosion Started

The entryman had fired a shot at noon and had retired to the cut-through, where he ate his lunch at the point marked *A*. The face of the entry had struck a clay vein and the shot fired had penetrated this vein, and it is supposed had opened a feeder of gas, which is very apt to occur when an opening is driven through a fault. The gas from the feeder had accumulated in considerable volume at the face of the entry while the entryman was eating his dinner.

As no gas had been discovered in this portion of the mine since Mar. 5, 1913, according to the reports of the fireboss, the entry was being driven with open lights, no safety lamps being used. As a consequence, when the miner returned to the face of the heading, after eating his lunch, he unconsciously walked into and ignited the gas that had accumulated. The burning gas evidently developed into a violent explosion a short distance from the face, as the last 10 ft. of the brattice near the head of the entry was left intact, while the remainder was entirely destroyed, as shown by the dotted line in the sketch. The bodies of the two men who were killed in these entries were found at the points marked *B* and *C*. The miner's cap and the lamp (a common miner's torch or lamp), were found at the end of the brattice, as shown in the sketch. When the miner returned from his lunch, he had brought in with him the empty car shown at the head of this entry. The explosion that developed gained force in its passage throughout the mine, and, as a result, 96 lives were ushered into eternity with but slight warning.

Inasmuch as the verdict and recommendations of the coroner's jury are somewhat out of the ordinary, we give them in full for what they are worth. They are as follows:

The Verdict

We, the jury, find that Stephen Long and the 95 others named came to their death in the Cincinnati mine of the Monongahela River Consolidated Coal and Coke company, Washington county, Penn., on April 23, 1913, from violence and asphyxiation as a result of an explosion of gas in the said Cincinnati mine at about 12:15 p.m., while the miners were at work and the mine in operation.

We further find from the evidence given by those that worked in the mine at the time of the explosion and previously, also the state mine inspectors, experts and officials and others who made an investigation and examination of the mine after the explosion, that the cause of the said explosion of gas was as follows:

(a) That it originated in No. 12 butt entry off No. 14 face entry, as a result of the entryman, who worked in said entry, firing a butt shot which struck a clay vein exposing a feeder of gas. After firing said shot, the entryman evidently went to the break to eat his dinner and on returning with an empty car he ignited the gas with his open light with which he was permitted to work; we also find that no gas has been reported in said entry since March 5, 1913, by any of the mine officials.

(b) Further, that said explosion of gas which we find originated in said No. 12 entry reinforced itself in other entries, namely: Nos. 4 and 6 entries in which gas was generated and had been reported by the mine officials at different times and which entries were being worked with safety lamps.

(c) We further find that said explosion could have been prevented had safety lamps been used in this section of the mine.

(d) While under the law the legal responsibility for any explosion such as this would rest on the mine foreman, we say frankly that a greater responsibility rests upon the lawmakers and particularly upon those responsible for its enactment, for the reason, that it places the entire responsibility for the operation of the mine on the man granted a certificate of competency by the state but employed and paid by the owner and operator of the mine; certainly an absurdity on the face of it, and one that under human events will not successfully protect life either in theory or practice. If the present system must continue, surely the legal responsibility ought to be placed upon the owner or operator equally with the mine foreman. Guided by the testimony given, opinions expressed by those in official capacity as well as those employed in and about the mine we make the following recommendations:

Recommendations

First. To the management of the Cincinnati mine: That hereafter it be operated by safety lamps as a whole, and that no machinery be used that would make possible the emission of sparks. Surely the lesson to be learned here is the folly of working a gaseous mine with part open and part safety lamps.

Second: To the legislature and senate of this state: That if it is your desire to make safe the operation of mines that in the enactment of mining legislation you be guided more by the opinions of those intrusted with the responsibility of safe-guarding lives, namely, the state mine inspectors, the mine foreman and the miner, rather than by the opinion of the corporation, attorneys and managers of corporations, who, from a careful reading of the present law, seem to have in mind the competitive nature of business and the protection of property rather than the safe-guarding of human life.

Third: To the Department of Mines: We recommend that a more definite report be required from the firebosses and mine foremen in respect to the dangers existing in the mine, in their daily and weekly reports. For instance, if gas be discovered, that they be required to state in what part of the working place it was found, whether it be on a fall, or in a clay vein, roof, or the face of the working place and if possible in what volume.

Fourth: We call attention to this fact that while many of the mines of this district are working in whole or in part with safety lamps it is not because of any legal requirement,

but rather because of the diligence of the inspectors. Hence, until the final authority for the safe operation of the mines be vested where it should be, in the state inspectors of mines, without the right of the reverse of appeal by common pleas and supreme courts with all its delays, that the owners and operators or managers of mines cheerfully comply with the recommendations of inspectors, particularly those made for the purpose of safeguarding life and they should not be considered a business hardship.

Further, we recommend that, at any mine where gas is or has been discovered or is being generated, they be worked with safety lamps and other necessary precautions and that the use of machinery that caused emission of sparks be discontinued. We have carefully considered the evidence and law and the opinions expressed by those who testified, and feel that we have placed the responsibility for the explosion where it properly belongs, namely, on the mine foreman (legally), as we believe through an error of judgment on his part he permitted part open and part safety lamps in that part of the mine where the explosion took place; but we place a greater responsibility, morally, on those responsible for the framing and enactment of such a law.

Signed:

C. H. LANDEFELD, Foreman,
T. J. ECKBRETH,
B. S. ALLEN,
W. F. ALTEN,
J. D. HOON,
ISAAC YOHE.

Plant of the Empire Coal & Coke Co.

Our front cover this week shows the plant of the Empire Coal & Coke Co. at Landgraff, W. Va., on the main line of the Norfolk & Western R.R., about 10 miles east of Welch. This is one of the most modern and uptodate tipples in the Pocahontas field.

The proper cleaning and sizing of the coal from this mine yields an increase in the market value approximating 15 to 20c. per ton upon the entire output. As the type of coal handled is a soft and brittle grade of Pocahontas, it has to be treated with extreme care to prevent degradation in sizes.

This tipple has a capacity of 500 tons per hour, and spans four loading tracks. It is so equipped that the coal is conveyed, sized, picked, mixed in any proportion desired, and loaded without appreciable breakage.

The mine cars are dumped at a point about 70 ft. above and 175 ft. south of the inside track. The coal is discharged from the mine cars into a 10-ton steel receiving hopper, from which it is delivered by a reciprocating plate feeder to a scraping conveyor, having steel flights 12 in. wide by 5 ft. long, placed every three feet on two 18-in. pitch sprocket chains. This conveyor is 135 ft. long between centers, and delivers the coal to shaking screens, where it is graded into slack, nut, egg and lump.

The slack coal passes by gravity to a 200-ton steel bin, from which it is carried, either by a 32-in. rubber belt conveyor to cars for shipment or by a scraper conveyor to a crusher and pulverizer, where it is reduced to uniform fineness for coking, and deposited by a 90-ft. bucket elevator in a 25-ft. diameter cylindrical steel larry bin at the end of the tipple.

The nut coal passes first to a revolving screen, where it is more thoroughly cleaned, and is then delivered to the nut picking table. This discharges either into cars direct or into a mixing conveyor. The egg and lump coal pass directly from the screen to their respective picking tables. These also deliver to cars direct or into a mixing conveyor.

The refuse is removed by hand from the picking tables, and deposited in a refuse conveyor, which runs parallel to and between the picking tables, but in the opposite direction. This discharges into a steel refuse tank located over a track at the end of the tipple.

The picking tables for lump and egg coal are each 5 ft. wide and 68 ft. long between centers, and both have hinged or adjustable loading booms, which are capable of being raised or lowered so as to discharge the coal into either the mixing conveyor or the railway cars without breakage.

The mixing conveyor runs at right angles of the picking tables, receiving coal from any or all of them simultaneously, and delivering it to the cars, mixed in any proportion desired.

All shaking screens are equipped with veils which permit of variation in the size of the product or the shipment of mine-run coal. From these screens the coal passes to the picking tables, practically without drop or breakage. The entire mechanical system consists of six units, each of which is driven by an independent motor and all operations are controlled by one man from an elevated bridge in the picking house.

The operation of this plant, which was designed and built by the Jeffrey Mfg. Co., of Columbus, Ohio, has been highly satisfactory and unattended by any serious troubles of any kind. The methods employed in the manipulation and treatment of the coal have not only eliminated the usual breakage, but have substantially increased the market value of the fuel prepared.

A Special Coke Number

The June 7 issue of COAL AGE will be devoted principally to the subject of coke manufacture. We will be pleased to receive articles and discussions dealing with some phase of the coke business from any of our readers. All matter for this particular issue of COAL AGE should be in our hands within the next week.

The Kentucky Mining Institute

The papers presented before the summer meeting of the Kentucky Mining Institute, held in Lexington, May 16-17, will be printed in our next issue of COAL AGE. A detailed account of the First-Aid Field Meet also will be published in our next number. It is safe to say that this most recent meeting of Kentucky coal men was the most enthusiastic and the best attended coal conference ever held in the State of Kentucky. The Continental Coal Corp. deserves particular mention for the vigorous support it rendered the Institute. The Continental people came to the meeting in a special train, with a brass band and all the other essentials needed to create plenty of enthusiasm.

American Coal in France

United States Consul General Frank H. Mason, stationed at Paris, says:

The year was marked by a notable advance in the prices of both coal and coke, so that some apprehension has been felt about future supplies of fuel for the iron and other industries. The price of coke for the metallurgical industries is fixed by agreement between producers in the Pas-de-Calais district and the blast furnaces in the east, and is revised every three months. The rates for the four quarterly periods of 1912 were as follows per metric ton of 2204.6 lb.: First quarter, $4.137; second; $4.194; third, $4.415; fourth, $4.697. This shows a net increase during the year of 56c. per ton.

EDITORIALS

The Miners' Opportunity

During the past few years much attention has been drawn to the various vocational mining schools being established throughout the country, and particularly in the anthracite region. Here the trapper boy, the driver, the laborer, miner and foreman meet upon a common level for mutual improvement. Nor is it uncommon to find the men in the inferior positions showing greater aptitude for, and improvement in, their studies than those higher up.

We have heard much of the hopelessness of labor and the inability of the laboring man to rise above his environment. These men should remember, however, that with the vocational schools and the mining institutes at their very doors, it is strictly "up to them" whether they shall remain in their present humble circumstances or shall succeed to positions of responsibility and profit in the mining industry. Surrounded by present-day opportunities, they and they alone are the masters of their own destinies.

Ohio's Proposed Anti-Screening Law

The determined and partially successful efforts that are being made to push through the Green "Run-of-Mine" bill in Ohio, in the face of numberless irrefutable arguments against it, furnishes conclusive evidence of another power in the political arena—the enormous and far-reaching power of organized labor. There was, of course, a time when corporations assisted in the election of men whom they could depend upon to at least protect their interests, but under pressure of public opinion they have been gradually forced to withdraw.

In the case of labor, the public is disposed to be more sympathetic and the unions are showing a prompt appreciation of the advantage and possibilities of this leniency. Class legislation is being enacted in all parts of the country, which is not only interfering with the management, but is destroying discipline and must eventually deplete the revenues of the industries affected. Labor's position differs from that of the corporation's only by delivering the votes instead of the money with which to buy them, and a candidate must declare himself or be branded as a "foe to labor" and suffer an ignominious defeat.

A brazen example of labor legislation is shown in a bill recently introduced in the New Jersey legislature, prohibiting railroads from testing their signals without first warning the locomotive engineers that such tests were to be conducted. It seems to have been the practice of the Pennsylvania R.R. to make tests of this character at intervals and of some 51,000 made in 1912 it was found that the enginemen failed to observe the signal in 510 cases.

Presumably each of these might have resulted in a fearful catastrophe and yet these men deliberately and unblushingly resent being disciplined and demand to be exempted from tests of their alertness and ability even though thousands of the traveling public are daily dependent upon these qualifications for their very lives. The "service bill" in Pennsylvania is an equally ridiculous and reprehensible measure, while the ultimatum delivered by the president of the Firemen's Brotherhood to the railroad managers that: "If we don't get it here, you can depend upon it we will get it in Washington" is particularly significant.

The Ohio screening bill is obviously a labor measure, headed by a labor leader and strongly supported by a labor party. It shows a determination on the part of the unions to gain their ends at a sacrifice of every other consideration and the people of Ohio would do well to study the effects of a like measure on the coal industry of Arkansas before idly conceding. The screening bill there went into effect in 1905. During the succeeding five years, to and including 1910 (the banner year in the coal industry for which any authentic returns are so far available), the coal production of the United States increased 28 per cent. During this same period Ohio's tonnage increased nearly 35 per cent., while that of Arkansas showed a slight *decrease*. The results are too obvious to require any comments.

The West Virginia Settlement

The Paint Creek mine-strike is settled, at least for a time, and we are not much surprised that an increase in wage is not among the provisions. The miners of West Virginia have been able to earn a fair living out of the present schedule, though it is lower on the actual tonnage basis than that obtaining in Pennsylvania and other states. This has been due to their steadier effort and to the fact that the coal is, for the most part, easier to dig.

But even if these statements were not true and the income from labor of the West Virginia miner were abnormally low, nevertheless we hardly think the Union, if firmly established, would be able to raise the wages of the miner in that state appreciably.

It has been always found that differentials were hard to correct because the interests of the operator and his employee and of the railroad transporting the coal are identical. Disturb the differential and the change in rates will reduce production in some other field; the railroad in that field as well as the operator and employee will be idle. So that real modifications of the balance are rarely effective whether decreed by courts or unions.

The Springfield, Ill., operators are raising a purse to seek lower rates from the commerce commission. If they succeed, other reductions will occur elsewhere and the differential will continue. The same condition is true of West Virginia in regard to wages. To raise the ton or day wage paid to miners and mining men will put West Virginia at a disadvantage in the market and in that misfortune, the workingman will suffer with the rest.

There was a time when wages could have been raised to a higher level in West Virginia, but that time has passed. The coal has worked its way into too closely competitive markets and the industry has grown accordingly, with the result that the lower wage is not merely needed to enter new markets but to retain those already secured.

It is foolish to believe that a Union could raise wages in a state where the ability of the operators to produce coal so largely overweighs their power to sell it. The Union and the operators have always acknowledged differentials where they existed and will be obliged to do so in the future. Labor is largely immobile and this fact prevents the actual compensation being nicely adjusted to the labor of mining. Men will not move from state to state for a trifling differential and when this difference is as much apparent as actual, the appeal is not enough to induce workingmen to migrate. So despite the lower wage the miner decides not to take "his beef and brawn" to the better market, and the price of his labor is fixed at the level which will permit the operator to conduct his business and meet the competition of all the fields into which his coal enters.

If labor was freely migratory, the lower-tonnage rate would years ago have caused the miner to move north and west. He would then have compelled the operator to raise the wage rate and the market of West Virginia would have been limited to its boundaries on three sides and to Virginia and the Atlantic Coast on the east. Labor did not migrate and West Virginia coal is found everywhere.

Nothing but a pronounced exodus can cause the operator to give higher rates than he now pays. If the miners would all have work and stay in the state, they must enable the operators to continue to ship coal to all points to which it is now being consigned by signing a wage scale like that now obtaining.

It is needless to add that the increase of wage cannot well come from the profits of the operator. West Virginia has been over-exploited like almost all of the American coal fields. Dividends in that state are hard to obtain and many are the concerns which cannot earn them or even "coax" a favorable balance on their books. The struggle between the operators of the state is now keen and profits are not made as freely as 15 years ago.

If the burden of a wage increase is to be laid anywhere, it might be placed on the royalties paid by the operators, but in any event such an increase would necessarily be small.

The Other Man's Way

The coal fields of America are operated in a number of exceedingly varied ways. It is remarkable that in a country with an active technical press, with railroads and mails highly developed, there is so much provincialism.

All our readers want a paper which will detail the plants in their own neighborhood—the mere chit-chat of local development. They do not know or care to know what is being done in remoter coal regions.

Yet the history of their own future mining methods is being written in these distant places. The State of Illinois, for instance, with increasing output and many new mines, is developing new standards—light steel headframes, fireproof yet not unreasonably expensive. It is adopting the electric hoist and largely using the recording scale. Some of its operators openly declare that the Eastern bituminous fields are effete and have set themselves largely against progress, but one can readily see where a trip East would reveal many new ideas which would revolutionize mining in the Middle West.

Our coal-mining institutes are doing valuable work in helping to bring the less modern mines of districts up to the level of the best, but these organizations are purely local. They do not broaden the minds of their members as such institutions should.

It is for this reason that we welcome the trip the Coal Mining Institute of America is about to make to Wilkes-Barre. It is well known that this body consists mainly of western Pennsylvania mining men, whose vision has been largely circumscribed by the Chestnut Ridge and the boundary lines of the western part of the state. There is a great need that all the institutions be widened by the travel of their members, and in no way could this end be obtained more successfully than by the welding of these smaller units into a common national body.

Relative Fatality Rate in Coal and Metal Mines

Albert H. Fay, at the recent meeting of the New York Section of the American Institute of Mining Engineers, declared that if the coal mines worked with the regularity of the metal mines, the fatality rate of the former would be higher than that of the latter.

But the method of calculating working days is perhaps not exactly parallel in the metal- and coal-mining industries. Mr. Fay declared that many of the companies reporting from the West, represented themselves as working 365 days, doubtless because every day some men were in the mine; the operations of timbering, laying track and repairing, proceeding briskly when the mines are idle.

The method of calculation favored by many metal-mine operators, has not found favor in the coal industry, the tendency being to record only the days when the mine is officially said to be running. In many mines when business is slack, much coal is undercut and shot down, not a little coal is hauled, and some is often actually dumped into the railroad cars on what are termed idle days; the tonnage being credited to the next official day.

Both the records of the Bureau of Mines and the Geological Survey relative to days worked are, we are assured by Mr. Fay and Jefferson Middleton, duly weighted so that the idleness of a small mine does not have appreciable effect on the estimated average, whereas the shutting down of a large mine has a much greater effect.

But the records received from the mining companies by these bureaus, while properly manipulated when presented, are not constructed by the reporting companies with due regard to scientific principles of reckoning. The results are, therefore, not entirely reliable, and if the truth could ever be known, it is probable that the small 11 per cent. margin, against the coal operator, would be shown to be the result of a variance in the method of calculation of the number of working days.

It remains a fact that the annual death rate of coal miners is 12 per cent. less than that of metal miners and, that thanks to the bureau amid many other agencies, the death rate is, at least, at present decreasing.

The Wilkes-Barre Industrial Exposition

The Greater Wilkes-Barre Industrial Exposition was held in the new Penn Tobacco Co. Building, on S. Main St., Wilkes-Barre, Penn., May 10-17, inclusive. The exhibits were displayed on the first and second floors, occupying a total space of about 24,000 sq.ft., while the third floor was used for concerts, etc. The total number of exhibitors was in the neighborhood of 112, while the materials displayed included everything from heavy mine machinery to a peanut stand.

The most interesting features of the exposition were in the display by the coal companies. To this the Lehigh Valley Coal Co., the D., L. & W. Coal Department, the D. & H., the Lehigh & Wilkes-Barre Coal and the Susquehanna Coal Co. contributed jointly. This exhibit included the demonstration of the first-aid rescue work, preparation of anthracite coal, pyramid of coal eight feet high, fossil tree weighing two tons, undercutting machine and all kinds of miner's and safety lamps, all sizes of coal and the face of a timbered gangway with a loaded car on the track.

The length of the gangway was about thirty feet and the timber was covered with tarred paper or similar black material, so that the whole room was made dark, while the face appeared to be a solid mass of coal, eight feet high, with a six-inch slate band, four feet from the bottom. It was built with lumps of coal, each about one cubic foot in size and mortared with a black cement. A dummy was placed at the face to represent a miner about to drill a hole. So realistic was this representation that a boy, after examining the face, remarked to his father: "This is really and truly a coal mine!"

Machinery Exhibits

The Vulcan Iron Works displayed a mine locomotive which was new and looked very attractive. It was so placed that a visitor could examine all its parts without bending or stooping. The Hazard Wire Rope Co. exhibited a machine drawing copper wire and insulating the same.

The Howells Mine Drill Co., of Plymouth, Penn., exhibited an electric coal drill. This outfit consisted of an electric drill, Spry type "S," and a 10,000-lb. lump of anthracite coal, obtained from one of the D., L. & W. mines, in Plymouth. This coal contained, roughly, 110 cu.ft., being a 4.8-ft. cube. The electric drill was mounted in front of the coal with a 1½-in. bit, and current was turned on. The machine actually drilled at the rate of 7 ft. per minute.

To drill a 7-ft. hole with a hand apparatus requires at least 30 min. In other words, the electric drill works thirty times faster than the ordinary hand machine. The motor requires about 15 amp. at 220 volts, direct or alternating current. The weight of the complete outfit with post is 275 lb., and the cost $275, or one dollar per pound. There are now about 300 of these electric drills used in the anthracite region. They are also being employed in salt, gypsum and talc mines.

Part of the Coal Companies' Exhibit at the Greater Wilkes-Barre Industrial Exposition

DISCUSSION BY READERS

Education in Coal Mining

Letter No. 18—Education, in its broadest sense, includes such instruction and discipline as is intended to enlighten the understanding, correct the temper, cultivate the taste, form the manners and habits, and fit persons for usefulness in their future stations. Education is as necessary in coal mining as in any other industry. Every man and youth needs all the education he can get, and the amount of good he will derive from it will depend upon himself.

A systematic study will bring good results, if properly applied to everyday conditions; but a spasmodic effort to get, in two weeks time, the knowledge that should require two years to obtain, can result only in final failure. Compulsory school laws will tend to keep many boys away from the mine; education will turn many to other occupations. As a natural result, the future of coal mining must depend on imported foreigners, who must be educated and trained how to mine coal properly, and how to protect themselves and the property of their employers.

The education that is mostly needed in coal mining is the kind that applies to the actual working conditions, and teaches the miner how to properly mine and shoot his coal, timber his working place, handle and load cars, and many other things that will insure his safety and economize time, labor and material.

My advice to every coal miner is: "Be ambitious; get all the book learning you can by reading and studying coal-mining books and journals. Do not crowd your head with formulas and neglect other things more important. Try to apply what you read to the actual conditions with which you are familiar. Make good use of your spare time and idle days. Consider the work in the mine as a course of educational training and study how the work can be done in the best, safest, cheapest and quickest manner. Observe closely all that is done in the mine, and, when possible, ask to have explained what you do not understand.

The question of deciding the character of mining examinations is a very broad one and can be looked at from many different sides. I think that only such questions should be asked as relate to the actual work and conditions that mine foremen and firebosses have to meet in the mine and the problems they must solve. Sometimes, questions are asked at examinations that are entirely out of place and, in actual practice, would be handled by one of the engineers rather than by the foreman.

Handbooks and textbooks are written by experts and authorities, and their purpose is to aid the worker and save his time. If a man understands the principles taught and has the intelligence to use a handbook correctly he will use it in actual practice; and the examination should be made to correspond to that practice, as nearly as possible. A mine worker going before an examining board is naturally anxious and excited. He fears and forgets; his hands are used to toil and it is hard for him to write fast and long. Therefore, I believe more stress should be laid on oral questions and less written work should be required of the candidate. In this way, the examiners would be able to draw out many good points that the candidate would forget to write.

Proper weight should be given to a man's experience and his personal and moral record. It frequently happens that certificates are granted to young men who are wholly incapable of running a mine and have not had the actual experience in gaseous mines; but who, by stretching the truth, are able to pass a creditable examination. A man's experience in gas should be verified. I am in favor of giving the mine worker every educational advantage possible, morally, physically, intellectually and sociologically; but, by all means, be square with him; and do not expect of him the attainments of a student or a college-trained man.

MINING ENGINEER.

Clarksburg, W. Va.

Letter No. 19—The necessity of requiring candidates for the position of mine foreman or fireboss, to undergo an examination and obtain a certificate of competency from a duly authorized examining board has been demonstrated as a wise provision. Mining today requires the services of men who have more or less technical training; but the man who blends both practical and technical experience and training is in greatest demand. The method of obtaining technical training in almost any line or industry is not denied any ambitious person today. Educational methods are made clear and concise, and the course of study much shortened by presenting only those parts of subjects that are necessary for the particular work in hand.

While there are some ambitious, energetic young men with means sufficient to obtain a thorough technical training, it cannot be denied that many of this class would have received greater benefit by going to work in the mills, mines, or on the farm than by going to college. There are, on the other hand, many thousands of men whose schooling has never gone beyond the eighth grade; and this, in many cases, has only been accomplished by the passage of the law prohibiting children under 14 years of age, in some states, and 16 years of age in Montana, from working in the mines. Few of these men realize they have much to learn until they have reached the age of 30 or 35 and sometimes 50 years.

A Chinaman in Butte City, Mont., took a course in land surveying, at 60 years of age, and successfully completed it. While men of advanced age, however, have generally lost the faculty of memorizing formulas, constants and other data, it is not difficult for them to learn to select and apply the proper formula required for the solution of any problem. The engineer, although a college-trained man, refers constantly to his handbook for such formulas, constants and data. The practical mine foreman, in the same manner, uses his handbook to work out any mathematical problem connected with his work.

Such a man is a more competent man in the mine than the college-trained man, who seldom has any practical experience.

I recently discussed the subject of examinations with a general manager of coal properties in Canada, who was himself a college-trained man but, later in life, gained considerable practical experience and understood well what was required of a good mine manager. This man remarked that, in Canada, the examinations were running more to the academic than to the practical; and that, on this account, good mine managers were becoming scarce.

When the mining law requiring the examination of mine foremen and firebosses in Montana was being drafted I asked those who had charge of the bill to incorporate a provision allowing the use of textbooks in the examinations, explaining that it would be a benefit to the practical man and that, by suitable regulations in respect to the character of the examination, it would give no advantage to the college-trained man. On the other hand, the practical man with some technical training would thus become a dangerous competitor of the technical man who had little or no practical experience.

Education is a valuable asset, more so to the man who works during the day and studies at night to acquire knowledge. Such a man is of more value to a company than any walking encyclopedia who can reel off formulas, constants and other data, without reference to textbooks. In the performance of difficult mining work, I very much prefer to employ the engineer who refers to his textbook in preference to the wiseacre who quotes from memory.

The use of textbooks, in examinations before county boards in Montana, is safeguarded, as the books are only allowed for certain purposes, and this law is working satisfactorily. I believe less harm will result in allowing the use of textbooks to enable the practical miner to pass an examination for mine foreman or mine inspector than would result if many of these men were debarred on account of their inability to memorize formulas. In such an examination the college-trained man certainly has an advantage, because he can more easily remember the data and formulas he needs in the examination.

It is my experience that the use of textbooks, in this manner in examination, does the technical man no harm, while it places the practical man of limited technical training on the same basis on which he is accustomed to work in the office or at home. In other words, it gives the practical man an opportunity to show his ability to handle this class of work in connection with his other duties. It would not make him a better man if he could remember the data and formulas he is accustomed to find in the textbook.

JOSEPH B. MCDERMOTT,
Chief Mine Inspector.

Helena, Mont.

A Suggestion

The practical man has a hard road to travel; and there should be some means adopted that would require him to increase his education along certain lines. It might be that an examination at certain periods would solve this question. Mining journals should give this matter careful consideration.

A MINE SUPERINTENDENT.

Johnstown, Penn.

Carelessness the Cause of Many Mine Explosions

Since I have been a reader of COAL AGE, many articles have appealed very strongly to me, especially those treating on explosions of gas or dust.

In the year 1888, Jan. 24, I was in an explosion at No. 5 mine, Wellington, B. C., Canada, where 97 men lost their lives. Eight months previous to this No. 1 mine at Nanaimo had exploded, causing the loss of 137 men. I was a witness of the terrible effects of these explosions, both of which were ascribed to coal dust ignited by blownout shots. I know gas was often found in each of these mines and I believe that in the explosion gas was disturbed and brought down on the naked lights by the blownout shots. I believe also the explosion was augmented by the coal dust blown into the air by the force of the blast. However, comparatively little was known then of the danger of coal dust in respect to mine explosions. In these cases the coal seam was irregular, measuring in some cases 16 and 20 ft. in thickness, while in other cases the coal would run out to 2 and 3 ft. in thickness. This condition interfered considerably with the proper ventilation of the mine.

I feel the coal industry deserves greater consideration by scientific men than it has received in the past; and I am glad to see that such men are applying themselves to a careful study of this subject. I believe that greater care should be taken by mine managers generally in the selection of workmen in mines where gas is encountered, and coal dust is known to be a source of danger.

I recall an instance that occurred when I was employed in an entry where several stalls were turned off and the only means used to conduct the air past these stalls into my place was a brattice cloth. I found gas in my place and went out to ascertain the cause, when I discovered a man with a curtain propped up while he was loading a car. I pushed the car ahead and dropped the curtain. Going back to my place, it was not long before the condition was as bad as ever. Going out again, I found the man working as before with the curtain up. It is true he was rather cramped for room to fill the car with the curtain down, and sooner than put up with that inconvenience he was willing to run the risk, and endanger the lives of every man in the mine.

I reported this incident to the firebоss, but it did not seem to impress him as a matter of importance, and I left the mine at once. I could not leave the camp, since a washout had occurred on the railroad, and while I was waiting for transportation, the most disastrous explosion ever experienced in British Columbia occurred at No. 2 mine, Fernie, May 22, 1902. I was at Michel. The superintendent there called for volunteers to go to Fernie. With others I answered the call and worked four days in the efforts to rescue the men in that mine.

I think this and similar accidents, which are of everyday occurrence show that it is of the utmost importance in coal mining that careless workmen should be eliminated and kept away from the mines. I admit there are difficulties in accomplishing this, but claim it should be the constant effort of mine managers to secure a force of careful workmen.

AMOS GODFREY, MGR.,
B. C. Anthracite Coal, Ltd.

Vancouver, B. C., Canada.

Appointment vs. Election of Mine Inspectors

Referring to the editorial on "The Anthracite Mining Code, COAL AGE, May 10, p. 733, permit me to add that the chief objection urged against the appointive system, in the selection of mine inspectors, is that this system places in the hands of a single person, generally the governor of the state, the power to appoint any person he may choose who fills the requirements of the law in this respect. If this were true, and it is in some states, the objection would be an important one, since it would inaugurate the "spoils system," which is opposed to civil-service practice, which should always control the selection of mine inspectors. All will agree that the office of inspector of any nature, mine inspector, boiler inspector, building inspector, etc., should be entirely disassociated from the spoils system, in order that the work of the inspector may be efficient, and that he may be untrammeled as an officer of the law, in the difficult work he has to perform.

Referring to the appointment of mine inspectors, the law recommended by the majority of the anthracite-code commission (Art. 9, Sec. 1), provides that the governor shall appoint a mine inspectors' examining board, consisting of four mining engineers and five miners, whose qualifications are specified in the law. The law further specifies the time and character of the examination and the qualifications of the applicant, and requires that the successful candidate must obtain at least 90 per cent. in the examination. The law provides that at least six of the nine members of the board shall certify to the governor and also to the chief of the Department of Mines the names and percentages of the candidates who passed a successful examination.

Then follows Sec. 6, which reads:

The governor shall, from the names certified to him by the examining board, commission a person or persons having the highest percentage in the examination, to be inspector for each district where a vacancy exists.

The advocates of this provision of the law claim that, since the governor must appoint the candidate or candidates receiving the highest percentage in the examination, he is not free to appoint the man of his choice. It must be remembered, however, that, in accordance with Sec. 1, the governor appoints also the examining board, which lays the law open to the previous criticism, giving the governor the supreme power that is always objectionable. To avoid this difficulty, the district court should be made to appoint the examining board, while the governor is authorized to appoint, as inspectors, and commission those candidates receiving the highest percentages in the examination.

A READER.

Pittsburgh, Penn.

Study Course in Coal Mining

BY J. T. BEARD

The Coal Age Pocket Book

MECHANICS

Mechanics is that branch of science which treats of the action of force on matter.

Force—Force is an indescribable agency that acts on matter and changes or tends to change its condition or state with respect to rest or motion.

Statics, Dynamics—There are two general divisions of the subject, which may be defined as follows: 1. Statics includes all cases in which force acts on a rigid body and no motion results. 2. Dynamics relates to the action of force on bodies free to move and motion is produced.

Measure of Force—A force is measured in either one of two ways, according to the conditions under which it acts or the results produced. In statics, the action of the force produces pressure only, and this pressure is the measure of the force expressed in ounces, pounds, hundredweight, or tons.

In dynamics, the unit of measure is a force capable of producing a unit velocity in a unit of mass. The moving force, in any given case, therefore, is expressed by the product of the mass (m) of the body and the velocity (v) produced. This moving force is sometimes regarded as imparted to the body when it is called the "momentum" of the body.

Gravity—The force of gravity is the most universal force in its manifestation and, for this reason, its effect is made the basis for the measurement of all forces both in statics and dynamics. Gravity is the attraction that every particle of the mass of the earth exerts on each particle of the mass of a body. This attraction is greatest at the surface of the earth and decreases above or below sea level.

Weight—The action of gravity on bodies produces weight. The generally accepted unit of weight is the pound. Since gravity acts equally on each particle of the mass of a body, the weight (W) of the body is proportional to its mass (m) and the force of gravity (g), as expressed by the formula

$$W = mg$$

The pound is the static unit of measure. It is the amount of the force of gravitation that acts on a certain prescribed mass, at sea level.

Mass—The mass of a body is expressed by the quotient obtained by dividing its weight, in pounds, by the value of the force of gravity at sea level, as expressed by the formula

$$m = \frac{W}{g}$$

Value of Gravity—The value of gravity is determined by the gain, each second, in the velocity of a body falling in a vacuum. This value varies with the latitude of the place and the elevation, and is expressed in feet per second. It has been carefully determined by a number of experiments.

The Coal Age Pocket Book

Theoretical Velocity—When a body falls freely in a vacuum there is no resistance to its fall; and the force of gravity (considered as constant for the distance of fall) acts on each unit of the mass of the body to increase the velocity of its fall. At sea level, New York, lat. 40°, the force of gravity produces an increase in the velocity of a body falling in a vacuum, of 32.16 ft. each second. This is called the "theoretical velocity" of a falling body; because, in practice, the resistance of the air is always present and reduces the gain or increase per second.

Body Falling from Rest, in a Vacuum—If the body falls from rest, in a vacuum, its velocity is zero at the beginning of fall and 32.16 ft. per sec., at end of 1 sec. The average velocity for the first second is therefore ½ (32.16) = 16.08 ft.; and the distance of fall in the first second is also 16.08 ft.

For two seconds, the gain in velocity is 2 × 32.16 = 64.32 ft. Falling from rest, the velocity at end of 2 sec. is 64.32 ft. per sec. The average velocity for the 2 sec. is ½ (64.32) = 32.16 ft. per sec.; and the distance of fall for two seconds is therefore 2 × 32.16 = 64.32 ft.

For three seconds, falling from rest:

Gain in velocity	= 3 × 32.16	= 96.48 ft. per sec.
Velocity at end of 3 sec.	= 0 + 96.48	= 96.48 ft. per sec.
Average velocity for 3 sec.	= ½ (96.48)	= 48.24 ft. per sec.
Distance of fall in 3 sec.	= 3 × 48.24	= 144.72 ft.

In like manner, for a body falling from rest, in a vacuum, the total gain in velocity is the final velocity at end of fall; the average velocity is one-half the final velocity; and the distance of fall is the average velocity multiplied by the number of seconds of fall; thus,

Time of Fall, in Seconds	Gain in Velocity Each Sec.	Total Gain or Final Velocity	Average Velocity in Ft. per Sec.	Distance of Fall, in Feet
0	.....	.....	.....	.....
1	32.16	32.16	16.08	16.08
2	32.16	64.32	32.16	64.32
3	32.16	96.48	48.24	144.72
4	32.16	128.64	64.32	257.28
5	32.16	160.80	80.40	402.00
10	32.16	321.60	160.80	1608.00

Formulas for Theoretical Velocity—The formulas expressing the final velocity (v), of a body falling from rest, in a vacuum, under the influence of gravity (g = 32.16 ft. per sec.); and the height of fall (h); for a number of seconds (t) are as follows:

Final velocity, $v = gt$ (1)

Average velocity, $\frac{v}{2} = \frac{gt}{2}$ (2)

Height of fall, $h = \frac{gt}{2} \times t = \frac{gt^2}{2}$ (3)

Time of fall, $t = \sqrt{\frac{2h}{g}}$ (4)

INQUIRIES OF GENERAL INTEREST

Removing Gas by Boreholes

A difference of opinion existing, we desire to submit the following question relating to the drainage of gas accumulated in abandoned workings that have been sealed off with air-tight stoppings:

The surface is of a hilly nature; a 6-in. borehole 900 ft. in depth has been drilled from the surface to tap a body of pure marsh gas accumulated in an abandoned section of a mine. The gas is dormant, by which is meant there are no feeders producing a fresh supply of gas. The abandoned section is entirely isolated from any other part of the mine and does not get any air from the mine workings. Owing to the depth of the workings below the surface, the difference between the atmospheric pressure at the surface and that in the mine is 1 in.; or, say the pressure on the surface is 23 in. of mercury when the pressure at the bottom of the shaft is 24 in. Will this borehole remove the accumulation of gas in the abandoned area under these conditions? The only vent is through the drillhole to the surface.

JAMES W. GRAHAM,
Deputy Mine Inspector.

Lafayette, Colo.

The question states that the place is sealed off with air-tight stoppings, and the only vent is through the drillhole to the surface. Therefore, no air can enter or leave this section except through the drillhole.

There are two conditions that would give rise to a slight or gradual interchange of the gas below and the atmospheric air at the surface: (1) The atmospheric air is generally cooler and therefore heavier than the mine atmosphere. (2) The "pure marsh gas" (CH_4), being much lighter than air, will tend to rise as fast as it is replaced by the heavier air at the surface.

The interchange of the gas below and the air at the surface will be very gradual at the best, owing to the great depth of the hole. There would probably be no perceptible current, either up or down, in the drillhole. The conditions named, however, would operate slowly to change the gaseous condition in the abandoned section, but the change would be too slow to be of any practical benefit in draining off the gas.

In order to drain the gas from the abandoned section, in this case, it would be advisable to insert a pipe provided with a stop-cock, in one of the sealed stoppings. Observations should be taken, from time to time, to ascertain any movement of air or gas through this pipe. If the blowing system of ventilation is used in the mine, the mine air will always escape through the pipe into the abandoned section and drive out the gas, which would then pass up through the drillhole to the surface. If, on the other hand, the exhaust system of ventilation is employed, the gas accumulated in the abandoned section will be forced by the pressure of the atmosphere exerted through the drillhole, into the mine workings whenever the stop-cock is open in the pipe.

Hoisting from Two Seams

What kind of an engine must we install to hoist coal from two veins in the same shaft? The first vein is 70 ft. below the surface and the second vein is 105 ft. lower, making the total depth of the shaft 175 ft. Should we use a friction clutch on the drum, or should the drum be keyed to the shaft?

ENGINEER.

Calvert, Texas.

For this depth of shaft (175 ft.), a geared engine, sometimes called a second-motion engine, should be used. In deep shafts, say where the depth exceeds 75 or 80 yds., a higher speed of winding must generally be used; and for that purpose a direct-connected or first-motion engine is generally preferred. In shallow shafts, the geared engine gives a better control of the hoisting operations and permits a heavier load being hoisted.

In order to hoist from two separate seams, a double drum must be used, one portion of which is movable on the shaft and supplied with a friction clutch by which it can be made fast to the other drum or to the drum shaft. This arrangement will permit the relative position of the cages in the shaft to be changed when it is desired to hoist from another seam.

For example, suppose it is desired to stop hoisting from the lower seam and start to hoist from the upper seam. When hoisting from the lower seam, one of the cages is at the landing in that seam when the other cage is at the tipple landing. Now, to change the relative position of these cages, it is only necessary to apply the brake firmly to the movable drum, thus securing the cage at the upper landing, and, having loosened the friction clutch holding that drum to the drum shaft, hoist the other cage to the landing at the upper seam, and again apply the friction clutch. The cages are now in position to hoist from the upper seam.

Percentage of Gas in Air Splits

If an air current containing 9.5 per cent. of gas and measuring 30,000 cu.ft. of air per minute, is divided at the regulator so that one split passes 10,000 cu.ft. per min., and the other split 20,000 cu.ft. per min., what percentage of gas is there in each of these splits, and what quantity of gas is passing in each split per minute?

STEPHEN STRANCH.

Helen, Penn.

Assuming the gas is evenly distributed in the air current, it will be divided in the same proportion in which the air is divided and there will be the same percentage of gas (9.5 per cent.), in each of the splits, as was found in the main air current before it was divided.

The quantity of gas in the first split is $0.095 \times 10{,}000 = 950$ cu.ft. per min.

The quantity of gas in the second split is $0.095 \times 20{,}000 = 1900$ cu.ft. per min.

EXAMINATION QUESTIONS

Bituminous Firebosses' Examination in Pennsylvania, May 8, 1913

Ques.—On entering a mine as fireboss, how would you discharge your duties as such, and what information should you obtain before beginning the examination in the mine?

Ans.—Assuming that the fireboss has properly cleaned, filled, trimmed and tested his lamp before entering the mine, his first duty is to proceed at once to the main intake airway in order to ascertain whether the usual amount of air is passing into the mine. Before entering the mine, the fireboss should always ascertain that the fan is running at the usual speed and that the proper danger signals are set at the mine entrance to prevent anyone from entering the mine while he is making his examination. The fireboss then proceeds to the intake of the section of the mine in his charge and examines, in regular order, the working places in that section.

Ques.—What are the legal duties of a fireboss? State briefly.

Ans.—The bituminous mine law of Pennsylvania requires the fireboss to examine carefully, within three hours before the appointed time for the men to enter the mine, every working place without exception; all places adjacent to live workings; every roadway and every unfenced road leading to abandoned workings and falls in the mine; and to examine for all dangers in all portions of the mine in his charge; and to mark the date at the face and side of every place examined, as evidence that he has performed this duty. He must examine the entrance or entrances to all worked out and abandoned portions adjacent to the roadways and working places, where explosive gas is liable to accumulate; and place a danger signal across the entrance to every place where explosive gas is discovered or danger is found to exist. In making his examination, he must use no other light than that of an approved safety lamp. It is the duty of the fireboss to explain all danger signals to the non-English-speaking employees of the mine, through an interpreter, in their own language.

The law requires the fireboss to enter in a book kept at the mine for that purpose, a record of his examination, in ink, and sign the same immediately after the examination is made. This record must show the time taken in making the examination and state the nature and location of any danger found, which danger must be then immediately reported to the mine foreman. He must notify the mine foreman, or assistant mine foreman, by telephone, or otherwise, that the mine is in safe condition for the men to enter. Where the record book is kept at a station in the mine, the fireboss must also sign the report made in the book kept in the office on the surface. The law requires that a second examination shall be made by the same or other firebosses during the hours when the men are at work. The mine foreman and the fireboss must provide a permanent station with a proper danger signal designated by suitable letters and colors, at or near the main entrance or entrances to the mine.

Ques.—Give six essential features of a safety lamp for testing purposes.

Ans.—A good lamp for the purpose of testing for gas and examining the mine for other dangers must not only be (1) simple in construction and sensitive to gas, but must be (2) capable of giving a good light when required. In order that the lamp shall be sensitive to gas, (3) the air should enter the lamp at a point below the flame and circulate upward through the combustion chamber. The lamp should be (4) provided with a double-gauze chimney that will permit of a free circulation of the air in the lamp while, at the same time, giving the needed protection in the upper part of the lamp. The lamp should be (5) provided with a suitable bonnet or shield, such as to protect the lamp against strong air currents or blasts of air, without unduly restricting the circulation in the lamp. The oil burned in the lamp should be such as (6) to give a constant flame that does not incrust the wick or cause the lamp to heat rapidly in gas. A pure sperm, or cottonseed oil, is better adapted for testing than a volatile oil, because the latter volatilizes more rapidly as the lamp heats in gas and gives unreliable results in testing.

Ques.—Who should be intrusted with a safety lamp, and when and where should you use safety lamps in bituminous coal mines?

Ans.—A safety lamp should only be intrusted to a competent person—one who has shown that he understands its use and can be relied on to exercise proper judgment and discretion in its handling and use. A safety lamp is never safe except when properly handled by a competent person.

Safety lamps should be used exclusively, in mines generating gas in sufficient quantity to be detected on the flame of a common Davy lamp, or where the condition at the working face, with respect to the generation of gas and the circulation of air, is such that gas can be readily fired at the roof or at the immediate face of the coal. In the present status of coal mining operations, it is not safe to work, with open lights, such places where the lamps must be kept at a safe distance below the roof and away from the face of the coal. The only exception to this rule may be at the anthracite mines, where coal dust is not as dangerous a factor in the production of an explosion.

It is not safe to work any bituminous coal mine with mixed lights, since any unforeseen occurrence in the safety-lamp section, such as a fall of roof or a slight derangement of the ventilating system, may precipitate a dangerous condition in the open-light section of the mine.

Ques.—Where should safety lamps be filled and trimmed before being given to the workmen?

Ans.—All safety lamps should be properly cleaned, examined, filled and trimmed in the lamp house before they are delivered to workmen.

COAL AND COKE NEWS

Washington, D. C.

T. P. MacDonald has filed with the Senate Committee on Territories a recommendation for dealing with the coal situation in Alaska which embodies the following suggested propositions:

First. Limit the ownership or control of any coal company to 4 or 6 sq.mi., or such acreage as may be deemed sufficient.

Second. Fix adequate penalties to prevent combinations to control output or prices.

Third. Empower the Interstate Commerce Commission or some other competent court to make thorough investigation and fix minimum and maximum prices upon a proper showing by either a coal producer or a coal consumer and thus prevent the crushing of independent operators by their more powerful rivals on the one hand or the charging of extortionate prices on the other.

Fourth. Fix a permanent tax of a few cents per ton to be paid into a territorial fund to defray the expenses of proper supervision of mining methods under laws to be enacted by the territorial legislature, to protect the lives and health of the miners, and to provide a laborers' compensation fund.

Such a law would preserve the principles necessary to secure competition, a wide distribution of ownership, and enable the operator of moderate means to finance his enterprise, and provide for the welfare of the miners.

Fifth. The coal-land law of May 28, 1908, was intended to restrict the amount of coal land any company might own or control and to prevent monopoly, but that law is only applicable to such lands as were located prior to the withdrawal. That act has been nullified to all intents and purposes by construction and such drastic rulings by the Land Department that no titles can be issued under it.

Opinion on an Alaskan Railway

Falcom Joslin, of Fairbanks, Alaska, in discussing before the committee the question whether a government line should be built in Alaska for the purpose of opening up the country and developing coal mining, said:

I think the coal fields should be opened without a moment's delay. Then I believe there is no better way of getting these trunk lines built than the way proposed in the bill. You might provide that the government shall guarantee 75 per cent. of the cost of those lines by guaranteeing the bonds of a company to build them, the company to supply 25 per cent. of the cost, as was done in the western half of the Canadian line.

This is a good system. It results in the economy of private enterprise both in construction and in operation; but if the government guaranteed 75 per cent. of the cost of the lines, I would certainly put in the contract that the government should have at least 50 per cent. of the net earnings when those roads become profitable. I cannot see any reason in the world why, if the government guarantees the cost of the lines, or 75 per cent. of the cost of the lines, the government should not have a percentage of the net earnings, exactly as a banker would require for supplying the money to build them on a straight business proposition.

If I sought the money to build that line across from Seward or Cordova from a banker in New York, and he supplied the money secured by bonds to build the line, he would unquestionably require at least half of the equity or half of the stock of such company. I cannot see why, if the government is going to do such a thing, it should not have an equal privilege.

Instead of giving the government stock for its interest the government would retain a certain percentage of the net earnings when there are net earnings. As these roads could not become profitable for five, or maybe ten, years after they are built, the government would be obliged probably to pay the interest on the cost of the lines for that period. Whatever they paid on such a guarantee should be added to the cost of the roads, as the Canadians do, after seven years.

Trouble with the Coal Roads

Further progress has been made by the Department of Justice with reference to the plan for the prosecution of the coal roads along new lines as was announced by Attorney-General McReynolds some time ago. It has not, however, been positively indicated precisely how the plan will be put into effect nor does it appear that details have been fully worked out in the department.

What is evident is that the work done under the Taft administration is not considered final or conclusive. It is intended to go further and get some more effective application of the commodities clause than has yet been considered feasible. It is probable that a suit will be started against some one road rather than against several at the same time in order to make a test of the method that has been developed by Mr. McReynolds.

According to apparently trustworthy information, legislation regarding the price of coal or legislation intended to affect that price directly is not likely to be attempted during this session of Congress, but there is a disposition to await the experience of the coming fall before acting definitely upon any proposition, however limited or ineffective it may be. Neither does it appear as yet that any very good prospect exists for the adoption of an extended form of the Erdman Act intended to apply to controversies involving the transportation of coal in interstate trade.

PENNSYLVANIA

Anthracite

Hazleton—As the result of a recent decision rendered by Charles P. Neill, commissioner of labor, who has been umpire on questions submitted to him by the Conciliation Board, $500,000 in back pay will be awarded the anthracite miners who have won a victory in three or four cases

Pottsville—Five-hundred employees of the Oak Hill Colliery at Duncott, are on trike in support of eleven firemen who have struck because their demands were flatly refused by Superintendent Jeffreys.

Plymouth—Of the 49 candidates who took the mine foremen's examination in the Ninth Anthracite District, held in Plymouth, four passed successfully for mine foremen's certificates, and 14 for assistant foremen's certificates.

Bituminous

Masontown—The explosion of 500 sticks of dynamite in the magazine of the Sunshine Coal & Coke Co.'s mine No. 1, three miles from Masontown, May 10, virtually wiped out the little mining settlement, killing three men and injuring forty more. The cause of the explosion is unknown.

Monongahela—The coroner's jury which has been hearing the testimony regarding the cause of the death of 96 men in the Cincinnati mine of the Monongahela River Consolidated Coal & Coke Co., Apr. 23, has returned their verdict placing legal responsibility for the disaster upon the mine foreman, and the moral responsibility upon the mining laws of the state. Throughout the verdict blames ineffective and defective laws for the disaster, and recommends to the coal company that it operate the Cincinnati mine hereafter with safety lamps and that no machinery be used which will cause sparks. The legislature is asked to pass remedial statutes.

Uniontown—The boiler house at the Colonial No. 4 mine of the H. C. Frick Coke Co., was destroyed by fire May 10. The loss is estimated at $15,000, and 350 men will be thrown out of employment for a week. Four boilers of the structure were damaged beyond repair, and it was necessary to hire traction engines from nearby farmers to keep the mine fans running. The origin of the blaze is unknown.

MARYLAND

Cumberland—Early on the morning of May 14, 1700 lb. of dynamite and 70 kegs of powder, stored in the magazine of the Consolidation Coal Co., at Eckhart, exploded, killing three men. Every house in the town was more or less seriously damaged. The shock of the explosion was felt distinctly a distance of 60 miles.

WEST VIRGINIA

Fairmont—John Hoffer, a blacksmith by occupation, claims to have invented a mine-cage safety device which will absolutely prevent an accidental drop. He states that in a short time he is going to make a demonstration of its merits by getting into a mine cage and cutting the cable when 279 ft. from the bottom of the shaft. This demonstration, Hoffer says, will be made at the shaft of the Jamison Coal Co., at its No. 7 mine, near Barracksville. The Jamison people will be the first to equip a mine cage with this invention. If this device is what Hoffer claims, a company will be formed by local business men and it will be put upon the market.

Morgantown—Delegates to the West Virginia State Mining Institute, which meets June 24 to 26, will go to Connellsville for a trip of inspection through the H. C. Frick and Oliver & Snyder Coke Works. Mining men from all over the state will attend the institute.

Charleston—Officials of the United Mine Workers of America and the Peytona Block Coal Co. have made arrangements whereby the men working in the mines will get an advance of 7c. per ton for mining coal. This company has plenty of orders and needs 35 families at once to do work in the mines. The same arrangements have been made with the Hickory Ash Coal Co.

After more than a week of strenuous debate the Senate has referred to the education and labor committee, Senator Kern's resolution for a federal investigation of the conditions in the West Virginia coal fields. It is understood that the committee will report favorably within a few days and that the senate will adopt it.

It is understood that charges of peonage and oppression of workers in the Paint and Cabin Creek coal fields in West Virginia have been laid before Senator Kern by representatives of the State Federation of Labor and Miners Union.

OHIO

Belle Valley—The bodies of fifteen miners who lost their lives, May 17, in an explosion of firedamp at the Imperial mine have been brought to the surface by rescuers. An investigation into the cause of the explosion was begun, May 19, by officials of the State Mining Department. The Imperial mine is owned by the O'Gara Mining Co., composed principally of Cleveland stockholders.

Dilles Bottom—Three-hundred miners employed by the Rail & River Coal Co., have gone on strike, asserting that they were not getting their full weight. They claim that the screens used by the company are fitted with meshes which are too large.

Columbus—Considerable discussion is heard among coal men of the action of the Hocking Valley Ry. Co. officials in selling three thousand 30-ton coal cars to a Northwestern railroad and only securing 500 of the 60-ton cars to replace the equipment so sold. It is believed the curtailment of the railroad equipment will work a hardship on the coal trade in the summer and fall.

KENTUCKY

Louisville—One of the most interesting and practical first-aid devices seen at the first-aid meet held under the auspices of the Kentucky Mining Institute at Lexington, Ky., on May 16 and 17, was the first-aid box used by the team representing the St. Bernard Coal Mining Co., whose general offices and mines are located at Earlington, Ky. The box itself contains bandages for every possible injury, from the finger to the head and the various parts of the body, as well as safety-pins, scissors, antiseptics, aromatic spirits, distilled water, and the like. Besides the box, however, the outfit consists of adjustable splints, which can be used in the shorter lengths or bolted together for the purpose of serving in case of compound fractures. A take-down stretcher frame is also included, consisting of four sections of pipe which screw together, forming the sides, with two wooden cross pieces which complete the framework.

Spottsville—The work of pumping the water from the coal mines on Green River, which were filled during the recent flood, will start in a few days. About one-half of the men who worked at the mines previous to the flood have left the town, fearing that the mine owners could not resume work.

INDIANA

Brazil—During a severe electric storm, May 15, a coal mine belonging to Geo. Wiederoder, was struck by lightning and the tipple and sawmill near-by were burned. The total loss was $1500.

Wheatland—The mines in this vicinity are temporarily shut down because of the recent high waters.

ILLINOIS

East St. Louis—Indictments against the Vandalia, the Big Four, and the Grand Trunk Ry. of Canada and the O'Gara Coal Co., of Chicago, were returned by the United States Grand Jury for the eastern division of Illinois, is session in this city.

The five indictments include 71 counts. In the last indictments the four corporations are named as defendents, charged with conspiracy, and the maximum fine is $10,000 each on seven counts, and no minimum is named. On the remaining sixty-four counts, the maximum is $20,000 on each count, with a minimum of $1000.

MONTANA

Butte—The one hundred and fifth meeting of the American Institute of Mining Engineers will be held at Butte, Mont., from Aug. 18 to Aug. 21, 1913. Tours have been carefully arranged for members of the Institute.

UTAH

Salt Lake City—The semi-annual convention of the Rocky Mountain Coal Mining Institute will be held in Salt Lake City, June 11-13. Excursions will be made to the celebrated copper mines at Bingham. The meetings will be held in Barratt Hall and will be open to the public. It is expected that 500 delegates will be present.

FOREIGN NEWS

Benthen, Germany—The strike of 60,000 coal miners in this district which began Apr. 21, has been called off by the Men's Trade Union, owing to the apparent hopelessness of attaining success. The employers have refused to grant the concessions which were demanded.

PERSONALS

John Gibson, formerly superintendent of the Boswell mine of the United Coal Co., has been appointed general superintendent of a mine of that company.

William Warner, for some years secretary-treasurer of the Pittsburgh District Mine Workers organization, has recently been appointed superintendent of the mines of the United Coal Co., at Thayer, W. Va.

William H. Weller, secretary and treasurer of the Munro-Warrior Coal & Coke Co., has resigned his position with that company, effective June 1. Mr. Weller has held the above mentioned position for several years.

Governor Major, of Missouri, has appointed J. P. Hawkins, of Kennett, secretary of the State Bureau of Mines and Mining, to succeed George Bartholemeus, whose term has expired. The appointment is for a period of four years, at a salary of $1800.

George Watkin Evans, consulting coal-mining engineer, of Seattle, has been selected to make an examination as to the commercial possibilities of the Matanuska coal field of Alaska, for the United States Bureau of Mines. Mr. Evans left Seattle on a preliminary trip May 18.

Word has been received of the selection of U. S. Morris, formerly commercial agent for the Clinchfield Coal Corporation, as vice-president and general manager of the Superior Colliery Co., which operates mines in the Jackson field. The general offices of the concern have been removed rfom Wellston, Ohio, to 418 Hammond Bldg, Detroit. The operating offices are still located at Wellston.

NEW PUBLICATIONS

Department of the Interior—Bureau of Mines, Bulletin 62, "National Mine Rescue and First Aid Conference, Pittsburgh, Penn., Sept. 23 to 26, 1912," by Herbert N. Wilson, 74 pages.

University of Illinois—Bulletin No. 64, "Test of Reinforced Concrete Buildings under Load," by Arthur N. Talbot, and Willis A. Slater, 104 pages, 6x9 in., with 75 diagrams, figures and illustrations.

Department of the Interior—Bureau of Mines, technical paper 38, "Waste in the Production and Utiliaztion of Natural Gas and Means for their Prevention," by Ralph Arnold and Frederick G. Clapp, 29 pages.

Department of the Interior—Bureau of Mines, "Monthly statements of coal-mining accidents in the United States for January and February, 1912," compiled by Frederick W. Horton, contains 12 pages and numerous tables.

Department of the Interior—Bureau of Mines, Bulletin 55, "The Commercial Trend of the Producer Gas Power Plant in the United States," by R. H. Fernald, 92 pages, with numerous tables and diagrams and an insert map of the United States, showing a distribution of gas-producer power plants using anthracite, bituminous and lignite fuel.

CONSTRUCTION NEWS

Sheboygan, Wis.—The C. Reiss Coal Co. will complete its new coal dock with a capacity of 250,000 tons at Green Bay before the end of the year.

Wilkes-Barre, Penn.—Bore holes are being drilled on North River St., for the foundations for the new $100,000 office building for the Lehigh Valley Coal Co.

Whitesburg, Ky.—The Lexington & Eastern is to build a branch line up Rockhouse Creek and into Knott County. It is planned to open up rich coal and timber districts.

Huntington, W. Va.—A new extension of the Baltimore & Ohio R.R., running 28 miles from Huntington, W. Va., up the left fork of Beaver Creek, is soon to tap the eastern Kentucky coal fields.

Windber, Penn.—Extensive improvements have been made by Lochrie Brothers Coal Co. at their Argentine, Butler County, plant. The daily output has been increased nearly 150 tons, and the capacity now reaches about 600 tons.

Coshocton, Ohio—Active development of the holdings of the Ohio Cannel Coal Co. in Bedford Township between Warsaw and Tunnel Hill is to be started within the next few weeks. A contract for the building of a tipple with a capacity for 5000 tons daily has been let.

Martins Ferry, Ohio—The Big Five Coal Co. has under construction eight new houses for the use of its men, employed in its Stewartsville mine. The capacity of this mine is about 1200 tons a day, and this tonnage is increasing steadily as the supply of cars is augmented.

Racine, Wis.—The Bauman & Murphy Coal Co. has decided to equip its coal-hoisting machinery with modern clamshell grabs, which will be put in operation within a week. This type of equipment lessens the time required to unload a coal barge, and reduces the number of men needed in the work.

Johnstown, Penn.—The Cambria Steel Co. has awarded contracts for 28 byproduct coke ovens, to be located at its works near Johnstown. The company proposes ultimately to increase the plant to 500 ovens, and will replace the present ovens with new ones of the byproducts type. Work on the new plant has already been commenced.

Knoxville, Iowa—Actual work of developing the New Ramsey coal shaft has been in progress since May 5, and at the present time the excavators are working in blue shale at a depth of 41 ft. The steam-hoisting apparatus is being put in place and will be in working order in a short time. The coal lies at a depth of 161 ft. and is 6 ft. 5 in. thick.

Youngstown, Ohio—Actual construction work has begun on the first ovens of the byproduct coke plant of the Republic Iron & Steel Co., at Youngstown, and it is hoped to have them completed and in operation by the end of the year. The plant will be of the Koppers' type, and is the first installation of this kind for the Republic company.

Milwaukee, Wis.—A $100,000 steel derrick is to be constructed by the Milwaukee Western Fuel Co. at 16th and Canal Sts. The derrick will form a span of 300 ft. and will be a twin to the coal hoist which was destroyed two years ago by the McNamara dynamiters. It will be equipped with clamshell grab, capable of carrying five tons of coal to each load.

Lebanon, Penn.—The Philadelphia & Reading Coal & Iron Co. has recently awarded a large contract for stripping a large tract of virgin anthracite at a point between St. Clair and Wadesville. The coal will be prepared for the market at the Wadesville breaker. The largest steam shovel employed in the anthracite region will be used in the stripping work.

Clarksburg, W. Va.—A new mine is being opened on the Stout Farm by the Francois Coal & Coke Co. It will be one of the largest and most modern plants in this region. Two of the four openings have already been made as far as the coal. The remaining two will be started at once. The work of constructing the tipple and power house will begin at an early date.

Indianapolis, Ind.—The Indianapolis Mortar & Fuel Co. is planning to enlarge its yardage and equipment and install modern coal-handling equipment. It has issued $50,000 in bonds, the money from which will pay for elevated coal pockets and apparatus for dumping cars and for dumping direct from the bins into wagons. A. E. Bradshaw is president of the company.

Whitesburg, Ky.—It is rumored from Wise County, Va., that the Wise Terminal R.R. is to be extended into the coal and Timber fields of Dickinson County, and that a right-of-way is now being secured. It is said that the road will make a connection with the Carolina, Clinchfield & Ohio, which is now constructing a branch to Elkhorn City. The work of construction will begin within the next two months.

Grafton, W. Va.—It is rumored that the Wionna Coal & Coke Co. intends to erect 16 new two-story residences at Coffman, and that the contracts will be let in a few days. During the early work at Coffman, about 25 houses were built along the hill east of the coal plant, and a few years ago several houses were built below the railroad west of the plant. The new buildings will be built north of the railroad, just west of the present location of the tipple and power house, and will be of frame construction.

Punxsutawney, Penn.—The Lindsey Coal Mining Co., which is opening a new operation at Ross Run, has awarded a contract to Patrick E. McGovern for the construction of a spur at a point three miles below this place to the new mine. The railroad track is to be completed during July, and the company expects to begin shipping coal before Aug. 1. It is estimated that the output will be between 500 and 600 tons a day when the mine is running full, and between 100 and 125 men will be employed. The new mine will be known as the Lindsey No. 8.

Pittsburgh, Penn.—More than 1000 new merchant coke ovens are being built by small independent companies in this region. Among them is the plant of the Poland Coke Co., which recently began to ship coke from its ovens at Dunkard Creek, Green County. This company is building 100 ovens. The Reliance Coal & Coke Co. is building 400 ovens at Denbo, Fayette County, and other small companies have 500 additional ovens under way. The majority of the new operations are located in Green County, which is rapidly developing as a coking center.

Pittsburgh, Penn.—Half a dozen working camps have already been established on the Montour R.R., which will extend from Homestead to North Star, where connections will be made with the old Montour R.R., a branch of the Pittsburgh & Lake Erie. A bridge to cross the Chartiers Creek near the Bell Tunnel is under way, and it is expected that the road will be completed in about 18 months. The road is owned by the Pittsburgh Coal Co. and will be used mainly as a coal and coke road. Passenger trains will be run, however, to meet the requirements of the State Railroad Commission.

NEW INCORPORATIONS

Little Rock, Ark.—The Sterling Anthracite Coal Co., of Clarksville; capital stock, $50,000. Sam Laser, president.

Chicago, Ill.—The Pilsen Coal Co.; capital stock, $10,000. Incorporators: G. H. Ruble, M. A. Bitullo, B. B. Collins.

McAlester, Okla.—The Pascoe Coal Co.; capital stock, $2000. Incorporators, W. M. Pascoe, S. Pascoe and August Bernhardt.

Dover, Del.—The American Mining & Power Co., Inc.; capital stock, $6,000,000. Incorporators: W. B. Jones and M. M. Mays.

Covington, Ky.—The Consumers Coal & Supply Co.; capital stock, $50,000. Incorporators: Louis Fritz, S. D. Rouse and D. C. Lee.

Hazard, Ky.—The Northfork Coal Co.; capital stock, $10,000. Incorporators: C. G. Bowman, E. L. Speaks, D. G. Speaks and J. W. Speaks.

Clinton, Ind.—The West Clinton Coal Co.; capital stock, $150,000; to mine coal and other minerals, and sell the same. Directors: J. Shirkie, S. Shirkie, F. P. Hancock.

Knoxville, Tenn.—The Catrons Creek Coal Co.; capital stock, $40,000. Incorporators: J. K. Grillin, L. M. G. Baker, C. H. Baker, G. H. Gallagher and B. A. Morton.

Evansville, Ind.—The Warrick Coal Mining Co.; capital stock, $5,000,000; mining. Directors: Robert R. Hammond, L. E. Fischer, H. C. Hays, W. H. Hays and A. C. Owens.

Huntington, W. Va.—The Blackburn-Thacker Coal Co.; capital stock, $100,000; coal development. Incorporators: J. C. Miller, J. E. Biscoe, F. W. Riggs, G. F. Wallace and M. E. Brown.

Birmingham, Ala.—The Fuel Economy Co.; capital stock, $25,000; headquarters, Birmingham. W. L. Rosamond, president; C. R. Waid, vice-president; W. L. Kirkland, secretary and treasurer.

Williamson, W. Va.—The Tug Valley Coal & Land Co.; capital stock, $500,000; real estate and mineral developments. Incorporators: B. C. Goings, A. Goings, W. Bronson, S. D. Stokes and F. Meeks.

Charleston, W. Va.—The Buffalo Creek Coal & Coke Co., of Atlanta, Ga., has been admitted to do business in West Virginia and hold property in that state. The company is capitalized at $800,000.

Kingwood, W. Va.—The Cleveland-Kingwood Coal & Coke Co.; capital stock, $250,000; to develop coal lands in Preston County, W. Va. Incorporators: John Orgill, S. M. Brady, Carl Huett, T. A. Fleming and W. B. White.

INDUSTRIAL NEWS

Galesburg, Ill.—A contract for 24,000 tons of soft coal has been landed by the Spoon River Coal Co. The coal will be used in federal service.

Poteet, Tex.—The Poteet Sand & Coal Co. has recently struck a new seam of very fine coal. The discovery is said to be 6 ft. 6 in. thick.

Pittsburgh, Penn.—The Cambria Steel Co. has recently purchased the Robert H. Love tract of 324 acres of coal land in Loyalhanna Township for $50,000.

Washington, Penn.—Sixty-three acres of coal land in Snowden Township, have been sold by H. J. Davis to Chas. Braznell, of Pittsburgh, at a price of $700 an acre.

Shenandoah, Penn.—The Locust Mountain Coal Co., which is opening a new colliery at Raven Run, has received two new locomotives and a number of mine cars to start work at their new operations.

Greensburg, Penn.—The Greensburg Coal Co. has placed a contract with William B Scaife & Sons Co., Pittsburgh, Penn., for a structural steel headframe, together with a number of plate steel bins.

Montreal, Can.—The Montreal office of the Sullivan Machinery Co., hitherto located at 403 Lagauchetiere St., West, is now situated at Room 806, Shaughnessy Bldg., corner St. Paul and McGill Sts.

North Sydney, N. S.—During 1912, the Nova Scotia Steel & Coal Co. mined 841,000 tons of coal. Of this amount 256,000 tons were used by the company itself. A new seam of high quality coal has been discovered and 1500 more men will be employed to work it.

Leslie, Ark.—A 14-in. seam has been discovered in this vicinity, and it is claimed that the surface is underlaid for miles around by a solid bed of coal. A company has been organized, known as the Red River Coal & Mining Co., with a capital stock of $100,000.

Toledo, Ohio—Nine-day tests of three qualities of coal to determine which variety is most suitable for locomotives, are being conducted by the Toledo & Ohio Central and the Lake Erie & Western. The same engine crews are retained without layoffs as long as the tests continue.

Columbus, Ohio—E. W. Clark & Co. have leased about 90,000 acres of land which they owned in West Virginia, to the Huntington Development & Gas Co. It is said that a bond issue of about $2,000,000 will be made for the purpose of developing the lands and putting in pipe lines for the transmission of gas.

Montgomery, Ala.—The Blount Mountain Coal & Lime Co. will, it is reported, develop mineral lands owned by them in Blount, St. Clare and Jefferson Counties, Alabama. The company is capitalized at $2,000,000. J. C. McGinnis is general manager and Carl F. Wittichen assistant general manager.

Pittsburgh, Penn.—When the Rice's Landing Coal & Coke Co. has taken out its charter of incorporation, it will take over the Dillworth Coal Co.'s plant, which went into bankruptcy about 18 months ago. This plant is located near Brownsville, on the Monongahela River, and its mine and shipping facilities will be developed more fully.

Lexington, Ky.—During the past week 41,800 acres of Tennessee coal and timber land were sold to Messrs. J. A. Smith, Roger E. Miles and W. A. Odell, of Cleveland and New York. The consideration is said to have been $400,000. It is said that the Cleveland people are looking out for coal and timber lands in both Kentucky and Tennessee, and claim to have large sums of money to invest.

Sergent, Ky.—The H. Hardaway interests of Wise County, Va., have just transferred their 300 acres of coal and timber land holdings on Pine Creek, near the new extension of the L. & E. R.R. to the Heuser Coal Co., of Roanoke. It is said that it is the purpose of the company to start the work of development within the next few months. It is rumored that the amount of the consideration is unusually large.

Tamaqua, Penn.—The East Lehigh Colliery has recently established a record for pumping water from its mine. Several days ago a tap was made to a large body of water in an abandoned working, with the intention of pumping out the water so that the mammoth seam could be worked in the mine. Three pumps were kept continuously at work, and 1,750,000 gal. of water were hoisted out of the mines within 36 hr.

Tracy City, Tenn.—The Tennessee Consolidated Coal Co., is reported to have purchased the property of the Fren Hill Coal Co. near Fern Hill, Ky., including 600 acres of land, with the complete equipment for the operation of the mine. The output will be increased by the purchasers to 350 tons a day. The price, it is said, was in the neighborhood of $75,000. This sale was rumored some time ago, but the identity of the purchasers was not known.

Pottsville, Penn.—The Otto colliery, at Branchdale, one of the Reading's most valuable operations, recently handled a total of 703 mine cars on a single tipple at the breaker. This colliery has been in continuous operation for about 70 years. One of its main feeders is the White Ash slope, which was sunk in the year 1859, and bids fair to keep up its shipments for many years to come. The Otto colliery is one of the most modern in equipment in the anthracite region.

Shadyside, Ohio—Work is progressing rapidly at the new mine of the Geo. M. Jones Coal Co., at Wegee. Contractors, who are doing the concrete work, have been making rapid strides, and, while other mines were out of commission during the flood, either on their own account or because of scarcity of cars, work was continued in preparing this large operation. It is rumored that the concrete work is to be completed next week. Already, a number of new houses have been erected.

Pontiac, Ill.—The property of the Brady Coal Co. has been sold to Murphy, Linskey & Cashier for $4825. It is proposed to begin work immediately in overhauling the mine and to have a large force of men engaged in mining coal by next fall The mine will be equipped in accordance with all the requirements of the state mining laws so that a large force of men may be put to work. The coal is of excellent steaming quality and there has always been a ready sale for it in this vicinity.

Marquette, Mich.—The City Fuel Co., recently organized at Manistique, at a capitalization of $10,000, has taken over the coal business of the Chicago Lumber Co., leasing the warehouse, coal bins, etc., and the building known as the Ann Arbor.

The company has procured the agency for the high-grade coals that have been handled in the past by the Chicago Lumber Co. and arrangements are being made to procure the supply for the coming year.

Lisbon, Ohio—All the metal which has been used in the operation of the mining plant of the Duquesne Coal Co., at Newhouse, has been sold as junk. This includes all the iron rails, copper, brass, machinery, and everything composed of metal about the power house and mine. The Duquesne mines were abandoned by the company following the fire, which destroyed the power house several weeks ago, and the probability is that they will never again be operated. The price paid for the metal was $4000.

Fayetteville, W. Va.—It is rumored that 5361 acres of valuable coal land belonging to the Wm. Hill estate has been optioned to Chicago capitalists. The ultimate consideration is said to be in the neighborhood of $250,000. The option is for a period of 90 days, but it is expected that the Chicago men will close it before the expiration of that time. The new owners will operate the mine already under development, and will also open up other extensive mines. It is said that they now handle over 500 cars of coal per day.

Zanesville, Ohio—The Pan-American Coal Co., which is owned principally by Newark men, has taken over the properties of five large coal mines in Ohio and West Virginia. It is said that the Pan-American company will apply for a new state charter, increasing its capital stock to $500,000. It is said that the average ouput of the five or six mines will reach 8000 tons per day. The company already has contracts for furnishing coal to the Michigan Central, Père Marquette, Ann Arbor and other large railroads, besides having a large market for domestic consumption. All of the mines own and operate individual electrical equipment, and the coal is mined with the latest improved electric mining machinery.

COAL TRADE REVIEWS

GENERAL REVIEW

Business in hard coal for the current month is exceeding expectations, which were pessimistic because of the lack of snap during April. As a result there is a better feeling in the trade, but receipts continue rather small, and dealers claim they are unable to get sufficient business ahead to justify any heavy buying. However, companies are having difficulty in meeting orders on certain grades, while promises for May shipments are now difficult to obtain, and many orders for June delivery are already coming in.

In the Eastern coastwise bituminous trade the better grades are becoming steadily stronger and predictions are freely made that there will be a general shortage in these the coming fall and winter. Some large consumers are in the market, but bids for their business are scarce. Supplies in the spot market are short, due to the slow loading in Hampton Roads, and consignment coal is scarce. The labor shortage is also becoming a feature in the market. There is a better consumption, and, as a rule, a generally better tone pervades the trade, particularly on the more desirable qualities.

The Pittsburgh market continues to show increased strength with operators asking a substantial advance on new business. There are, however, rumors to the effect that this firmer tone is an artificial condition brought about by a restriction in production, so that the situation is subject to reversal should the companies open up full blast. The mines are running short of men and the car supply is a trifle tight. It is obvious that there is not sufficient coal to go around, and producers have ceased to ask for further orders. There is considerable activity in the steam grades in Ohio, due to a heavier railroad movement and an increased demand from manufacturers. The congestion at the head of the lakes has been removed, and the lake shipments are heavy. Quotations are firmer than for several months, with production steadily increasing.

A very heavy dumping, mostly on contract, occurred at Hampton Roads during the week, with the result that the congestion there has been relieved, and there is a scarcity of coal for the remaining vessels. The Southern market is weak, but would be much more so were it not for a car shortage which has had a steadying influence on the situation. This shortage of equipment seems to be general on all roads touching the coal fields, and there are no indications of any immediate improvement.

In the Middle Western market the consumers are becoming anxious to close contracts in order to protect themselves over a possible suspension in mining next April. The market remains moderately firm, particularly on the steam grades, and Eastern coals. The possibility of an acute shortage the coming fall is also a condition which is to be considered. Prices here, as in the Eastern coastwise markets, are holding unexpectedly firm.

BOSTON, MASS.

Bituminous—The market continues to improve, both on spot business and contract. Two large corporations have been in the market here this week, and there have been surprisingly few competitors for the business. Several of the larger agencies sent in regrets that they were not in a position to submit any quotations. The tonnage has not yet been awarded and it will be interesting to see to what quarter it goes. The $2.85 price for Pocahontas and New River f.o.b. Hampton Roads is firm, and there are those now who freely predict a shortage of high-grade coal next fall and winter.

Georges Creek is also in strong position. Shipments are regular and orders plentiful for that grade as well as for the better qualities from the Pennsylvania districts. Prices are hardening on all the desirable coals and the prospect is good for an even market during the summer months.

For inland shipment quotations are somewhat up from a week ago. The slower loading at Norfolk has shortened up the volume of consignment coal for sale, and there is a disposition to go slow for the present on commitments. All-rail shippers are getting coal forward rather slowly for the season, due, in part, to good business and parly to the shortage of labor in the various districts.

Anthracite receipts in May continue to be rather small, as compared with other normal years. Several of the anthracite companies have difficulty in working out the sizes the trade calls for, and the succession of miners' holidays, and all manner of interruptions to mining, have seriously cut down the supply available for New England. It is now practically impossible to secure from any of the larger companies a promise of May shipment and orders are already being set forward into June. The cool weather is creating a demand on retailers, especially for domestic coal, and with the fill-up orders that are usual in the spring there is a rather brisk trade.

Reports are that the companies shipping West have so much business in view that they will have little coal this summer and fall for delivery in this market. Tide-water New England is so largely dependent on the companies that are suitably equipped with transportation, and now that these are practically confining their output to the line and Western trade, the choice of coals is pretty well narrowed down from what it was two years ago.

Current wholesale quotations on bituminous are about as follows:

	Clearfields	Cambrias Somersets	Georges Creek	Pocahontas New River
Mines*	$1.05@1.40	$1.25@1.45	$1 67@1 77	
Philadelphia*	2 30@2.65	2 50@2.70	2.92@3.02	
New York*	2 60@2 95	2 80@3 00	3.22@3.32	
Baltimore*			2.85@2.95	
Hampton Roads*				$2.85
Providence†				$3.73@3 78
Boston†				3.78@3.90

*F.o.b. †On cars.

NEW YORK

Bituminous—The local soft-coal market continues to show a better tone. There is less coal on demurrage than is customary at this period of the year, and consumers are buying more freely because of the scare last winter. A great many of the new contracts are for much heavier tonnages, buyers frequently signing up for more than their actual requirements, in order to guarantee an adequate supply. Last year many of the operators failed to fulfill their contract obligations during the period high prices were in effect, and consumers are endeavoring to protect themselves against this contingency over the coming season; the possibility of a strike next April is also having an effect upon the situation. Quotations are becoming still stronger, but actual prices have not advanced and we continue those of last week as follows: West Virginia steam, $2.55@2.60; fair grades, Pennsylvania, $2.65@2.70; good grades of Pennsylvanias, $2.75@2.80; best Miller, Pennsylvania, $3.05@3.15; Georges Creek, $3.25@3.30.

Anthracite—The local hard-coal market is featureless. Business is continuing without any let up, but there is an entire absence of any snap to the trade. Indications are that May business will fall behind April, and, in fact, no great activity is anticipated until about the middle of August, when the demand will rapidly become insistent. The mines are working good at the present time, there being no further reports of "button strikes," and with the car supply good, the shipments are quite heavy.

Some companies report that they are ready to furnish any size in any quantity demanded, while others state that they are unable to meet requisitions for certain grades; it is clear in any event that nothing is going into storage. Rice and stove continue in the shorest supply, with pea and buckwheat the easiest. The water trade out of New York up into New England is quite heavy.

The local hard-coal market has not shown any material variation during the week, and is now quotable on approximately the following basis:

	Circular	Individual—Lehigh	Individual—Scranton
Broken	$4 60	$4.45	$4 50
Egg	4 85	4.80	4 85
Stove	4 85	4 80	4 85
Chestnut	5 10	4.95	5 00@5 10
Pea	3 50	3 30@3 35	3 35@3.50
Buckwheat	2 75	2 10@2 45	2 50@2 75
Rice	2 25	1 85@1.95	2 25
Barley	1.75	1 40@1 70	1.70

PHILADELPHIA, PENN.

Judging from the expressions heard, the current month thus far has exceeded the expectations. April did not start with the usual whirl and snap to business that characterizes that period, and rather pessimistic utterances were heard regarding business for May; now that the month is almost gone, there is a better feeling regarding June business. One large operating company states that their tidewater business already in hand is likely to carry them over during the month of June, but the business locally is not much to brag about. This is not meant to convey the idea that no coal is being sold, as there is a large tonnage moving, especially of the domestic sizes, with a fairly good demand for pea, but the dealers state that they do not seem to be able to accumulate sufficient ahead to warrant them in placing any extensive orders; one day's business almost cleans up what orders they have in hand.

This is the kind of business prevailing at present. Orders given in the morning are quite frequently filled in the afternoon, but at that, the dealers as a whole, characterize the situation as fairly satisfactory. The mines are all working full and the entire production of the prepared sizes is being absorbed. The independent operators are still on their good behavior, little or no reports of concessions being made. This is really one of the features of the market, and speaks well for prevailing conditions. Quotations of the individual producers heretofore have almost been a perfect index of trade conditions.

The bituminous market is still holding its own. The slack coal seems to be the only bad feature; outside of this, quotations are not reported as fluctuating, and in some coals, there is a better price being realized. As far as the demand is concerned, coal on cars seems to be as active as it has been, with a fair movement on contracts, although there is a host of the latter that have not been signed up as yet, for next year's business. The 10c. or 15c. advance is meeting with opposition, and with coal on the market at this much less, current requirements are being filled from spot offerings.

PITTSBURGH, PENN.

Bituminous—The local coal market continues strong, with operators continuing to ask an advance over the season prices on new business, though the standard market is still represented by the prices put out some time ago. The Pittsburgh district trade is undoubtedly stronger than the market in some of the more Western districts, and while superficially the demand is active and not easily satisfied, there is a theory in some quarters that this condition is due in considerable part to some of the larger operators having held back part of their tonnage in anticipation of better prices. If this is the case, there may not be as plain sailing as now presaged, as difficulty may occur in marketing the additional tonnages.

The advance in railroad fuel is being maintained by a number of interests, the advance being 5c. to 85c. for slack, $1.20 for mine-run and $1.30 for ¾-in. Shipments are increasing slightly from week to week. On new business the majority of operators are usually asking 5c. to 10c. over the regular prices on mine-run, ¾-in. and 1¼-in., but on the other hand the regular price of 90c. on slack is sometimes shaded 5c. We quote regular prices unchanged as follows: Slack, 90c.; nut and slack, $1.05; nut, $1.25; mine-run, $1.30; ¾-in., $1.40; 1¼ in., $1.55, per ton at mine, Pittsburgh district.

Connellsville Coke—Shading of the $2.25 asking price on prompt furnace coke has been less pronounced in the past ten days. The Bethlehem Steel Co. purchased about 15,000 tons, and paid $2.15 or $2.20 for the bulk of the tonnage, purchasing a little at $2.25. A 10c. cut is about the most to be expected now from $2.25. As to contract coke, there is more dickering. The New Jersey Zinc Co. has inquired for about 10,000 tons a month over the latter half of the year, and it is rumored in several quarters that the Pittsburgh Steel Co. has closed for its requirements against two blast furnaces now being completed and involving a possible consumption of about 25,000 tons a month. The rumor mentions 15,000 tons as having been covered, but this cannot be confirmed. While $2.50 is frequently mentioned on contract coke, no specific quotation is known to have been made on a bona fide inquiry, the $2.50 price merely representing the idea of a group of operators. We quote: Prompt furnace, $2.15@2.25; contract furnace (nominal) $2.50; prompt foundry, $2.75@3.25; contract foundry, $3@3.25 per ton at ovens.

BALTIMORE, MD.

The demand for the better grades of fuel continues good and prices remain firm. The output of most of the mines is going on contracts, and operators say that the supply for the spot market is short. In some instances, the best free steaming coal is difficult to obtain, especially Quemahoning. Some operators are not disposed to sell more than one car to spot purchasers. There is about 10c. difference in the price of spot and contract business, better grades of Georges Creek coal under contract bringing $1.60, while spot delivery is around $1.50. Georges Creek and Quemahoning coals are practically out of the spot market being contracted up for about as much as the mines are producing. Spot prices for the last-named fuels were quoted at $1.15, while contract prices ranged from $1.25 to $1.35, the same as last week. Gas coals are in good demand, and the shipments to the Lakes are heavy; there was no material change in prices for these grades during the week.

A reduction in the coal tonnage of the Baltimore & Ohio R.R. occurred in March, on account of the floods in Ohio and adjoining states. The total tonnage of the road for the month was 2,538,039 as against 3,173,168 tons for the same month of 1912.

BUFFALO, N. Y.

In spite of all sorts of discouraging conditions the bituminous market is good. There is not enough coal to go around and it appears to be growing scarcer daily. The price of slack which is usually the gage of the market, is much above what it was a year ago. Jobbers say that it went begging then at 65c. net, while it sells easily now on contract as high as 90c. The increase in the price of sizes is not so great, but there is no discount on the trade so long as slack sells at a good figure.

At the same time mine-run and three-quarter are at least 10c. higher than they were a year ago. There are also a good many shippers who are not asking for any more business at present. Especially is this true with Pittsburgh coal, which is going into the lake trade so freely and is so tied up in contracts, that shippers are pulling their salesmen off the road and letting the trade take care of itself. One reason for the strong market is that the mines are all short of men. The drain caused by so many men going home to the Turkish war has not been made up yet and it is not going to be right away. Cars are none too plenty also and a good many delays are caused in that way.

At the same time the condition of the coke trade is not reassuring. It has been weak for quite a long time and now the most optimistic of jobbers advise a quotation decidedly down from former figures, in fact to a basis of $4.75 for best Connellsville foundry. It is not very easy to say why the weakness exists, except that iron is not high and is crowding coke down to its level.

Bituminous quotations are strong at former figures, $2.80 for Pittsburgh lump, $2.65 for three-quarter, and $2.15 for slack. There is no consignment coal on track anywhere and everything is healthy. The anthracite trade is quiet, but very steady. Shipments by lake for the week were heavy, being 164,500 tons.

COLUMBUS, OHIO

Coal men in Ohio are having a good run of business in steam grades. This is due to increased activity among manufacturing establishments and a larger tonnage required for railroad fuel. In fact, every branch of the trade shows activity with the possible exception of the domestic sizes. Generally speaking, the market shows a good tone, and it is the belief that the year 1913 will be a prosperous one in coal circles.

One of the features of the trade is the good demand for lake tonnage. Since the boat congestion at the upper lake ports is over the vessels are running much more smoothly. The docks on the lower lakes are busy loading a heavy tonnage. The Northwest is demanding a large amount of fuel and Ohio operators are trying to supply the demand. Lake prices are 10c. higher than last year, and this aids in the lake movement; the ore trade is also good, and boats are active in both directions.

Steam tonnage is wanted by manufacturers in this territory in larger quantities than for some time. The bad effects of the flood are now passed and practically all factories are again in operation. Railroads are taking a larger tonnage since the freight movement has increased. No trouble has yet been experienced from a car shortage, but operators are looking forward to a lack of equipment in a few months.

Preparations are being made for an active domestic demand in about a month when the stocking period starts. The fact that dealers stocks are unusually low, is taken as an indication of a larger domestic movement than in years. Sales agents are busy making their connections for the domestic business.

Increases in production from all Ohio producing districts are reported during the past week. In the Pomeroy Bend district, which is waiting for the domestic trade, the output is estimated at 55 per cent. of the average and the same percentage prevails in the other domestic fields. In the Hocking

Valley the output is practically normal and the same is true of the Eastern Ohio field.

Quotations are rather firm and there is less price cutting now than for several months.

	Hocking	Pittsburgh	Pomeroy	Kanawha
Domestic lump	$1 50		$1 50	$1 50
2-inch	1 35	$1 25	1 35	1.30
Nut	1.15		1 25	
Mine-run	1.15	1.15	1 15	1 10
Nut, pea and slack	0.70		0 70	0 70
Coarse slack	0 60	0 65	0 60	0 60

HAMPTON ROADS, VA.

The beginning of the past week saw some large shipments, both foreign and coastwise, over all the local piers, but tonnage to move coal has gradually decreased, and there is at the end of the week very few vessels waiting cargo. Such vessels as are now in the stream are not loaded on account of suppliers being short of coal due to the heavy loadings at the beginning of the week. Bonker business for the week has been exceptionally good at all piers. The greater portion of the cargo shipments have been on contract business, although there have been a few sales of spot cargoes. The New England market has taken practically all of the coastwise business.

To date the dumpings for the Sewalls Point piers alone will amount to over 150,000 tons, and unless tonnage now bound for this pier is delayed, it is hoped that the dumpings for the month of May will amount to considerably over 275,000 tons. Lamberts Point and Newport News are also well ahead in tonnage dumped, and it is expected that these piers also will run considerably over past records.

BIRMINGHAM, ALA.

The shortage of coal equipment in this district takes on a more serious aspect from week to week. Practically every railroad touching the coal fields is short of cars and there are no indications that any of them will be able to relieve the situation at any time in the near future.

Labor conditions are also gradually becoming more acute. A number of the smaller mines have suffered from shortage of labor during the past week and it is possible that had an ample supply of cars been furnished their outputs would not have been materially increased. A lack of equipment always causes unrest among the labor which has a habit of roaming from mine to mine when regular work is not obtainable.

LOUISVILLE, KY.

There is a noticeable shortness in the supply of cars at the present time and although not sufficient to restrict operations at the moment it is threatening to develop to larger proportions at any time. The probabilities are, however, that this feature will be eliminated by June when operations should be open in full swing and a heavy movement of domestic coal on into the northwest. The recent elimination of the 10c. differential in freights against the eastern Kentucky field as compared with the Jellico district is of course, having a stimulating effect on the movement from the former field into the North and Northwest.

Prices on the steam grades are weak, the off-qualities of pea and slack being quoted at as low as 20 and 25c. Western Kentucky nut and slack are selling at 40c., with the second-grade eastern Kentucky qualities at 50 and 55c., f.o.b. mines. The better grades from this district are not in very heavy demand, because of the plentiful supply of cheap coal and can be had at 85 to 90c. Block coal is also rather low, at $1.50 to $1.65, with block and nut at $1.45 to $1.50, depending largely upon the conditions of the sale. Indications point to still lower prices when consignment coal begins to come in and demurrage charges start accruing.

INDIANAPOLIS

There is little change in the mine situation in Indiana. Some mines are operating only two days a week but the average for all seems to be three or four. Prices hold steady. Practically no domestic coal is moving, but there is a normal demand for steam grades from the local mines.

Jobbers say they are not able to place all the orders they wish to for Eastern coals, the mines there reporting they are sold far ahead and that prices will be advanced 15c. a ton in June. That is probably the reason the wholesalers are anxious to get their orders in this month. Another reason is that the new interstate agreement will be made next spring and buyers are willing to make contracts to carry them over this uncertain period.

Retailers in the city report a satisfactory opening summer trade. More consumers than usual seem to be ready to put Eastern coal in their cellars while the price is at the low point. It is noted that some of the small coal yards that sprang up in the winter are for sale. This occurred when it was seen the weather was apparently going to continue mild and there was a chance to get coal at lower figures than had been paid when the fall trade opener at high figures, forcing a continuation of the high prices throughout the winter by the large yards.

DETROIT, MICH.

Bituminous—There seems to be a diminishing activity in the local market, notwithstanding the fact that industrial concerns are operating up to full capacity. However, there is no excess coal being shipped in. Quotations remain unchanged, and the strongest demand is for the finer sizes. The situation will probably become somewhat easier as the summer advances, but indications are that it will remain stronger than ordinarily.

The local market is quotable on about the following basis, f.o.b. mines:

	W. Va. Splint	Gas	Hocking	Cambridge	No. 8 Ohio	Pocahontas	Jackson Hill
Domestic lump	$1.50	....	$1.40	....	..	$1 70	$1 90
Egg	1 50	....	1.40	....	..	1.70	1 90
1¼-in. lump	1 25	....	....	....	..	....	....
¾-in. lump	1.15	$1 15	1 10	$1 10	$1 10		
Mine-run	1.05	1 05	1 00	1 00	1.00	1 25	
Slack	0 85	0 90	0.80	0 80	0.80	Open	

Anthracite—The movement of hard coal so far this month shows some little improvement over that of last month. The unusually cold spring has tended to stimulate the consumption. While there is no particularly active demand, the circular seems to be well maintained and there are no surplus tonnages in evidence. Some coal ordered as far back as February is only now coming in.

CHICAGO

There continues to be a strong demand for steam coal, the prevailing prices for the steam lump and mine-run being $1 and $1.15 at the mines. Screenings are selling at 80c. to 85c. for the lower grades and 85c. to 90c. for the better qualities.

Conditions in the coke trade are satisfactory, the supply of this commodity not being fully up to demand. A fair amount of smokeless coal is being received. Mine-run, chiefly, is in demand, the circular price being $1.25. An increase in orders for anthracite is being noted and the volume of business for the year is expected to be fully up to normal.

The car shortage question is again agitating dealers and operators. With the assurance that bountiful crops will be harvested this year, the opinion prevails that the railroads will not have a sufficient supply of equipment to handle an unusually large volume of business next fall. On this account many dealers are now purchasing coal for storage purposes.

Prevailing prices in Chicago are:

	Springfield	Franklin Co.	Clinton	W. Va.
Domestic lump	$1.97@2 07	$2 30@2 40	$2 27	
Egg		2.30@2 40		$3 65
Steam lump	$1 82@1.87		2 07	
Mine-run	1 77	2 20@2.30	1 97	3 30
Screenings	1.57	1.95	1 57@1 62	

Coke—Connellsville and Wise County, $5.25@5.50; by-product, egg, stove and nut, $4.55@4.75; gas house, $4.65@4.75.

MINNEAPOLIS—ST. PAUL

Business in the coal line has only been a repetition of the past two preceeding weeks. The trade has been slow and were it not for the fact that the time for writing contracts was here, very little activity would have been experienced. Prices are being maintained, far beyond expectations, even in the face of the existing sluggishness of the market. Very little all-rail coal is moving and the market during the past week has been practically free from demurrage coal. The steam trade is holding off expecting prices to weaken along about June 1 as was the case last year.

The hard-coal business is reported to be unusually quiet so far this year, with a tendency to hold off on the part of the country dealer. This is contrary to last year at this time, and it would seem that with the empty bins in the country and the advancing price of 10c. per month, the dealer is playing his hand very poorly. Conditions will not favor him any more by waiting. Prices on all grades of Illinois coals are holding steady with not much change from two weeks ago. Various grades of screenings are still in demand and the price is ranging from 80c. to $1 at the mines.

ST. LOUIS, MO.

There is absolutely no change in local conditions, and country business, instead of picking up, seems to be dropping off. There is a fair movement of anthracite under way, and during the past week a small tonnage of Arkansas has been placed. There is nothing doing in coke, and it is al-

most a drug on account of a few speculators bringing it in unsold.

Among the washed coals No. 2 is just a trifle too plentiful, and Nos. 3 and 4, which have been bringing an exceptionally good price, are expected to drop. The circular of last week still prevails.

OGDEN, UTAH

The coal market throughout the entire Western territory is in a bad condition, with mines only working one or two days per week, due to the small demand for lump coal. This has caused quite a shortage of slack. The demand for nut coal has decreased, and with the mines working short time, the market is able to take care of the production. At this time last year there was quite an over-production of this grade, due to the brisk demand for lump coal.

The reduction in price on May 1 has not stimulated shipments or caused anyone to commence storing coal. This has been somewhat of a disappointment to the operators, who cannot get away from the idea that lowering the price or cutting quotations will increase shipments. At this time of the year the consumption of coal is at its lowest point, and at the same time the operator, whose output is large enough to dictate prices, sees fit to sell his coal at the lowest price.

SPOKANE, WASH.

A coal war has been precipitated here because mining companies are selling direct to large business blocks, hospitals and other large consumers at jobbing prices, which is lowering materially the price of the product to these buyers. Whether it will become so general as to effect the buyer of one- and two-ton lots is not known at present. The trouble has grown out of the charge that the Crows Nest Pass Co. is owned largely by the same stockholders as the Great Northern Railroad and this company is chiefly responsible for the trouble. Responsibility is also laid at the doors of the McGillvary Co. and the Corbin Coal & Coke Co. The local men have appealed to officials of the Great Northern both at Seattle and St. Paul asking that the coal company be forced to change its methods, and adding the threat that they might not receive any more shipments over their lines. This threat has been carried out after learning that the railroad will not enter into the controversy, and nearly all local dealers have refused to accept coal shipped over this line.

PORTLAND, ORE.

Newcastle (Wash.) and South Prairie coals are selling here at $9 and $7 per ton, retail, respectively. They have been shipped in to replace the Black Diamond coal of which there has been very little in the local market for some time. Lignite coals retail here at from $6.50 to $8 per ton, the wholesale price to dealers being $5.25 per ton sacked and in three-ton lots. Wyoming coal is retailing for $10 per ton, and Utah brings $9.50@10 according to haul. Stocks are light for the present but receipts are quite liberal and there will be enough to fill all requirements. Although practically no Australian coal was imported here during the past year there is still some in stock. High freight rates prohibit importations for the present. Very little Wellington coal is being sold owing to its high price, and little has been shipped in since the strike at the mines.

PRODUCTION AND TRANSPORTATION STATISTICS

CHESAPEAKE & OHIO RY.

The following is a comparative statement of the coal and coke traffic over the lines of the C. & O. Ry., for March, and the nine months ending Mar. 31, 1912-13, in short tons:

	March			Nine Months		
Destination	1913	1912		1913	%	1912	%
Tidewater	328,442	487,236		2,720,022	23	3,092,449	23
East	292,410	198,472		2,032,099	15	1,671,276	13
West	700,150	805,017		6,809,347	56	8,261,891	62
Total	1,321,002	1,160,725		11,561,468		13,025,616	
Coke	32,207	22,932		227,550		170,548	
From connections							
Bituminous	71,588	20,060		494,699	4	173,950	1
Anthracite	309	3,330		9,138	1	29,976	1
Grand total	1,353,209	1,513,657		11,789,018	100	13,195,164	100

NORFOLK & WESTERN RY.

The following is a statement of tonnages shipped over this road from mines in West Virginia and the commercial and company coal, for the month of March, in short tons:

Field	Shipped	Tipple	Total	Commercial	Company
Pocahontas	1,003,352	16,363	1,019,715	981,120	120,031
Tug River	184,658	3,169	187,827	153,430	34,397
Thacker	238,340	8,978	247,318	177,358	69,960
Kenova	59,345	7,470	66,815	57,108	9,707
Clinch Valley	.....	....	.....	139,426	8,621
	1,485,695	35,980	1,521,675	1,508,442	242,716

Shipments of coke entirely from the Pocahontas field, were 116,219.

BALTIMORE & OHIO R.R.

The following is a comparative statement of the coal and coke movement over this road for March and the first three months of this year and last year:

	March		3 Months	
	1913	1912	1913	1912
Coal	2,538,039	3,173,168	8,091,860	8,312,570
Coke	405,220	384,094	1,215,753	1,080,427
Total	2,943,259	3,557,262	9,307,613	9,392,997

FOREIGN MARKETS

GREAT BRITAIN

The market remains firm, but quiet, there being little inquiry. Buyers are disposed to wait until after the holidays, in the hope of easier conditions. With supplies so limited after the recent stoppages, sellers show no signs of relaxing quotations either for large or small coals. The very best Cardiff large steams are now unobtainable for May loading.

Quotations are approximately as follow:

Best Welsh steam	$5.40@5.52
Best seconds	5.28@5.40
Seconds	5.04@5.28
Best dry coals	5.04@5.28
Best Monmouthshires	$4.80@4.92
Seconds	4.68@4.80
Best Cardiff smalls	3.60@3.72
Seconds	3.36@3.48

The prices for Cardiff coals are f.o.b. Cardiff, Penarth or Barry, while those for Monmouthshire descriptions are f.o.b. Newport; both exclusive of wharfage, and for cash in 30 days—less 2½%.

COAL SECURITIES

The following table gives the range of various active coal securities and dividends paid during the week ending May 17:

Stocks	Week's Range High	Low	Last	Year's Range High	Low
American Coal Products	87	87	87	87	87
American Coal Products Pref.	109¼	109¼	109¼	109¼	109¼
Colorado Fuel & Iron	31½	31	31	41½	31
Colorado Fuel & Iron Pref.	....	....	155	155	150
Consolidation Coal of Maryland	102½	102¼	102½	102½	102¼
Lehigh Valley Coal Sales	225	210	215	....	....
Island Creek Coal, com	52	51	51	....	....
Island Creek Coal Pref.	85	84	84	....	....
Pittsburgh Coal	..	..	18	24¾	17½
Pittsburgh Coal Pref.	80¾	80¾	80¾	95	79½
Pond Creek	22¼	19½	19½	23¾	19½
Reading	160¼	158½	159½	168½	152½
Reading 1st Pref.	91	90	90	92½	89½
Reading 2nd Pref.	..	..	89½	95	87½
Virginia Iron, Coal & Coke	43	43	43	54	43

Bonds	Closing Bid	Asked	Week's Range or Last Sale		Year's Range	
Colo. F. & I. gen s.f.g. 5s	96	97	95	April '13	95	99½
Colo. F. & I. gen. 6s	..	..	107¼	June '12	..	..
Col. Ind. 1st & coll. 5s, gu	78½	79½	78½	78½	78½	85
Cons. Ind. Coal Me. 1st 5s	75	80	85	June '11	..	..
Cons. Coal 1st and ref. 5s	..	94	93	Oct. '12	..	..
Gr. Riv. Coal & C. 1st g 6s	..	100	102½	April '06	..	..
K. & H. C. & C. 1st s f g 5s	..	..	98	Jan. '13	98	98
Pocah. Con. Coll. 1st s f 5s	86½	87½	87½	Mar. '13	87½	87½
St. L. Rky. Mt. & Pac. 1st 5s	76	78	76	Mar. '13	76	80
Tenn. Coal gen. 5s	100	101½	100	May '13	100	103
Birm. Div. 1st consol. 6s	101½	103½	101	April '13	101	103
Tenn. Div. 1st g 6s	..	103½	102	Feb. '13	102	102
Cah. C. M. Co. 1st g 6s	..	104	110	Jan. '09	..	..
Utah Fuel 1st g 5s	..	..	....	....	....	....
Victor Fuel 1st s f 5s	..	80	80	May '13	79½	80
Va. I. Coal & Coke 1st g 5s	93	97	93	May '13	93	98

DIVIDENDS

Delaware & Hudson—Regular quarterly of 2¼% payable June 20, to holders of record May 28.

Hocking Valley—Regular quarterly of 1% and an extra of 4½%, payable June 28 to holders of June 6.

INDEX OF COAL LITERATURE

We will furnish a copy of any article (if in print) in the original language for the price quoted. Where no price is quoted, the cost is unknown. Inasmuch as the papers must be ordered from the publishers, there will be some delay for foreign papers. Remittance must be sent with order.

BLASTING, EXPLOSIVES

Development in Explosives in the United States During the Last Three Years. Chas. E. Munroe. Eighth Internat. Cong. of App. Chem., Vol. XXV, 1912, 9⅓ pp.

Methods for the Determination of the Effective Strength of High Explosives. A. M. Coney and F. B. Holmes. Eighth Internat. Cong. of App. Chem., Vol. XXV, 1912, 16¼ pp.; illus.

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The Selection of Explosives Used in Engineering and Mining Operations. C. Hall and S. P. Howell. Bureau of Mines, Bull. 48, 45 pp.; illus.

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The Testing of Safety Explosives. Prof. V. B. Lewis. (Abstract of paper read Apr. 2 before the Royal Soc. of Arts.) Iron Coal Trades Rev., Apr. 4, 1913, 2 pp. 40c.

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BORING, SHAFT-SINKING AND TUNNELING

Rand Practice in Deep Shaft-Sinking. Chas. B. Brodigan. Min. & Sci. Press, Apr. 26, May 3, 1913, 7½ pp.; illus. 40c.

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Briquette Making at Polmaise Colliery. Iron Coal Trades Rev. Apr. 4, 1913, 1⅓ pp.; illus. 40c.

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The New Coal Dust Experiments. Third report of the Explosions in Mines Committee. Iron & Coal Trades Rev., Apr. 18, 1913, 2 pp. 40c.

Small Coal and Dust; Its Production, Prevention, Treatment and Utilization (Dry Mines). J. Drummond Paton Paper read Apr. 8 before the Manchester Geol. & Min. Soc.). Iron & Coal Trades Rev., Apr. 11, 1913, ¾ p. 40c.

The Combustion of Oxygen and Coal Dust in Mines. (Paper read Apr. 12 before North of England Inst. of Min. & Mech. Engrs.) W. C. Blackett. Iron & Coal Trades Rev., Apr. 18, 1913. ¾ p. 40c.

The Experimental Gallery Station in Derne. A detailed description of the new Westphalian outfit for explosion tests. (Die Versuchsstreckenanlage in Derne.) Beyling and Zix. Glückauf, Mar. 22, 1913, 9½ pp.; illus. 40c.

COKE

Production of Ammonium Sulphate by Means of the Sulphur in Coke Oven Gases. Coke Works Commission Report. Ueber die Gewinnung von Ammoniumsulfat mit Hilfe des in den Kokereigasen enthaltenen Schwefels.) J. Reichel. Glückauf, Apr. 12 and 19, 1913, 7½ pp.; illus. 80c.

Types of Coke Oven Plants as Seen in Operation—II. The Gas World. Apr. 5, 1913, 5 pp.; illus. 40c.

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COAL AGE

Vol. 3 NEW YORK, MAY 31, 1913 No. 22

The Best Time

By Berton Braley

Written expressly for Coal Age

I

I'll tell yuh somethin', neighbor,
Which same I will expound
—Uv all the hours uv labor
I puts in underground,
The one that's most appealin'
(An' that's no idle hunch)
Comes with that hungry feelin'
When it is time fer lunch!

II

My ratchet drill—I chucks it
An' lays my shovel by,
An' opens up my bucket
An' eats my bread an' pie,
There's fun an' talk an' jokin'
Among the dusty bunch
That's eatin', laughin', smokin',
When it is time fer lunch.

III

The mule he champs his bridle,
The trapper gulps his scoff,
The bloomin' mine is idle
An' everybody's off,
The pipe smoke's curlin' hazy,
You hear the miners munch
—Gee, life is good an' lazy
When it is time fer lunch!

IV

There ain't no need to hurry,
There ain't no need to sweat,
Yuh murmurs, "I should worry,"
An "wot's the use to fret,"
Yer eyes they halfway closes,
Yuh nods among the bunch,
An' then—an' then yuh dozes
When it is time fer lunch

V

An' so I'm sayin', neighbor,
Which same I will attest,
Uv all the hours of labor
The lunchin' hour's the best,
At minin' I'm no slow one
But—listen to my hunch,
I make my biggest showin'
When it is time fer lunch!

Flood Protection at the Illinois Mines

Special Correspondence

SYNOPSIS—A brief description of the methods employed in protecting the shafts of the O'Gara Coal Co. during the recent floods. One of the chief troubles encountered was in obtaining clay for filling in the bulwarks; as the surrounding country was completely inundated, this material had to be carried in by hand. The water stage exceeded the previous high record of 1884 by 3 ft. but the O'Gara Co. was uniformly successful in protecting its mines.

The rich coal field of Saline County, Ill., lies in the low valley of the Saline River, a tributary of the Ohio, with its mouth near Shawneetown, Ill. The Middle Fork of the Saline River flows within two miles of Harrisburg, the county seat of Saline County. The drainage area at this point approximates 200 square miles of low land of which 25 square miles are subject to overflow. At the time of the recent flood, back water from the

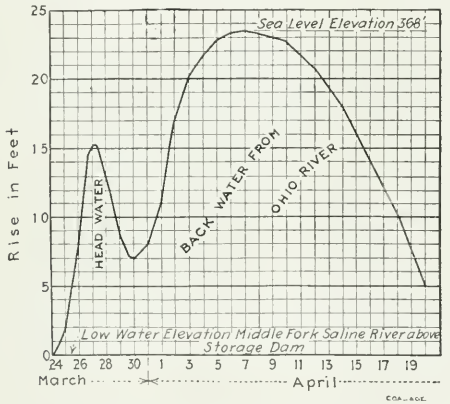

Sea Level Elevation 368'
Rise in Feet
HEAD WATER
BACK WATER FROM OHIO RIVER
Low Water Elevation Middle Fork Saline River above Storage Dam
March
April
24 26 28 30 1 3 5 7 9 11 13 15 17 19
0 5 10 15 20 25

Fig. 1. Profile Showing Rise and Fall of the Flood

Ohio River extended 30 miles inland with a varying width of from 2 to 10 miles.

No definite record of the precipitation was kept at Harrisburg during the storm period of Mar. 22 to 26, but approximately 6 in. of rain fell. The effect was plainly visible in the rapid rise of all streams, which reached a flood stage filling all the low lands on Mar. 27. On Apr. 1 the head water had almost disappeared. At 1 p.m. on this date a reversal of the current in the Saline River was noted and a rapid rise of back water at the rate of 3 in. per hr. was registered. Reports of flood conditions in other states had been received, but owing to the rapid fall of the local headwater no one feared extensive damage from the incoming flood. The overflow from the Ohio continued until Apr. 8, when observations showed the water to be stationary. The previous high-water mark of 1884 was passed and a new record 3 ft. higher has been duly recorded. A large territory in Harrisburg Township was submerged, including a portion of the city of Harrisburg. Fig. 1 shows the rise and fall of the water, while Fig. 2 shows the submerged area.

Five mines of the O'Gara Coal Co. were within the flooded district. These have a daily output of 10,400 tons of coal when operated to capacity. The shafts are all sunk in low ground but were considered above high water. Mines Nos. 2, 3, 4 and 9 are all connected, forming a chain of underground workings more than three miles in length. The average depth is 230 ft. The soil depth in the shafts ranges near 40 ft., which includes 10 to 15 ft. of loose rock fill around the timber casing.

After observing the rapidity of the rise of the water on Apr. 2, the management of the O'Gara Coal Co. began the fight to keep the water from the threatened mines. Work continued for five days and nights before the mines were considered safe; subsequently all company men reported at the mines as a reserve until the water subsided.

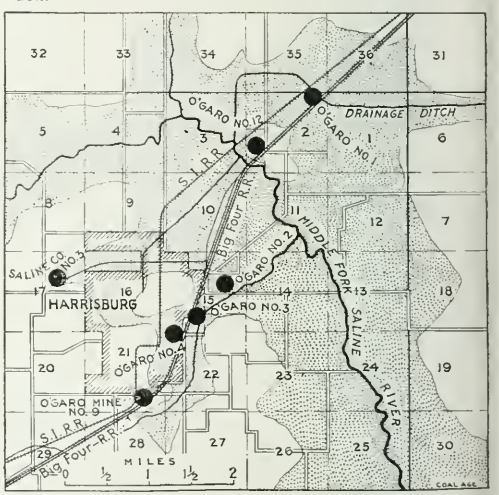


Fig. 2. Map Showing Area Inundated

Methods of Protection

Mine No. 1—The air shaft and fan house at this mine are located 300 ft. distant from the hoisting shaft; they were threatened on Apr. 4. A protecting wall of puddled clay was immediately started around the entire fan house. The clay was held in place by a substantial form built of car lumber. In order to make the wall as water-tight as possible, the top soil was removed and a stiff clay substituted. This wall proved effectual against a head of 2 ft. of water. The hoisting shaft was never reached by the flood, although the same protection was provided as at the air shaft.

Mine No. 2—The hoisting shaft at Mine No. 2 was first surrounded by a wall 6 ft. distant from the casing, 3 ft. high and 2 ft. thick, formed of puddled clay supported by timber forms. As the water approached the bulkhead, leaks from underneath became so numerous that it was found neeessary to increase the height of the shaft casing at least five feet. This was done and a wall formed of clay was thrown around the added casing, the clay being protected from the waves by lumber forms

well braced (see Fig. 3). The air and escapement shaft was provided with a clay and timber bulkhead carried to a height of 5 ft.

At all of the mines the greatest problem was to obtain the clay, as the territory surrounding the mines had become flooded before the work of protection began. Dump wagons drawn by company mules were abandoned after the first day's work. Railway flat cars were then loaded along the right-of-way of the Big Four Railroad two miles from the mine and placed at the mines by switch engines as long as these were able to run. Later cars were pulled in to the low mine tracks by means of block and tackle, the power being furnished by mules working from small elevated areas.

FIG. 3. HOISTING SHAFT AT THE O'GARA CO.'S NO. 3 MINE

Mine No. 3—O'Gara Mine No. 3 is located within the corporate limits of Harrisburg. The underground works are connected with O'Gara Mines Nos. 2, 4 and 9, so that the failure to save any one would have flooded all four mines. The air and escapement shaft at Mine No. 3 received the first attention. The wood casing around the shaft appeared to be weakening under the pressure of the saturated soil. Immediately men were placed in the shaft and the portion subject to the direct soil pressure was heavily reinforced.

Bulkheads made of puddled clay, supported by forms, were started around the entire fan house. As soon as the water reached these walls, leaks through the loose rock fill under the bulkheads developed to such an extent as to prove dangerous. All efforts to stop these from the outside were in vain until clay was filled in between the bulkheads and the fan house and its height kept above that of the surrounding water. When observations showed the flood at a standstill, five feet of water was found around the protecting wall as shown in Fig. 4.

More than 300 cu.yd. of clay had been used in the protection of this shaft alone, 75 per cent. of which had been carried to place in cement sacks over a trestle man-

FIGS. 4 AND 5. VIEWS AT THE O'GARA CO.'S NO. 3 MINE, SHOWING PROTECTION AT AIR SHAFT

FIGS. 6 AND 7. METHOD OF PROTECTING THE AIR SHAFT AT O'GARA MINE NO. 4

way 200 ft. long. The work at night was aided by means of strings of incandescent lights, the current being supplied from the central power station at Mine No. 3. In order to do this, two boilers were surrounded by dikes and fired when the water level stood several inches above the top of the fire box. Hand pumps and jets took care of all leakage.

At the time everything seemed safe a strong wind sprang up from the east, causing waves to run 3 ft. high.

These waves soon softened the clay in the bulkhead to such an extent as to render it almost fluid. Cement sacks were immediattely filled with sand, some being rammed into the softened clay while others were placed outside the walls until the exposed side was protected, as shown in Fig. 5.

The hoisting shaft at Mine No. 3 is 6 ft. higher than the air shaft and therefore requires less attention. The clay wall was thrown around it and all leaks in the casing calked. No difficulties developed at this point.

Mine No. 4—The hoisting shaft at Mine No. 4 was quite high, compared with the air shaft which required immediate attention. Owing to a peculiar location of the air shaft, it was uncertain just how soon the water would break across the railway embankment which had temporarily held it. For this reason the fan house was partially removed and the shaft sealed. (See Fig. 6.) The

FIG. 8. FLOOD AT THE O'GARA CO.'S WAREHOUSE

bulkheads with the filling of clay were also added, 200 cu.yd. of clay being used. This clay was hauled to a convenient point on flat cars, sacked and carried to place over a trestled manway, as at Mine No. 3.

RESULTS OF THE FLOOD

Some water seeped in around the casing at all the shafts. This could have been easily handled by the bottom pumps had the boilers remained in service. Two days' pumping prepared each mine for hoisting coal. The O'Gara Coal Co. sustained considerable loss, additional to the expense incidental to the actual protection of the mines. Seventy-five company houses were submerged and damaged by waves and floating débris. The company warehouse, machine shop, electric shop, foundry and corn crib were all damaged, including various supplies and machinery located at this center of distribution. Two weeks of running time were also lost, due to the railroads being unable to handle the traffic.

The work of protection was directly in charge of Harry Thomas, general superintendent of mines of the O'Gara Coal Company.

All predictions of past years that coal could not be worked at a greater depth than 1500 ft. no longer hold water. At the present day, according to W. E. Garforth, president of the British Institute of Mining Engineers, coal is being mined at depths exceeding 3000 ft. The adoption of a system of long-wall working has solved the question of superincumbent weight. The coal is exposed to this weight for a very short time and places are closed up rapidly.

A New Safety Lamp and a Blasting Machine

Schaffler & Co., of Vienna, Austria, are the manufacturers, and Peter A. Frass & Co., Inc., of 417 Canal St., New York City, are the American agents of the new mining apparatus illustrated herewith. Fig. 1 shows an electric blasting machine with a capacity of six detonators fired simultaneously. It is not a magneto but a miniature dynamo-electric generator, operated through a ratchet by a detachable T-handle.

This device measures 3⅞ in. long, 3⅛ in. wide over the strap buttons—being but 2¼ in. wide over the case—and 5¼ in. high to top of handle connection. The weight is 4½ lb. As may readily be seen, the whole machine

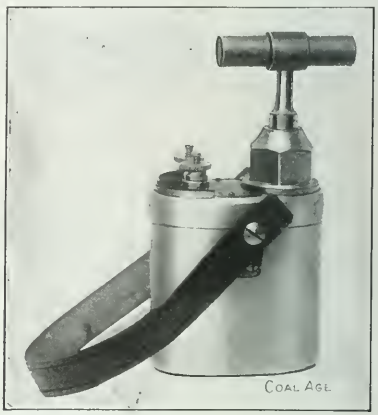


FIG. 1. SHOTFIRING MACHINE

is small, compact and durable, being thoroughly protected by a seamless drawn-metal case.

The magneto machines, as ordinarily constructed, are heavy for their capacity, and the magnets are certain to deteriorate or lose their strength, correspondingly weakening the current generated. This device is free from this inherent defect, as it is furnished with electro instead of permanent magnets. This greatly increases the life of the machine.

Fig. 2 shows an electric safety lamp of remarkable simplicity. The three principle exterior parts, base, housing and cover, are each a single casting of magnalium metal, which has the strength of cast brass and about the same weight as aluminum.

The battery is of the lead-plate, non-spilling, celluloid-incased type. A lug placed upon the side of the case fits into a mortise in the housing and renders it impossible to get the connections to the lamp reversed. The one- or two-candlepower tungsten filament light bulb (this lamp is made in both powers) is incased between two convex reflectors in a heavy glass cylinder, which is rendered air-tight by means of a gasket upon either end. The outer or protecting glass is shielded from external injury by four heavy columns cast integral with the main body of the housing.

The cover to which the suspension hook is attached is screwed into place and automatically locked by the insertion of the battery. A small thumb-screw upon the side

of the housing and plainly visible in the illustration serves as a switch for turning the current on or off from the lamp.

The bottom or base of the housing screws to place and is locked securely by means of a small winged socket-wrench. The locking bolt can not be readily withdrawn by any other means than this key.

As may be seen from Fig. 2, this lamp is extremely

FIG. 2. LAMP ASSEMBLED AND TAKEN DOWN

simple yet carefully made and amply strong. It weighs, dry, 4 lb. 3 oz. The addition of the electrolite would probably increase this weight a few ounces more.

An Indiana Mining Bill

The following bill introduced by Senator Kolsem, president of the Indiana Bituminous Coal Operator's Association, was passed by the last legislature, and signed by Gov. Ralston. It is felt that this law, in time will prove to be of great benefit to both the mine employee and employer.

A bill for an act to amend Section 3 of an act entitled "An act to revise the laws in relation to coal mines and subjects relating thereto, and providing for the health and safety of persons employed therein," approved Feb. 28, 1905.

Section 1. Be it enacted by the General Assembly of the State of Indiana that Section 3 of the above entitled act be amended to read as follows:

Section 3. It shall be unlawful for any operator to allow more than ten (10) persons to work in any mine at any one time after five thousand (5000) square yards have been excavated until a second outlet shall have been made; provided, that all air and escape shafts sunk hereafter shall be separated from the hoisting shaft by at least two hundred (200) feet of natural strata and shall be provided with stairways not less than two (2) feet in width, at an angle of not more than fifty (50) degrees, with landings at easy and convenient distances and with guard rails attached to each set of stairs from the top to the bottom of the same, and shall be available at all times to all employees engaged in such mines.

Also provided, that the stairways, landings and guard rails shall be of suitable design and strength to accomplish the purpose for which they are intended, and shall be kept free from obstructions. And that when the escape and air shafts are combined, the escape shaft and air shaft shall be separated by a good substantial partition from top to bottom.

Provided, further, where the approach or aproaches to the escape shaft crosses an air course, entry or other passageway used as an air course, either as an intake or return, the air current shall be conducted by an overcast or undercast, over or under the point where such approaches shall be kept free from falling slate, mine tracks, mine cars and other débris, and shall be used only as a means of ingress or egress to or from the escape shaft. All water coming from the surface or out of any strata in such shaft shall be conducted by rings or otherwise to prevent it from falling down the shaft and wetting persons who are descending or ascending the shaft. The operator may provide at such outlet or escape shaft hoisting apparatus, which shall be at all times available to all persons in the mine, the same signals to be used as provided by law for use at hoisting shafts. The traveling roads or gangways to said outlet shall be separated from the hoisting shaft by at least two hundred (200) feet of natural strata and not less than four (4) feet in height and four (4) feet wide and shall be kept as free from water as the average haulage roads in such mines. At all points where the passageway to the escapement shaft, or other place of exit, is intersected by other roadways or entries conspicuous boards shall be placed indicating the direction it is necessary to take in order to reach such place of exit. It shall be unlawful to erect any inflammable structure or building or powder magazine on the surface so near to the escapeway as to jeopardize the safety of the workmen in case of fire. And no boiler house shall be erected nearer than thirty-five (35) feet of the mine opening. All explosive materials shall be stored in fireproof buildings on the surface located not less than three hundred (300) feet from any other building.

Fans shall be located and maintained at such place as not to be directly over the opening of an air shaft or escapement shaft, and all fans hereafter installed shall be arranged so as to enable the operator, when desirable, to reverse the air current.

Provided, further, that escape shafts already constructed under the provisions of the law herein amended shall not be affected by this act except they shall be maintained according to the provisions herein.

New Development Work in Illinois

The Consolidated Coal Co., of St. Louis, with offices in the Syndicate Trust Building, have completed arrangements for the greatest development made in the coal mining fields of Illinois for many years. A huge central power house is being erected, about a mile and a half north of Staunton, which will supply all the power required at four new mines that this company will open. Mines Nos. 14 and 15 will be midway between Benld and Staunton to the west, and connected up by spurs from the C. & N. W., which is now building down to connect with either the Wabash or Litchfield & Madison. Mines Nos. 16 and 17 are two and four miles respectively southwest of Staunton on a proposed spur from the C. & N. W. The four mines will have a daily capacity of from 4000 to 6000 tons each.

No information is available as to what this tonnage is intended for, but it is presumably a part of the original Gould scheme to furnish fuel from central Illinois for all of the Gould lines, including the Wabash, Cotton Belt, Iron Mountain, and Missouri Pacific, and possibly a portion of the Texas & Pacific and International & Great Northern. Excluding the T. & P. and I. & G. N., the Gould roads at the present time are estimated to use about 10,000 tons of coal per day.

At the present time the Consolidated Coal Co. has several mines in the field east of St. Louis and has recently taken over a big operation at Johnson City in Williamson County. They, with the Western Coal & Mining Co., which has a mine in Williamson County and several mines in Missouri, Kansas and Arkansas, are furnishing fuel for part of the Gould system at this time.

The Origin and Deposition of Coal

By W. B. Richards*

SYNOPSIS—A rather detailed summary of the modern theories of the formation of coal. Types of coal measure flora are described together with the different agencies which determined the varying qualities of the fuels. Particular attention is devoted to anthracite coal.

Plants are the source of coal beds. Their stems, leaves and tissues have gathered in places and beds like peat bogs and after long burial have been converted into coal. The formation of the coal from the beds of vegetable *debris* probably only made a beginning while these lay as open beds of peat. The same process is carried forward in the modern peat beds but result only in poor coal, which contains 25 per cent. or more of oxygen. Peat is a woody material passing part way to coal and sometimes wholly so in places; it is an accumulation of half decomposed vegetable matter in wet or swampy depressions.

In the temperate climate it is due to the growth mainly of spongy masses of the genera of sphagnum which are very absorbent of water. Besides spreading over many swampy places they extend in a floating layer from the borders of shallow ponds, dropping portions to the bottom from their lower roots, as they die above. They thus gradually take possession of the pond and may form beds of great thickness. The leaves, stems, branches of trees and shrubs, growing over the marshy region or in shallow water also contribute to the accumulating bed. This dead and wet vegetable mass slowly undergoes a change in its lower part, becoming brownish-black, loose in texture and often friable, although commonly penetrated with rootlets. This change is sometimes continued until coal is formed, but unlike good coal, it still contains 25 to 33 per cent. of oxygen.†

The rate of growth varies with the amount of vegetation, moisture and other conditions. A foot of depth may form in from five to ten years. Over many parts of New England, there are extensive beds; the amount in Massachussets has been estimated to exceed 130,000,000 cords. Peat waters have an antiseptic power and, consequently, tend to prevent complete decay of the vegetable matter. The deposits of clay or sand over the peat accumulations of the Carboniferous prevented the atmospheric oxygen from participating in the change and to this is due the better product.

The Carboniferous period, or that of the coal measures, was a period of large marshes. The clay beneath the coal, often called the underclay, generally contains fossil plants and especially the roots of underwater stems of the Lepidodendrons and Sigillaria, called Stigmaria. It is often the old dirt beds of earth over which the earth's plants grow that commence to form the coal beds. It was either those or the clayey bottoms of the plant bearing marshes or basins which accounts for the slate bottom in the anthracite seams.

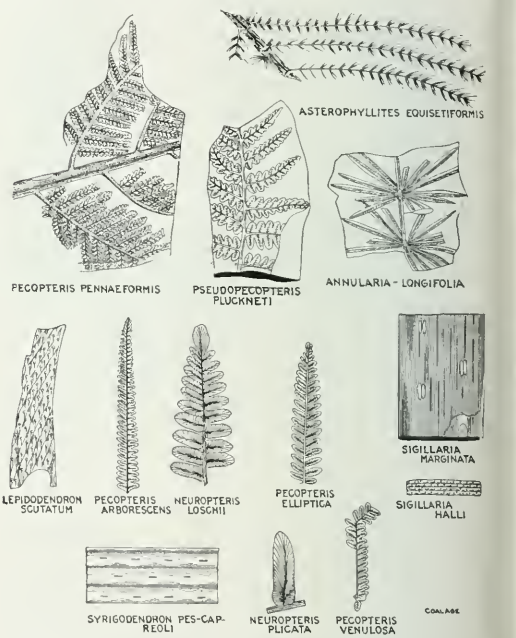
*Engineer, Lehigh Coal & Navigation Co., Lansford, Penn.

Note—Abstract of paper read before the Panther Valley Mining Institute.

†A more technical and detailed discussion of this interesting phenomenon will be found in "Coal Age," Vol. 1, page 712.—Editor.

Plant Life of the Carboniferous Period

The Nova Scotia coal fields abound in erect stumps of trees, standing in the old dirt beds. The rocks capping the coal may be slate, sandstone or conglomerate, depending on whatever circumstances succeeded. The shaly beds often contain the ancient ferns spread out between the layers and so abundant that however thin the shale may be split, it opens to view new impressions of plants. In the sandstone, broken trunks of trees sometimes lay scattered through the beds. Some of the logs of the Ohio coal measures are 50 to 60 ft. long and 3 ft. in diameter.



Typical Coal-Measure Fossils Found in the Panther Creek Valley

At Carbondale, Penn., there was found an impression of the bark of a Lepidodendron 2 ft. wide and 75 ft. long.

At Breckenbridge, Ky., the coal is marked through its whole mass by stems and leaves of the Stigmaria and Lepidodendrons, rendered distinct by the infiltration of sulphuret of iron. The coal is often penetrated with the tissues and spores of plants; even the solid anthracite has been found to contain vegetable tissues.

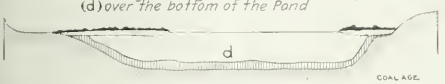
Animal material has also contributed to the coal, though sparingly, for animal decomposition always yields carbonaceous material and animal life, particularly fishes, were so abundant that the contribution in some cases may have been important. The mineral charcoal differs very little in composition from the ordinary bituminous coal. It must be kept in mind that all the agencies which contributed to the formation of coal beds worked on a prodigiously larger scale than those which are now in activ-

ity for the formation of peat. Then the deposits of vegetable remains were from an exceptionally exuberant vegetation, favored by the greatest possible humidity of the air and a superabundance of carbonic acid in the atmosphere. During that period the amount of carbon in the atmosphere was at least 3 in 1000 parts as compared with 3 in 10,000 parts today.

Deposition of the Coal Materials

The flora consisted of acrogenous plants, ferns, lycopods and equiseta (horsetail) covering nearly the whole area of the coal region. All the plants of these orders, represented by the numerous genera, were then large trees, their trunks measuring from 1 to 3 ft. in diameter and from 10 to 100 ft. high or even more, growing close together and forming an impenetrable forest of stems, branches and leaves, whereas at the present time plants are represented by mere herbage of small size with stems and branches scarcely as thick as a goose quill.

The first growth was generally floating or creeping plants and was essentially composed of a peculiar species, the Stigmaria, whose unusually long stems and branches from 4 to 6 ft. thick, were woven together into a mat or thick carpet over which the luxuriant land vegetation



Sketch Showing Deposition of Peat

spread itself. Such a mass of vegetation naturally sank of its own weight at times and places, until wholly submerged. This hypothesis is proved by the superposition of the beds of sandstone, shale, clay, ironstone and limestone upon the old coal beds.

The measures containing the coal seams were laid in salt, brackish or fresh water and vary accordingly. If the salt water had found its way into the life of the jungles and forests they would have been destroyed. At that time the encroaching water occasionally flowed with great and plunging waves, as is shown, not only by the coarse gravel beds of conglomerate, but also by the erosion of rock deposits, and in some cases the vegetable *débris* was washed away making what we call faults. Geologists admit that in some regions the coal plants may have been drifted to their place of deposit.

Subsidence and Compression of the Coal Measures

To account for the succession of coal beds separated from each other by many feet of strata, constituting a mass of coal measures several thousand feet in total thickness, it is necessary to take into consideration the slow subsidence of large areas of the earth's surface; these have taken place in all geological ages and were nearly continuous on a grand scale during the whole time in which the numerous formations of middle and western Pennsylvania were being deposited, ending with the rise of the whole region to its present height, at the end of the coal periods. During the last part of the downward movement the coal vegetation flourished magnificently but was interrupted by inroads of the sea on an equally grand scale, which explains the intermediate sandstones, shales, limestones, and iron-ore beds. The plant life was precisely similar but vastly greater and perhaps more long-lived than the plants composing the peat bogs of our day.

From all that has been said, it plainly appears that in the growth of the peat, we have microcosmic, but true, representation of the formation of coal. A coal bed itself bears evidence of alterations of conditions in its own lamination, and even in the alteration in shades and colors. A layer of one-eighth of an inch in thickness corresponds to an inch, at least, of the accumulating vegetable remains and, hence, the regularity and delicacy of structure is not surprising.

There may have been great variations in the length of time before the peat-like vegetation, after forming, was covered with water, which would cause a varied quality of coal due to the pressure of the beds of clay and sand. The decomposition of the vegetation depended on the amount of water, the composition of that water, and the length of time exposed. In some parts of the marsh, there were pools where the vegetation was long steeping and so became reduced to pulp, thus obliterating all bedding planes. The coal period was a time of increasing change, eras of verdure, alternating with those of widespread inundation destructive to all the vegetation and terrestrial life, except that which covered the region beyond the coal measures. Yet it was an era in which the changes went forward for the most part with such extreme slowness and with such prevailing quiet, that if a man had been living at that time, he would not have suspected the change.

The Change of Wood into Coal

All organic materials tend to decay and in this the chief process is oxidation; oxides are the largest part or all of the final result. Wood, when thoroughly dried, consists approximately of the following percentages: Carbon, 49.66; hydrogen, 6.21; oxygen, 43.03; nitrogen, 1.10 and traces of sulphur and phosphorus; animal fat contains the same elements. In smothered combustion, as in making charcoal by burning wood under a cover of earth, nearly all of the hydrogen and oxygen disappear in carbon monoxide, carbon dioxide and water, without the consumption of all the carbon. This also occurs when the plants decompose under a complete covering of water or earth, because this excludes the air and confines the change to the elements of the plant and the more complete the protection the greater will be the proportion of carbon and hydrogen saved. In the change of ordinary bituminous coal, the loss in the hydrogen in wood as compared with carbon is about 2 to 5 and to that of oxygen about 4 to 5. About 5.5 per cent. of such coal (ash excluded) is hydrogen and 12 to 15 per cent. oxygen, with 80 to 81 per cent. carbon. Mineral coal consists chiefly of carbon. Anthracite contains, usually, 2 to 5 per cent. of oxygen and hydrogen, and bituminous often 12 per cent., by weight, of oxygen and 4 to 6 per cent of hydrogen, while brown coal contains 20 per cent. or more of oxygen, with 5 to 6 per cent. of hydrogen.

The process of conversion of woody material into coal is shown in the following table:

	C.	H.	O.	N.
Wood	49.66	6.21	43.03	1.10
Peat	59.5	5.5	33.00	2.0
Bituminous	81.2	5.5	12.5	0.06
Anthracite	95.0	2.5	2.5	0.00

It is probable that in the formation of bituminous coal, at least three-fifths of the ingredients of the original

wood was lost, and in anthracite about three-fourths. Besides this reduction of two-fifths and one-fourth by decomposition there is a reduction of bulk by compression, which, if only one-half, would bring the total up to one-fifth or one-eighth. On this estimate it would take 5 ft. in depth of compact vegetable *débris* to make one foot of bituminous coal, and 8 ft. to make one foot of anthracite. For a bed containing 55 ft. of pure coal, like that at our Greenwood Colliery, the bed of vegetation should have been at least 440 ft. thick.

Anthracite coal is a result of the action of heat on bituminous coal under the pressure which accompanied the upturning of the rocks, the heat driving off nearly all the volatile matter, and leaving the anthracite behind. Anthracite in eastern Pennsylvania is due to the action of heat on ordinary bituminous coal, caused by the upturned and flexed condition of the rocks in that part of the state. The upturning fades out to the north westward and the Wilkes Barre anthracite region is on its outskirts. The conversion of bituminous to anthracite coal would not require any great amount of heat nor heat of prolonged duration. Moreover, it would have spread laterally from the area of greatest disturbance, as is well exemplified in the various metamorphic regions.

The following are the facts governing the origin of coal:

First—The coal of the upturned and more or less metamorphic coal measures of Rhode Island is the hardest of anthracite.

Secondly—The coal of the Carboniferous coal measures of western Pennsylvania and that of the states farther west, where beds are nearly horizontal, is uniformly bituminous and not anthracite.

Thirdly—Variations in the condition of the coal making eras over the whole globe have led to various kinds of coal without making anthracite. Brown coal, or that containing a large percentage of oxygen, is known to form where there is much excess of air. Cannel coal, a kind rich in oil producing hydrocarbons and little oxygen, was formed by prolonged steeping beneath a deep cover of sediments. Graphite, a grade beyond anthracite, is formed from the excessive heating of mineral coal, as is proved in the metamorphic regions of Rhode Island and Worcester.

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An Improved Steel Mine Car

By Alfred C. Fickes*

SYNOPSIS—These cars have a capacity of nearly three tons run-of-mine coal and weigh over 5200 lb., yet they are so constructed that one man can easily push them about upon a level track or even a slight grade.

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As the use of steel mine-cars is becoming more general every day, a description of an advanced type recently put in service by the Lehigh Coal and Navigation Co., will be, perhaps, not altogether inappropriate.

The Car Is Practically All Steel

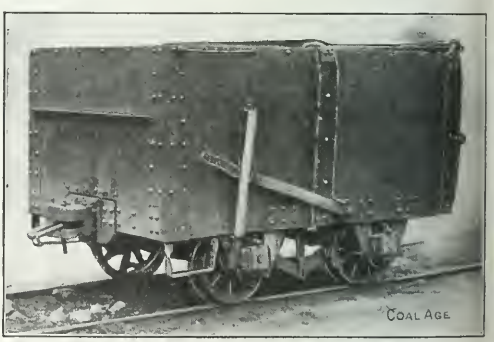
The car weighs 5204 lb. and is composed almost entirely of steel and wrought iron. The wheels, brake-shoes and pedestal-box lids are the only parts constructed of cast iron. The pedestal boxes and bearings are made of malleable iron, while the pedestals, couplers, door-brackets, etc., are made of cast steel, there being eleven various parts composed of this material.

The car is constructed for a gage of 3 ft. 6 in., the general dimensions being shown on the accompanying drawing. The capacity is 115.43 cubic feet, top-level full, or about 2⅞ tons of run-of-mine coal.

The L. C. & N. Co. has been experimenting with part steel and all-steel mine-cars for some years with various degrees of success, having made up cars ranging in weight from 4150 to 5530 lb. The new car was designed at the Lansford shops, under the supervision of Robert E. Hobart, master mechanic, who has had much experience along these lines and who has endeavored to embody all the good features of former cars without their disadvantages, at the same time introducing improvements wherever possible. The present car contains the latest features of car design.

The sides and bottom are made of ¼-in. steel, strongly reinforced with heavy angles and channels. A heavy strap-brace of 1x4-in. iron is placed across the top of the car at the center. With the exception of the slightly protruding brake, there are no projections on the outside of the body, while on the inside, all the rivets are flattened.

One of the improved features is the brake, which is operated on the rachet principle from either side of the



General View of the Car

car. A workman can easily operate this mechanism by running alongside, lifting the brake-lever and engaging it in the rachet, thereby setting in motion the levers and operating the brake-shoes. As these latter wear, an adjustment is easily made by means of shifting holes on the brake-arms. In localities where steep pitches are common, it is easy to discern the advantages of the brake over spragging.

The 20-in. wheels are spoked and can be spragged if necessary. They weigh 177 lb. each.

Another notable improvement has been made in the

*Lansford, Penn.

couplers. They are equipped with 1-in. round steel spiral springs and have been found to decrease considerably the strain on the locomotives hauling the trips, especially in starting. The compression and pull on these cars are both on center. The impact being deadened greatly reduces the wear on couplers, which in the old-style cars ran into a considerable sum of money annually for repairs and replacements. Instead of the usual three-link coupling but one link is used.

The axles are made from 3⅜-in. stock, turned down to 3¼ in. in the center and 3 in. at the wheels and journals. The ends of the axles project beyond the wheels as shown and are inclosed by the bearings and pedestal-boxes. Ordinary car-oil is used for lubrication and the boxes are packed with waste to keep out dust and dirt and prevent leakage of the oil. The pedestal-box lids are fastened to the boxes by ¼-in. round iron chain to prevent being lost.

Journal Boxes Are Carried on Springs

The shock on the bearings is reduced to a minimum by the use of ⅞-in. square steel spiral springs, each

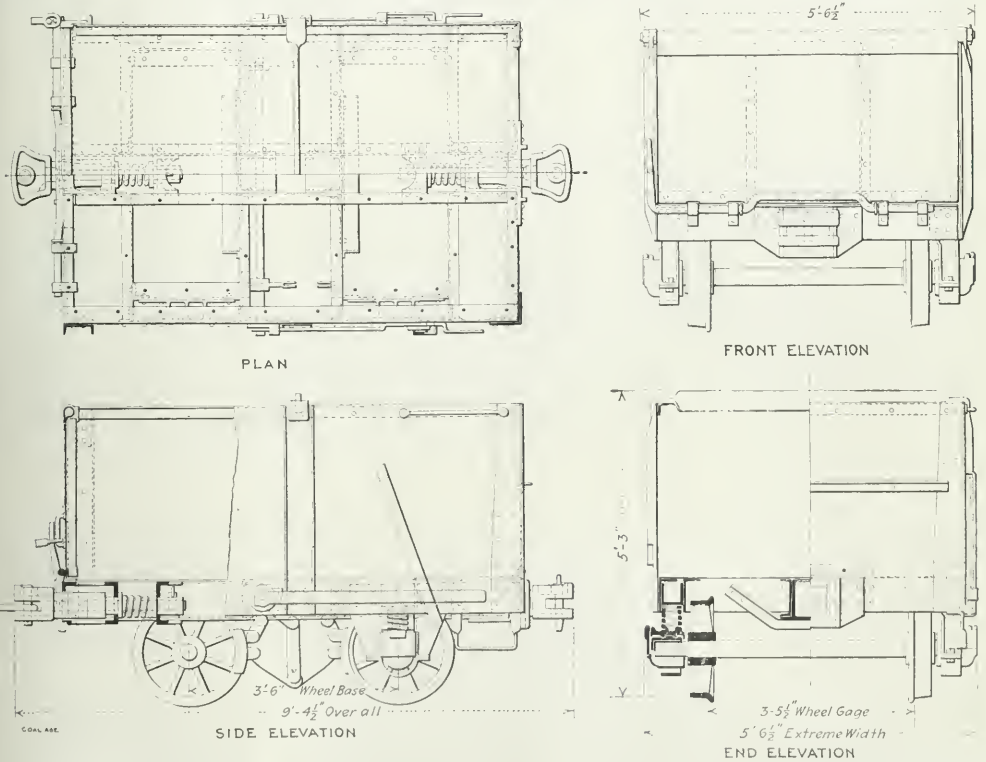
Last February, 175 of these cars were placed in service on the Springdale run at Coaldale Colliery and are doing good work. These were fabricated by the American Car & Foundry Co. Orders have been placed for 400 additional cars and the Lansford shops are now building them in large numbers.

This type of car costs approximately 40% more than the style formerly used by this company. It is the intention however to replace the old ones as fast as possible and manufacture the new style exclusively in the future, modified, of course, or improved wherever conditions warrant.

Last Year's Anthracite Production

According to the figures of the United States Geological Survey, the production of anthracite coal in Pennsylvania during the year 1912, amounted to 75,310,049 long tons. The value of this coal at the mines was $177,167,054, or an average price of $2.36 per ton.

The year's production was smaller than that of 1911



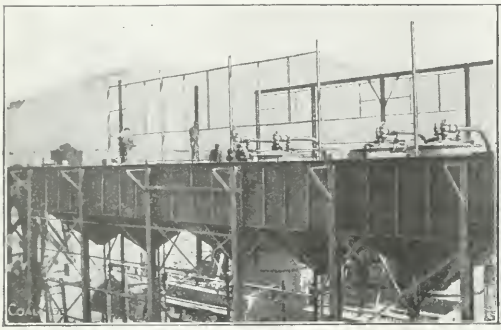
Details of Construction, Note Spring Dr awheads, Spring-Supported Journal Boxes, and Ratchet Brake

figured for 5800-lb. safe load. Every effort has been made to produce an easy-running car in spite of the great weight and as one man can readily push a car about on the level, or even on a slight grade, it would indicate that these efforts have been successful.

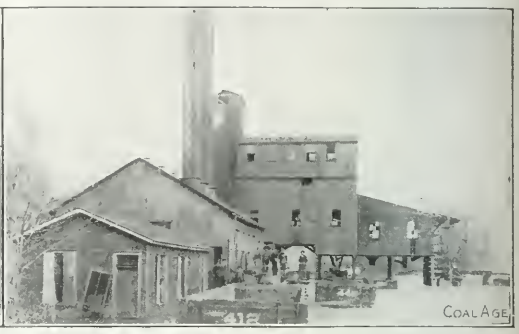
by approximately five and one-half million tons; but its value was greater by over $2,800,000.

The present average price at the mine is greater than at any previous time, the highest price charged before being $2.28 per ton in the year 1903.

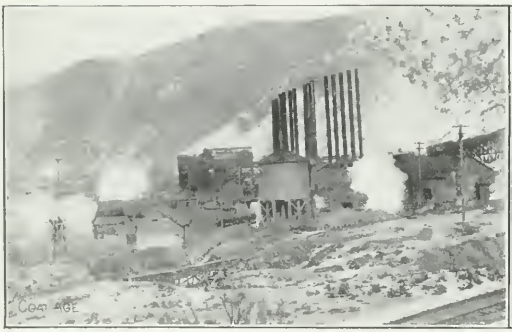
SNAP SHOTS IN COAL MINING



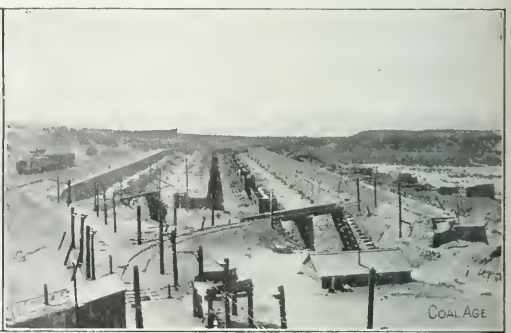
Coal Bunkers in the Hastings Central Power Plant of Trinidad E. T. R. & G. Co., in Colorado



Mining under Difficulties. Recent Ohio Valley Floods at Spottsville on Green River in Kentucky



Tipple and Power House of the Utah Fuel Co., at Sunnyside, Utah



General View of the "Old" Coke-Oven Installation at Sunnyside, in Utah

Tipple of the Rose Creek Coal Co., at Coyletown, Ky.

Steel I-Beams in No. 8 Mine, Madison Coal Corp., Dewmanie, Ill.

Non-Fatal Injuries in Anthracite Mines

By F. L. Hoffman*

SYNOPSIS—The author points out that workmen's compensation is about to become universal without any data being available in the United States from which the probable rate of injury per 1000 men employed can be determined. The records covering only serious injuries are inadequate, as comparisons with British statistics amply prove.

The increasing extent to which employers' liability laws are being replaced by workmen's compensation statutes makes it important that the nature of industrial accidents should be much better understood than they are at present. In a few of the annual reports of state mine inspectors, the information is given in sufficient detail to disclose the nature of the injuries, as well as their causes, and the resulting degree of incapacity for work. It would serve a most useful public purpose if mine inspectors were to present the facts in a more convenient form, and, as a suggestion towards a feasible method of statistical research, the following tables and observations are presented as a first contribution towards a subject which has heretofore been much neglected.

The Pennsylvania Records

As a rule, the information concerning mine accidents is limited to a statement of the number of fatal and non-fatal injuries and their causes. But fortunately, in the reports of the Pennsylvania Department of Mines, additional information is supplied as regards the nature of the injuries sustained, but the data are not presented in the form of a convenient summary or made the subject of critical analysis. The total number of such accidents during 1907-11 was 5745, equivalent to a non-fatal accident rate of 6.7 per 1000 employed.

Since the fatality rate for the same period was 3.8 per 1000, it requires no extended analysis to sustain the conclusion that the non-fatal accidents are far from being fully reported, and that a thorough revision of the methods by which records of such accidents are obtained is urgently needed. Granting that the most serious accidents are of most importance from a medical, legal, social or economic point of view, it is nevertheless true that a large number and proportion of less serious non-fatal injuries occur, for which compensation would be required under the operation of more or less drastic compensation laws.

In Great Britain 105 Are Injured to One Killed

As perhaps the best illustration of existing defects in the reporting of non-fatal mine injuries, attention may be directed to the British experiences for 1911, as reported in the statistics of compensation and of proceedings under the Workmen's Compensation Act of 1906, and the Employers' Liability Act of 1880. According to this return, the number of persons employed in mines was 1,059,612, and among this number there occurred 1711 fatal accidents and 178,166 non-fatal accidents. The fatality rate was, therefore, 1.6 per 1000, and the non-fatal accident rate was 168.1 per 1000. The ratio of fatal to non-fatal accidents was, therefore, as 1 to 105.

If the ratio of non-fatal to fatal accidents for British mines is applied to the Pennsylvania anthracite collieries, the resulting number of non-fatal accidents during the five-year period ending with 1911 would be 114,348 against 5745 as actually reported. Granting that possibly the non-fatal accident rate is much less in the Pennsylvania anthracite mines than in British coal and metalliferous mines combined, the fact remains that the returns of non-fatal injuries, as at present made, are unquestionably untrustworthy and a serious understatement of the facts.

To secure more trustworthy and complete returns it is essential that the term "accident" should be defined in the law and general usage, and that uniform rules of statistical practice should be agreed upon by the mine inspectors of the several coal-producing states. Such a definition, to be trustworthy, should provide for information regarding the resulting duration of incapacity for work, and the importance of such a requirement is best illustrated in the British statistics, according to which, of the non-fatal accidents reported during 1911, 60.6 per cent. caused a work incapacity of less than four weeks.

TABLE I DURATION OF INCAPACITY FOR WORK, OR PERIOD FOR WHICH COMPENSATION WAS PAID

Compensation Paid (weeks)	Mining	Quarrying	Railroad Employees*	Dock Laborers	Shipping Steam	Shipping Sailing
Under 2	6 1	7 9	16 0	9 7	6 3	2 5
2—3	35 1	30 2	28 9	23 1	20 4	12 2
3—4	19 4	18 2	17 4	18 1	15 4	15 7
4—13	34 3	38 4	31 8	41 9	45 3	52 8
13—26	3 5	4 0	4 0	5 0	8 4	12 5
26+	1 6	1 3	1 9	2 2	4 2	4.3
	100 0	100 0	100 0	100 0	100 0	100 0

* Excepting clerical staff

According to this table, of the mine accidents, 5.1 per cent. required compensation for 13 weeks or more as against 16.8 per cent. for men employed on sailing vessels, and 12.6 per cent. for men employed in steam navigation. The table emphasizes the wide divergence in the economic consequences of non-fatal injuries, which by modern conceptions of legal responsibility will probably require to be provided for by the compensation of the injured employee by the employer, who, as far as practicable, will shift the expense upon the cost of production.

Are Returns Less Accurate or Mines More Safe?

As stated at the outset, the non-fatal accident returns for the anthracite coal mines of Pennsylvania are without doubt seriously defective. Since the returns do not show the duration of resulting incapacity for work, it is impossible to say whether the defect in the returns is limited to accidents of comparatively small economic importance, or to all classes, excepting, perhaps, the most serious. The table which follows seems to show that the tendency is rather towards diminished accuracy or completeness, for against a rate of 8.11 in 1907 the reported rate for 1911 was only 6.18 per 1000 employed.

TABLE II NON-FATAL ACCIDENTS IN PENNSYLVANIA ANTHRACITE COAL MINES, 1907-1911

Year	Employees	Accidents	Rate per 1000 Employed
1907	168,774	1369	8 11
1908	174,503	1170	6 70
1909	171,195	1034	6 04
1910	168,175	1048	6 23
1911	173,338	1124	6.48
Total	855,985	5745	6 71

*Statistician, Prudential Insurance Co., Newark, N. J.

The analysis which follows is for a five-year period, since a study of the facts by single years would have required much more space than is available for a discussion of this kind.

Considering first the age distribution of the injured, the table below gives the required information by divisional periods of life. It has not seemed necessary to extend the analysis to single years of life, since the frequency distribution is quite well emphasized by the less elaborate and more convenient method.

TABLE III. AGE DISTRIBUTION OF PERSONS INJURED IN NON-FATAL ACCIDENTS IN PENNSYLVANIA ANTHRACITE COAL MINES, 1907–1911

Ages	Number Injured	Per cent. of Total	Ages	Number Injured	Per cent of Total
12—14	18	0 3	45—49	418	7 3
15—19	825	14 4	50—54	251	4 4
20—24	1000	17 4	55—59	135	2 3
25—29	949	16 5	60—64	60	1 0
30—34	809	14 1	65+	49	0 9
35—39	686	11 9	Unknown	2	
40—44	543	9 5			
			Total:	5745	100.0

The value of the foregoing table is materially impaired by the fact that the age distribution of the men employed in anthracite mines is at present not known. It is possible that the forthcoming results of the Twelfth Census may give the required information, but in view of the curtailment of census appropriations, it is doubtful whether the analysis was extended, as indeed is desirable, to the age distribution of occupations by divisional periods of life.

The Relation of Place of Birth to the Accident Rate

The same conclusion, in part, applies to the factors of race and nativity, which also have an important bearing upon the frequency of accident occurrence. As shown by the table, which follows, the proportion of Polish mine workers injured during the five-year period was 25.1 per cent, or not much less than the proportion of native-born Americans, returned as 26.6 per cent. A serious question may be raised, however, as regards the accuracy of the nativity returns, since it is difficult to believe, for illustration, that the number of Magyars and Greeks, as well as Austrians, was not larger than actually reported. Apparently, many men of these nativities were returned as Slavs, which is a rather indefinite term in popular usage, although ethnologically well defined and understood.

TABLE IV. NATIVITY OF PERSONS INJURED IN NON-FATAL ACCIDENTS IN PENNSYLVANIA ANTHRACITE COAL MINES, 1907–1911

Nativity	Number Injured	Per cent. of Total	Nativity	Number Injured	Per cent. of Total
American	1530	26.6	Lithuanian	529	9.2
Arabian	2	0.0	Magyar	3	0.1
Austrian	161	2.8	Mexican	1	0.0
Bohemian	2	0.0	Montenegrin	2	0.0
English	157	2.7	Norwegian	1	0.0
Finnish	7	0.1	Polish	1442	25.1
French	6	0.1	Russian	261	4.5
German	147	2.6	Scotch	19	0.3
Greek	12	0.2	Slavish	379	6.6
Horvat (Croatian)	3	0.1	Swedish	11	0.2
Hungarian	141	2.5	Syrian	3	0.1
Irish	308	5.4	Tyrolean	18	0.3
Italian	391	6.8	Welsh	209	3.6
			Total:	5745	100.0

Conjugal Condition

The same conclusion as to inherent inaccuracy would seem to apply to the returns as to conjugal condition. Out of 5745 injured mine employees, 56.1 per cent. were returned as married, 43.6 per cent. as single, but only 0.1 per cent. as widowers. It is practically certain that the widowers were returned as married, in conformity to local usage. From a legal point of view, in connection with workmen's compensation legislation, it is of considerable importance that returns of this kind should be accurate and conclusive, since the compensation rates vary according to the relationship of dependent survivors.

TABLE V. CAUSES OF NON-FATAL ACCIDENTS IN THE ANTHRACITE COAL MINES OF PENNSYLVANIA, 1907–1911

	Fall of coal	Fall of rock or slate	Falls into shafts	Mine cars	Explosions of gas or dust	Explosions of powder	Explosions of blasts	Explosions of boilers	Ma-chinery	Elec-tricity	Horses or mules	Tim-ber	Miscell-aneous	Total
Inside employees														
Mine foremen	3	3	3	11	3	2	..	..	..	..	3	1	8	37
Asst. mine formen	1	1	3	6	8	1	..	..	1	..	1	..	3	25
Firebosses	2	1	..	5	12	..	1	..	..	..	..	..	1	22
Miners	549	702	46	170	372	152	203	..	9	..	5	8	109	2325
Miners' laborers	214	454	49	378	127	56	38	8	20	2	7	53	114	1520
Drivers and runners	17	41	11	601	20	6	4	..	17	2	74	5	62	860
Door boys and helpers	..	..	..	62	5	1	..	..	..	2	5	1	9	85
Pumpmen	2	2	1	2	3	..	..	1	..	..	..	..	10	21
Company men	11	33	7	61	17	2	4	..	4	2	7	8	44	200
Other inside	22	29	17	84	19	8	3	2	4	..	3	6	34	231
Total	821	1266	137	1380	586	228	253	11	55	8	105	82	394	5326
Outside employees														
Superintendents	..	..	..	1	2	..	..	..	..	..	..	1	1	5
Foremen	..	1	..	..	2	..	..	..	1	..	..	..	6	10
Blacksmiths and carpenters	1	7	7	16	..	2	..	..	6	1	..	11	15	66
Engineers and firemen	1	4	2	29	1	..	..	9	5	1	..	1	23	76
Slate pickers	1	2	18	14	..	4	..	2	7	..	6	10	45	109
Bookkeepers, etc	..	..	..	..	..	..	..	..	..	..	..	..	..	..
Other outside	4	8	15	46	3	2	1	4	24	..	1	1	44	153
Total	7	22	42	106	8	6	3	15	43	2	7	24	134	419
Grand total	828	1288	179	1486	594	234	256	26	98	10	112	106	528	5740
Per cent.	14 4	22.4	3.1	25.9	10.3	4.1	4 5	0.5	1.7	0.2	1.9	1.8	9.2	100.5

The causes of injuries have been classified in reasonable detail in the table which follows, and the minor occupations have been grouped on account of the required limitation of space. For scientific purposes the occupations in detail would be of considerable importance, but the value of the analysis diminishes on account of decreasing numbers by minute classification, which can only be made to advantage for a much longer period of time or upon the basis of much more complete returns than are at present available.

Table V is self-explanatory and requires no extended discussion. It is shown that of the accidents reported, 25.9 per cent. were due to mine cars, 22.4 per cent. to falls of rock or slate, 14.4 per cent. to falls of coal, and 10.3 per cent. to gas or dust explosions. These four principal groups of causes, therefore, accounted for 73 per cent. of the non-fatal accidents from all causes.

Nature of Injuries

The foregoing discussion has been with reference to the general facts of non-fatal injuries in anthracite mines, which it is necessary to take into consideration in a subsequent discussion of the nature of the injuries sustained.

TABLE VI. PARTS OF THE BODY INJURED IN NON-FATAL ACCIDENTS IN THE ANTHRACITE MINES OF PENNSYLVANIA, 1907-1911

Occupation	Number of employees	Head	Face	Eye	Eyes	Nose	Shoulder	Shoulders	Arm	Arms	Wrist	Wrists	Hand	Hands	Finger	Fingers	Collar-bone	Collar-bones	Rib	Ribs	Trunk	Hip	Hips	Leg	Legs	Knee	Knees
Inside employees																											
Mine foremen	2,128	1					2										1			1	1		2	10		2	
Asst. mine foremen	3,676					1			1				1							1	1			7	1	1	
Firebosses	3,728	3																	1	1				3			
Miners	221,025	105	38	9	10	5	21		99	3	1	2	28	15	15	19	44		13	74	157	62	12	561	8	4	4
Miners' laborers	160,014	88	15	4	18	11	19	10	79	9	4		10	12	14	10	32		7	34	48	25	7	574	15	8	1
Drivers and runners	58,983	34	15	1		3	11	2	96	1	9	1	18	6	22	15	25	6	4	24	31	16	21	245	13	12	1
Door boys and helpers	13,560	3	1				2		10	1	1					1	4		1	2	3	1	1	28		6	
Pumpmen	5,468	1					1		4					1					1	1	2			3			
Company men	65,461	5	1	2	2			1	13		3		3	2	1	2	6		2	11	4	4	2	66	2	3	
Other inside employees	78,890	10	3				4	1	27	1		1	8	5	4	3	5	1	1	6	8	3	2	54	12	4	
Total	612,933	250	103	16	30	20	60	14	329	15	18	4	68	41	56	50	117	7	30	155	255	111	47	1551	51	40	6
Outside employees																											
Superintendents	707		1					1														1		1			
Foremen	2,158								2															1			
Blacksmiths and carpenters	14,191	5		1		1	4		8		1				3	2			2	4	3	2		14			
Engineers and firemen	29,832	4		1		1	1	1	9				1		2	1	2		1	4	4			16	1	1	
Slate pickers	61,333	8	1			1	2	2	25	1	4		2	1		2	1			1	3	1		25	8		
Bookkeepers and clerks	4,313																										
Other outside employees	130,518	8		2		1	1		27		1		5	2	7	3	3			4	5	1	1	44	2	2	
Total	243,052	25	2	4	0	4	8	4	71	1	6	0	8	3	12	8	6	0	3	13	15	5	1	101	11	3	0
Grand total	855,985	275	105	20	30	24	68	18	400	16	24	4	76	44	68	58	123	7	33	168	270	116	48	1,652	62	43	6
Percentage		4 8	1 8	0 3	0 5	0 4	1 2	0 3	7 0	0 3	0 4	0 1	1 3	0 8	1 2	1 0	2 1	0 1	0 6	2 9	4 7	2 0	0 8	28 8	1 1	0 7	0 1

Occupation	Ankle	Ankles	Foot	Feet	Toe	Toes	Internal	Not Specified	Eye and other	Eyes and other	Leg and other	Legs and other	Arm and other	Arms and other	Hand and other	Hands and other	Finger and other	Face and other	Head and other	Other combinations	Total	Rate per 1000 employed
Inside employees																						
Mine foremen	2	1	2					2			1		1			5				3	37	13 6
Asst. mine foremen							1	2							1	5					25	6 8
Firebosses								5							2	5				2	22	5 9
Miners	45	2	44	1	9	8	5	221	3	1	26	6	13	3	7	281	1	160	25	155	2325	10 5
Miners' laborers	27		12	13	2	3	16	101	2		49	1	4	1	1	47	1	31		95	1520	9 5
Drivers and runners	14	9	44	4	5	4	15	35			4	1	5	1	1	8	1	4	3	67	860	14 6
Doorboys and helpers			2					10							3	3				2	85	6 3
Pumpmen							1	3					1			1				1	21	3 8
Company men	3		6		2	2	2	20			6		3		1	8				12	200	3 1
Other inside employees	5		5		1	3	4	15			2	4			1	9		3	2	14	231	2 9
Total	96	12	145	18	19	20	44	414	5	1	88	15	27	5	17	372	3	200	30	351	5326	8 7
Outside employees																						
Superintendents							1									1					5	7 1
Foremen			1										1	1						3	10	4 6
Blacksmiths and carpenters			2			1		3							1				1	8	66	4 7
Engineers and firemen	1		6		2	1	1	3			1				4	3		1		3	76	2 5
Slate pickers	1		6			2		5					1							6	109	1 8
Bookkeepers and clerks																						
Other outside employees	4	1	10		1	1	1	5					1	3		1		2		4	153	1 2
Total	6	1	25	0	3	5	3	16	0	0	1	2	5	0	5	5	0	3	1	24	419	1 7
Grand total	102	13	170	18	22	25	47	430	5	1	89	17	32	5	22	377	3	203	31	375	5745	6 7
Percentage	1 8	0 2	3 0	0 3	0 4	0 4	0 8	7 5	0 1	0 0	1 5	0 3	0 6	0 1	0 4	6 6	0 1	3 5	0 5	6 5	100 0	

It is much to be regretted that the reports do not state the duration of the injuries, since the total amount of compensation is naturally conditioned by the length of time for which the compensation is paid. To a certain extent, of course, the probable duration of injury is indicated by the nature of the injury sustained, and the following table gives in detail the single injuries as well as the complicated injuries where more than one part of the body was affected.

Considering the large number of complications possible, it has been necessary to combine some of the injuries, which, however, are not of sufficient numerical importance to affect the results. The proportion of not specified injuries was 7.5 per cent. of the whole, and of injuries combined but not available for tabular analysis, 6.5 per cent. The table exhibits the principal groups of occupations, together with the estimated number of employees for the five-year period, the percentage distribution of single and combined causes in detail, and the non-fatal accident rate per 1000 employed for each specified group.

The foregoing results have been summarized in the next and concluding table, in which the bodily injuries have been arranged somewhat in conformity to the human anatomy. This table is of unusual interest and is the first statement of its kind exhibiting with approximate accuracy, the nature of the injuries sustained in anthracite mining, with a due regard, however, to the necessity of combinations, and returns too indefinite for scientific classification. The proportion of

such returns and the data not available for analysis was 14 per cent. and to that extent the table is open to criticism, although there are no reasons for believing that any one class of minor injuries is more affected by this degree of uncertainty than another.

Most Accidents Are to Lower Extremities

The foregoing table exhibits the rate of non-fatal injuries according to their nature per 1000 employed, together with the percentage distribution of the injuries according to the part of the body affected. It is shown that the lower extremities, including the hips, represent the largest group, or 11.5 per cent. of the whole, followed by the upper extremities, including the shoulders, which account for 21.1 per cent. Injuries to the head, including the eyes and nose, account for 12.1 per cent., or about the same as injuries to the trunk, including the collar bones and internal injuries not otherwise specified, which account for 11.3 per cent.

TABLE VII. PARTS OF BODY INJURED IN NON-FATAL ACCIDENTS IN THE ANTHRACITE MINES OF PENNSYLVANIA, 1907–1911

Part injured	Number injured	Rate per 1,000 employed	Per cent. of total
Head	306	0 36	5 3
Face	308	0 36	5 4
Eyes	56	0 07	1 0
Nose	24	0 03	0 4
Total	694	0 81	12.1
Shoulder	86	0 10	1 5
Arm	453	0 53	7 9
Wrist	28	0 03	0 5
Hand	519	0 61	9 0
Finger	129	0 15	2 2
Total	1215	1 42	21.1
Collar bone	130	0 15	2 3
Rib	201	0 23	3 5
Trunk	270	0 32	4 7
Internal	47	0 05	0 8
Total	648	0 76	11.3
Hip	164	0 19	2 9
Leg	1820	2 13	31 7
Knee	49	0 06	0 9
Ankle	115	0 13	2 0
Foot	188	0 22	3 3
Toe	47	0 05	0 8
Total	2383	2 78	41 5
Other and not specified	805	0 94	14 0
Grand total	5745	6 71	100 0

In more detail, the most important cause of injuries was to the legs, or 31.7 per cent., followed by injuries to the hands, or 9.0 per cent., and to the arms, or 7.9 per cent. The analysis proves the economic importance of compensation, in that evidently a considerable amount of prolonged incapacity for work resulted from the injuries sustained. If the returns were more complete, it is safe to assume that the number of minor injuries would be largely of a nature not involving continued absence from work, or chiefly to the fingers, hands, wrists and feet, including ankles and toes. Eye injuries have been comparatively infrequent, at least of the most serious kind, for, according to the table, there were only 56 such injuries, equivalent to 1 per cent. of all injuries, or 0.07 per 1000 employed.

Internal Injuries Are Rare

Internal injuries also appear to have been comparatively rare, the actual number having been 47, and the proportion 0.8 per cent. of the whole, or 0.05 per 1000 employed. The relatively small number and proportion of internal injuries, however, is accounted for by the fact that most of such injuries in mine labor are followed by fatal results.

The foregoing discussion is merely intended as a brief contribution towards a better understanding of the accident problem in anthracite mining. The discussion suggests the economic importance of non-fatal mine injuries and the imperative necessity for more complete and, as far as practicable, uniform returns, to provide a better basis than is at present available for discussions of workmen's compensation problems in coal-producing states, with special reference to the needs of mine workers.

Definitions of Fatalities and Injuries

It may be suggested that every accident involving an absence from work of more than one day should be reported, and that accidents which do not result in death within seven days should be listed not as fatalities but as injuries. At present the definitions vary and accidents reported in one state as non-fatal would be reported in another as fatal. In order to avoid a subsequent correction of the record, after several months have intervened, most of the states class fatalities which occur long after the accident as merely injuries.

As a final illustration of the economic importance of the non-fatal accident problem, it may be pointed out that if the non-fatal accident rate experienced in the British mines is assumed to prevail in the Pennsylvania anthracite mines, the amount of compensation required on the British basis of $24.70 per accident, would have been $3,560,456. The amount requires only to be stated to emphasize the great practical importance to the employer, the employee and the state, of trustworthy accident statistics on the one hand, and of a thorough understanding of the facts on the other.

View of Kentucky First-Aid Meet

Showing the Teams Standing at Attention Ready to Commence Work

Meeting of Kentucky Mining Institute

SYNOPSIS—The spring meeting of the Kentucky Mining Institute was held in Lexington, Ky., May 16 and 17. In addition to several interesting papers which were read, there was a state-wide first-aid meet, with 24 teams competing.

The first-aid field meet held in connection with the spring meeting of the Kentucky Mining Institute at Lexington on May 16, took place on the athletic field of the State University.

An address of welcome was delivered by President Barker of the Kentucky College, after which there was a short drill by the cadets of the state school. Following this the first-aid teams lined up preparatory to commencing the contest. The events were as follows:

First Event—Lacerated wound in palm of left hand. Right-thigh compound fracture, bleeding; patient carried 50 ft. on an improvised stretcher. Full-team event.

Second Event—Treat burns of face, neck, ears and hands. Two men carry patient without stretcher. Two-man event.

Third Event—Dislocated shoulder left side; right foot mashed, bleeding. Full-team event.

Fourth Event—Man overcome by gas; one man shoulder, lift and carry to place of safety. Perform standard form of respiration. One-man event.

Fifth Event—Man to fall on electric wire; back down, unsconcious. Rescue, give artificial respiration, one minute; treat burns on back and right upper arm. Improvise stretchers; carry 50 ft.

LIST OF TEAMS

No. 1—Wallsend: James Dixon, captain; Robert Coswell, Thomas McDonald, James McGleneroy, James Wicks.

No. 2—Stearns Coal Co.: Earl Malley, captain; Brier Donaldson, Harry Donaldson, Sam McMurry, Clabe Brier, Elmer Chitwood.

No. 3—Rim No. 1: Anderson Manon, Harry W. Fritts, J. Grayson Ponder, Charles McPherson, John Shelton, Jim Stone, Captain. Instructed by Dr. E. M. Howard.

No. 4—Stearns, No. 2: Nels Robbins, captain; Will Taylor, Alec Taylor, Ben Sweet, Jacob Reeves, Louis Burnet.

No. 5—Barker, No. 1: J. W. Dean, captain; J. I. Stone, E. G. Moore, Henry Hubbard, James Hampton, Chas. Mailer, Joe Cox, Dr. B. E. Giannini.

No. 6—Luzerne.

No. 7—Arjay: Sid Ingram, captain; R. A. Billings, L. M. Disney, R. F. Frye, Walter Fortner, Joe C. Cobb, Dr. Fred D. Haston.

No. 8—St. Bernard Coal Co.: Tom Peyton, captain; Wads Cole, F. Griffin, Chas. Ray, James Cloren, Will Donnelly.

No. 9—Barker No. 2: William Taulbee, captain; Charles Pressnell, John Sutton, J. S. Dozier, Perry Lone, Chas. Moore, Dr. B. E. Giannini.

No. 10—Jenkins No. 1: Lester Shrum, captain; Louis Biggs, James Walker, G. W. Rucker, Forest Bice, Thad Shunk.

No. 11—Rim No. 2: John Clark, captain, Ben Stone, Halsey Johnstone, William Anderson, James Phillips, Charles Robins; instructed by Dr. E. M. Howard.

No. 12—Stearns Coal Co., No. 3: Joe Henry, captain; Lee Tourds, Sid King, Oscar Ross, Jim Strunk, Silas Jones.

No. 13—Glendon: John Onks, captain; Frank Bowman, John T. Lackard, Jim Lay, Bentley Messer, Dr. Fred D. Haston.

No. 14—Van Lear: J. P. Jennings, captain; Noah Henson, William Joushon, J. M. Stambaugh, Grover Wolf, Carl Picklesiner.

No. 15—Castro: James Hyatt, captain; Wilson Spivy, Walter Lock, Walter Green, Elijah Burke, Tip Jackson.

No. 16—Graham: W. B. Hager, captain; S. E. Hite, W. L. Cash, P. H. Morgan, T. J. Vinson, J. H. Spencer, W. D. Duncan Coal Co., of Greenville, Ky.

No. 17: Geraldine: Smith Snow, captain; William J. Black, Ed. Whittaker, Ballard Mattimgly, Harvey Markham, Floyd Mills, Dr. F. D. Haston.

No. 18—Stearns No. 4—Reason Cecil, captain; Ed. Winchester, John Smith, John Hiffdon, Jim De Prossett, Bill Bowman.

No. 19—Cary: Ed. Duncan, captain; John Stillings, Frank Bradshaw, Francis Dunn, Thad Idol, Will France.

No. 20—Stearns, No. 5: Noble Stevens, captain; Dault Boyce, Edgar Phillips, Carl Fleming, Homer Stevens, George Smith.

No. 21—Auxier: John Ward, captain; M. L. Cornutte, John Coyer, Dave Corder, A. M. Alley, Ancil Rogers, Northeast Coal Co.

No. 22—Benham: L. D. Smith, Verner Luigart, J. R. Foster, Orby Hall, Orion Kelly. Wisconsin Steel Co.

The colored teams, Barker No. 3 and Rim No. 3, from the Continental Coal Corporation competed for Events 3, 4 and 5.

PRIZES

First prize, a silver loving cup, donated by the Goodman Manufacturing Co., of Chicago, and $60 in cash donated by the Jeffrey Manufacturing Co., of Columbus, was tied for by the following teams:

Team No. 9, Barker No. 2, Continental Corporation, 99 1/8 per cent.; team No. 22, Benham, Wisconsin Steel Co., 99 1/8. By agreement the money was divided and the cup was given to the Benham team to keep for six months, when it will be sent to the Pineville team and at the meeting in October it will be contested for as a side event between these two teams.

Second prize, a Johnson & Johnson first-aid cabinet, one Woods emergency case, five copies of Johnson's First-Aid Manual, and one-half dozen rubber-cloth covered first-aid packets. Won by team No. 10, Jenkins, Consolidation Coal Co., 98 1/8.

Third prize, an electric-lamp outfit and a safety lamp. Won by team No. 8, St. Bernard Mining Co., Earlington, Ky., 98 1/8.

Fourth prize, clock mounted in cannel coal. Was won by team No. 3, Rim No. 1, Continental Coal Corporation, 98.

Colored teams, Barker No. 3, 91⅜, Rim No. 3, 95.

RATINGS

No. 1, 92; No. 2, 97 1/8; No. 3, 98; No. 4, 95 3/8; No. 5, 97 3/8; No. 6, 75 1/8; No. 7, 97; No. 8, 98 1/8; No. 10, 98 4/8; No. 11 96 1/8; No. 12, 97 1/8; No. 13, 94 3/8; No. 14, 96; No. 15, 93 3/8; No. 16, 95 3/8; No. 17, 96; No. 18, 96 2/8; No. 19, 97 4/8; No. 20 95 1/8; No. 21, 97 4/8; No. 22, 99 1/8.

The prizes were awarded by Prof. Norwood, chief state mine inspector. President Barker of the University also presented each team with a banner, and Mr. Wilson, Chief Engineer of the U. S. Bureau of Mines, presented a dozen medals to the teams, giving one medal to each of the twelve teams scoring the highest number of points.

In the evening, at 7:30, a banquet was held at the Phoenix Hotel. Short addresses were delivered by E. W. Parker, Floyd W. Parsons, Pres. Rash, James W. Paul, J. E. Beebe, J. B. Johnston, E. B. Wilson, C. J. Norwood, W. A. Miller and W. L. Moss.

THE MEETING SATURDAY MORNING

On Saturday morning the convention of the Kentucky Mining Institute convened in the Civil Engineering Building of the State University. The meeting was called to order by President Rash. The convention then adopted a memorial to C. F. Frazier, mining engineer, Taylor Coal Co., Beaver Dam, Ky. Next was the reading of a paper by Dr. A. M. Peter on "Calorimeter Tests Made on Kentucky Coal." Then followed a paper on "Workmen's Compensation," by K. W. Meguire, president of the Snead & Meguire Coal Co., Louisville, Ky. Following this was another paper by W. C. Tucker, general superintendent of the Wisconsin Steel Co., Denham Ky. Mr. Tucker discussed "welfare work." After Mr. Tucker came David Victor, chief mine inspector of the Consolidation Coal Co., Fairmont, W. Va., who read a paper on "How Best to Handle the Dry or Dusty Mine."

Because of trouble to the electrical apparatus of the University, it was found impossible to use the stereop-

ticon slides that were necessary to illustrate Mr. Wilbert A. Miller's paper on "Shortwall Mining." Pres. Rash announced, however, that this paper will appear in the proceedings of the Institute.

Next was a discussion on Mine Ventilation by Mr. Weinshank, after which President Rash made a short talk thanking the members of the Institute for the hearty coöperation they had rendered him during his term of office. He then called for nominations for a new president and Mr. Davies presented the name of White L. Moss. The nomination of Mr. Moss was made unanimous, and he was elected president of the Institute for the ensuing year.

The committee on nominations reported further elections as follows: For secretary and treasurer, T. J. Barr; for vice-presidents from the following districts of Kentucky: For the central district, B. R. Hutchcraft; for the western district, T. E. Jenkins of Sturgis, Ky., and C. W. Taylor of the W. P. Duncan Coal Co.; for southeastern Kentucky, James Butler of Stearns, and W. C. Tucker of the Wisconsin Steel Co., Benham; for the northeastern district, L. G. Abbott and H. LaViers. There being no further nominations, the foregoing were duly elected to the offices suggested.

The meeting closed after a further discussion on ventilation by Messrs. Victor Weinshank and Paul.

⁂ ⁂

Heat in the Volatile Matter of Coal

By Alfred M. Peter*

SYNOPSIS—The author endeavors to separate the heat of combustion of the volatile combustible matter in coal from that of the fixed carbon. He uses several analyses of coals from the Kentucky field and concludes that the bituminous matter from the Eastern field is more heat-giving than that from the Western. The heat from the volatile combustible matter is much greater than that from fixed carbon and appears to reach 17,412 B.t.u., whereas carbon on burning only generates 14,500.

⁂

During the years when the Kentucky Geological Survey was being conducted under the able and efficient directorship of Charles J. Norwood, with headquarters at State University, a number of calorimeter determinations were made upon samples of coal obtained from different mines in the state. For this work Prof. Norwood provided, first a Parr fuel calorimeter and later one of the Emerson design, the latter being a new form of the bomb type of calorimeter and capable of giving results as accurate as those obtainable with the other standard instruments of this type but much easier to manipulate and more rapid in action.

The determinations were made at different times by Prof. Norwood's assistants, Messrs. Quickel, McHargue and Calloway. Some of these results have been published in the report of progress of the survey for the years 1908 and 1909; some are to be found in the bulletins of the survey, part of which, however, are still in the hands of the public printer, and I believe some have never been published.

Is the Volatile Combustible in the Kentucky Coals All Equally Heat-Giving?

I intend to take only a few of the determinations, those which are most representative of the more important coal beds in the state, and I shall endeavor to ascertain whether that part of the coal which is both volatile and combustible is of equal heating value in all the coals presented, considering, of course, the quantity of such matter in the coal.

Where coal has a large amount of volatile combustible matter, we naturally expect it to have a high heating value because of the large amount of hydrocarbons which are contained in such matter. Hydrogen, on burning, produces 62,000 B.t.u. per pound, whereas carbon develops only 14,500 B.t.u., and for this reason we would expect matter containing hydrocarbons to give more heat than fixed carbon when burned.

On the other hand, volatile combustible matter contains more or less oxygen, and its presence indicates that the coal is more or less an oxidized product and, therefore, less capable on combustion of giving out all the heat which a completely unoxidized body would emit on burning. Moreover, in this volatile combustible part of coal, sulphur and nitrogen are included, the former having a low heat value, about 4000 B.t.u. per pound when burning, and the latter oxidizing with the emission of but little heat. In the incombustible volatile matter, more or less water is found. This is derived from the clay which forms after burning a part of the ash constituent. Thus, if the volatile matter has a varying composition, it may have a variant ability to emit heat when burned.

I propose to estimate the heat in this volatile part of the coal by deducting the heat generated by burning fixed carbon or coke from that which is obtained when the original sample is burned. This deduction for the heat of the fixed carbon will not be taken from coke prepared in the laboratory, nor from the same sample of coal of which the heat of combustion is determined but will be derived as an average from 7 commercial cokes made from coal mined in Kentucky and consumed in a Parr calorimeter.

Had this investigation been kept in view at the time the survey made the tests on Kentucky coals, the goal would have been more certainly attained by actually determining the heat of combustion of the coke from a sample of coal which was a duplicate of the fuel tested in the calorimeter.

AVERAGE ANALYSIS AND HEAT OF COMBUSTION OF 7 COMMERCIAL COKES FROM KENTUCKY COAL

	Highest Value	Lowest Value	Average Value
Moisture	0.77	0.02	0.35
Volatile combustible matter	1.62	0.19	0.89
Fixed carbon	90.61	79.23	84.63
Ash	19.16	9.07	14.13
Total			100.00
Sulphur	2.01	0.45	1.01
B.t.u. per lb. of coke	12,717	10,283	11,703
Total combustible matter (100 − moisture − ash)			85.52
B.t.u. per lb. of same	14,491	12,842	13,684

*Chief chemist, Agricultural Experiment Station, Kentucky State University, Lexington, Ky.

Abstract of paper entitled "Some Calorimeter Determinations of Kentucky Coals," read at the Kentucky Mining Institute, Kentucky State University, Lexington, Ky., May 17, 1913.

From this table it appears that the average heat value of the combustible matter in these samples of coke was 13,680 B.t.u. per pound, and, in the absence of better data, I propose to use this figure in the calculations which are to follow.

Why Coke Burns with Less Heat than Amorphous Carbon

The range of variation in the analysis of these samples and in their heat values as thus determined, is quite large and the figure for the average heat value is considerably lower than that usually accepted for carbon. There are, however, certain reasons why the heating value of the combustible matter in coke should not be as great as that of pure carbon. Coke always contains more or less sulphur as well as small percentages of nitrogen and hydrogen.

Hydrogen, of course, would tend to bring up the value a little, whereas, sulphur and nitrogen would reduce it. Besides this, according to the statements of the textbooks, Favre and Silbermann, whose work was published in 1852, declare that the heat value for graphitic carbon is decidedly lower than that for the amorphous form of that element, and it is probable that a part, at least, of the carbon in coke is graphitic in character. The value, 13,680 B.t.u., therefore, does not seem unreasonably low.

In recent literature there seems to be little which bears upon the subject of this investigation. One chemist, however, seems to have made some careful inquiries along much the same lines, but unfortunately I have the account of his work only in the form of the brief summary which appeared in the Abstract Journal of the American Chemical Society.[1] The work is a thesis by Herman Streit, entitled "Studies on the Chemical Composition and Heat of Combustion of Cokes Prepared by Different Methods, and on the Determination of the Heat of Combustion of Coals by Calculation."[2]

STREIT'S AVERAGES FOR HEAT OF COMBUSTION OF COKE

For oven coke	14,310 B.t.u.
For gas coke	14,400 B.t.u.
For crucible coke made by the American method of analysis	14,580 B.t.u.

These averages are close to the commonly accepted value for carbon and much higher than the one derived above from Kentucky cokes. Indeed they seem too high.

One of the author's conclusions is that, with few exceptions, due to abnormal composition, as high sulphur, the heat of combustion of cokes can be calculated within about 1 per cent. by multiplying the per cent. of combustible matter by the appropriate factor corresponding to these findings. Thus, for an analysis by the American method, the factor would be 115.8. Another conclusion is that the heat of combustion of the total combustible matter of coke obtained by the same method from different coals is the same, but differs if different methods are employed. The author also concludes that the chemical composition and hence the heat of combustion of the combustible matter of a coal depends on the method of coking.

A paper by H. Bunte, entitled "Notes on the Byproducts of the Gas Industry,"[3] an abstract of which was seen in the Journal of the Society of Chemical Industry,[4] contains data of interest in this connection. The author reports the chemical analysis and heat of combustion of 12 gas cokes, mostly German.

LABORATORY DETERMINATION OF 12 GAS COKES

Ultimate analysis combustible part of cokes	
Carbon	94.18 per cent.
Hydrogen	0 90
Oxygen and nitrogen	3 77
Sulphur	1 13
	99 98
Proximate of analysis of original coal	
Total combustible matter	89 11
Water and ash	10 89
	100 00
Actual and theoretical determinations of heat values	
B.t.u. per lb. of total combustible matter, from the calorimeter determinations	14,101
Calculated from the analysis by Dulong's method	14,096

This value, also, is higher than that obtained from the Kentucky cokes, but tends to confirm it because gas cokes are presumably less thoroughly carbonized than are oven cokes and would be expected to have a somewhat higher heat of combustion on account of their containing more hydrocarbons.

Having decided upon a value for the heat of combustion of the combustible matter in coke, we may determine, by difference, what the heat of combustion of the volatile combustible matter in a coal should be, if we have the proximate analysis of the coal and its heating value as determined by the calorimeter.

Allowance Is Made for Water of Constitution in Clay

In order to get the total combustible matter in applying this method, I have decided to subtract not only the ash and moisture but in addition a further 10 per cent. of the ash, which is an allowance made for the combined water contained in the ash constituents before heating.

The ash of coals is composed largely of clay and it is evident that this clay must have contained its proper amount of combined water before the coal was burned. This water would be driven off with the volatile combustible matter and be counted with it in the analysis. Kaolin contains about 13 per cent. of combined water, but as the ash is not all clay I have assumed 10 per cent of the weight of the ash as approximately representing the original amount of water in combination.

Accordingly, in the following calculations, one-tenth of the ash has been, in each case, deducted from the amount of volatile combustible matter shown in the analysis of the coal. The percentage of fixed carbon multiplied by 136.8 gives the heat of combustion of the fixed carbon. This deducted from the heat of combustion of the original coal gives the heat of combustion of the volatile combustible matter, which, divided by the weight of that matter, corrected as already explained for combined water, gives the heat of combustion per pound of the volatile combustible matter.

These calculations have been made upon the analyses representing coal from five of the important beds of ordinary bituminous coal and also upon a number of cannel coals, as shown in the following tables, which give the data for the calculations and the results. In the last table the final results are brought together and a comparison of them is interesting. As was to be expected, the cannel coals show considerably the highest heat of combustion, both for the total and for the volatile combustible matter.

[1] "Chemical Abstracts," Vol. 2 (1908), p. 1040.
[2] Herman Streit, Dissertation, Univ. Zürich, 1906, p. 115.
[3] J. fur Gasbelenchtt, 40, 1897, pp. 405-407.
[4] J. Soc. Chem. Ind., xvi (1897), pp. 661-662.

The Volatile Matter of the East Kentucky Field Has More Heat Units Than That of the West

The most important point brought out in this table is that the coals of two important beds, Nos. 9 and 11, in the Western field, agree pretty closely in the heats of combustion of their total combustible matter and of their volatile combustible matter, but differ materially in these respects from the coals of three important beds in eastern Kentucky. It is seen that the heat of combustion of the volatile combustible matter from the Eastern Kentucky coals approximates more nearly that of cannel coal than that of the western Kentucky coals. I believe this observation is a new one and while I do not know that it has any practical application, it seems to me to be worth recording. It would be interesting to extend this study to coals of other important beds, but the time at my disposal did not permit this in the present communication.

In conclusion I desire to thank Mr. J. S. McHargue for assistance in looking up the literature. It is proper also to say that he made nearly all the chemical analyses used in this paper.

CALCULATION OF HEATS OF COMBUSTION OF TOTAL COMBUSTIBLE MATTER AND VOLATILE COMBUSTIBLE MATTER

Coal No. 11. Western Coal Field. Average of 12 samples from Muhlenberg, Union and Webster Counties.

	Highest Value	Lowest Value	Average Value
Moisture	5 87	1 16	4 11
Volatile combustible matter	41 78	37 55	39 67
Fixed carbon	51 11	41 58	47 63
Ash	15 52	5 62	8 59
Total			100 00
Sulphur	4 69	2 64	3 59
B.t.u. per lb. of coal	13,450	10,722	12,833
B.t.u. of 0.4763 fixed carbon @ 13,680 per lb.			6,516
B.t.u. of 0 3967 volatile combustible matter			6,317
B.t.u. per lb. of same after deducting 1 10 of the ash			16,277
Total combustible matter (100 less moisture, ash and 1 10 of the ash)			86 44
B.t.u. per lb. of same $\left(\frac{12,833}{0\ 8644}\right)$			14,846

Coal No. 9. Western Coal Field. Average of 16 samples from Daviess, Henderson, Hopkins and Webster Counties.

	Highest Value	Lowest Value	Average Value
Moisture	7 32	2 41	4 17
Volatile combustible matter	38 47	34 24	37 19
Fixed carbon	54 34	46 03	49 62
Ash	14 02	5 46	9.02
Total			100 00
Sulphur	1 34	1 96	3 26
B.t.u. per lb. of coal	13,235	11,821	12,730
B.t.u. of 0 4962 fixed carbon @ 13,680 per lb.			6,788
B.t.u. of 0 3719 volatile combustible matter			5,942
B.t.u. per lb. of same after deducting 1 10 of the ash			16,374
Total combustible matter (100 less moisture, ash, and 1 10 the ash)			85 91
B.t.u. per lb. of same $\left(\frac{12,730}{0\ 8591}\right)$			14,818

Pineville Coal. Eastern Coal Field. Average of 5 samples from Bell County.

	Highest Value	Lowest Value	Average Value
Moisture	2 47	1 13	1 70
Volatile combustible matter	39 03	35 50	36 91
Fixed carbon	61 22	56 85	59 21
Ash	3 16	1.34	2 19
Total			100 00
Sulphur	0 91	0 71	0 79
B.t.u. per lb. of coal	14,952	14,141	14,447
B.t.u. of 0 5920 fixed carbon @ 13,680 per lb.			8,099
B.t.u. of 0 3691 volatile combustible matter			6,348
B.t.u. per lb. of same after deducting 1 10 of the ash			17,302
Total combustible matter (100 less moisture, ash and 1 10 the ash)			95 89
B.t.u. of same $\left(\frac{14,447}{0\ 9589}\right)$			15,066

Upper Elkhorn Coal. Eastern Coal Field. Average of 5 samples from Pike County.

	Highest Value	Lowest Value	Average Value
Moisture	1 70	1 50	1 61
Volatile combustible matter	35 65	32 80	34 51
Fixed carbon	61 80	60 05	60 92
Ash	5 25	1 05	2 96
Total			100 00
Sulphur	0 65	0 61	0 63
B.t.u. per lb. of coal	14,755	13,540	14,205
B.t.u. of 0 6092 fixed carbon @ 13,680 per lb.			8,334
B.t.u. of 0 3451 volatile combustible matter			5,871
B.t.u. per lb. of same after deducting 1 10 of the ash			17,161
Total combustible matter (100 less moisture, ash and 1 10 of the ash)			95 13
B.t.u. per lb. of same $\left(\frac{14,205}{0\ 9513}\right)$			14,932

Lower Elkhorn Coal. Eastern Coal Field. Average of 5 samples from Floyd and Pike Counties.

	Highest	Lowest	Average
Moisture	2 58	1 67	2 04
Volatile combustible matter	37 15	31 39	34 14
Fixed carbon	64 10	50 87	58 45
Ash	9 40	1 80	5 37
Total			100 00
Sulphur	1 57	0 50	0 82
B.t.u. per lb. of coal	14,835	12,870	13,797
B.t.u. of 0 5845 fixed carbon @ 13,680 per lb			7,996
B.t.u. of 0 3414 volatile combustible matter			5,801
B.t.u. per lb. of same, after deducting 1 10 of the ash			17,265
Total combustible matter (100 less moisture, ash and 1 10 the ash)			92 06
B.t.u. per lb. of same $\left(\frac{13,797}{0\ 9206}\right)$			14,987

Cannel Coal. Eastern Coal Field. Average of 10 samples from Bell, Breathitt Johnson, Leslie and Morgan Counties.

	Highest Value	Lowest Value	Average Value
Moisture	2 74	0 68	1 45
Volatile combustible matter	53 09	38 75	46 25
Fixed carbon	53 91	31 72	39 18
Ash	25 62	5 64	13 12
Total			100 00
Sulphur	1 88	0 54	1 16
B.t.u. per lb. of coal	14,244	10,695	13,185
B.t.u of 0 3918 fixed carbon @ 13,680 per lb.			5,360
B.t.u. of 0 4625 volatile combustible matter			7,825
B.t.u. per lb. of same after deducting 10 per cent. of the ash			17,412
Total combustible matter (100 less moisture, ash and 1 10 the ash)			84 12
B.t.u. per lb. of same $\left(\frac{13,185}{0\ 8412}\right)$			15,674

TABULATED SUMMARY

	B.t.u. per pound of Total Combustible Matter	B.t.u. per pound of Volatile Combustible Matter
Western Field		
Coal No. 11	14,846	16,277
Coal No. 9	14,818	16,374
Average	14,832	16,326
Eastern Field		
Pineville Coal	15,066	17,302
Upper Elkhorn Coal	14,932	17,161
Lower Elkhorn Coal	14,987	17,265
Average	14,995	17,264
Eastern Field		
Cannel Coal	15,674	17,412

The Kentucky Coal Mining Industry and Workmen's Compensation

An interesting paper with the title given above was read before the Kentucky Mining Institute by K. U. Meguire. We hope to publish the principal part of this article in our next issue.

A European method of disposing of a large gob fire is to first locate the area by testing the temperature of the goaf with metallic rods. The limits of the spontaneous combustion being defined, roads are opened to it through the goaf and the fire or heated material dug out, the space being filled in with sand or flue dust.

Welfare Work at Benham, Kentucky

By W. C. Tucker*

SYNOPSIS—A detailed discussion of the sociological work being carried on by a subsidiary of the International Harvester Co. in its coal mines. The article includes some interesting remarks on Workmen's Compensation Laws, and suggests a basis for the enactment of such legislation.

In building the town of Benham we built neat comfortable houses of two, three, four and five rooms. These houses are on stone foundations, have novelty siding or weather-boarding and are plastered throughout with one coat of wood-fibre plaster. We have found that plaster is more cleanly and sanitary, makes a warmer, cleaner house, and is at the same time cheaper than good ceiling.

There are chimneys with grates in every room except the kitchen, which is provided with a brick flue. The town is cut up into blocks by regularly laid out streets, each house is fenced separately with a neat picket fence in front, and the back yard has either a board or woven wire fence, and there are alleys through center of blocks in rear of lots for convenience in removing refuse, delivering coal, etc.

Water is piped to the back yard of every house from a dam built across a small mountain stream and impounding about one-half million gallons of water suitable for all domestic uses. Electric lights are furnished at the rate of 25c. per room per month, the tenant supplying the lamps after the initial installation. The houses are painted and trimmed in different colors and are of different designs, the idea being to give the appearance of a village where the individual dwellers are owners and have expressed their different ideas in building and painting.

All Yards Must Be Kept Clean

We insist that all tenants keep their yards clean, and we haul away all trash and refuse and furnish lime for the closets, which, by the way, are the ordinary outside type as we have no general sewage system—a vault is dug in the ground, cased with lumber, and the closet set over this and filled around with earth to exclude light and flies.

Under the plan followed by all mines our employees contribute a fixed sum toward a medical fund, which, is used to pay our physician a fixed salary and to pay for all drugs; this also provides a visiting nurse, an experienced trained graduate nurse who visits the homes, attends the sick and instructs the mothers in the care of their babies and helps the physician in operations or accidents.

We have three churches, one for the colored population, also one for the catholics, and another for the use of all protestant denominations. The company does not support these churches so far as pastors or visiting preachers are concerned, but does provide the buildings, furnish same, and gives free electric light. The protestant church is supported financially by a league organized for that purpose, and a regular Sunday school is carried on by all the denominations together and is self supporting.

The School System

In order to give our people a full term school we tax our men $1 for families with children of school age, 50c. for those children under school age or none, and 25c. for single men. This charge is monthly and when added to the public funds enables us to have a good school the full term, and we have three teachers and an enrollment of about 140 pupils. In this case we are acting on the idea of enlisting the employees' interest and aid and insuring the attendance of the children through their contributions.

Realizing that amusement is a necessity, it was planned to erect our amusement hall, but through the efforts and solicitations of the State Y. M. C. A. Secretary, this was abandoned and a Y. M. C. A. building erected and equipped at a total cost of about $15,000. This building is steam heated, electrically lighted, and is equipped with tub baths, shower baths, hot and cold water, lavatories, closets, etc. It contains three pool tables, one table for either pool or billiards, a double bowling alley and a moving picture machine. Shows are given three times a week for which a charge is made and on Sunday afternoon a free show of appropriate pictures is given. A handsome soda fountain is in operation, cigars, candies, etc., are sold. A neat barber shop is included in the equipment and is kept busy. The moving picture hall is used for a number of purposes as well as shows.

The Y. M. C. A. Is Self-Supporting

The Company contributes $100 per month to the operation of the Y. M. C. A., but its accounts show that the Association is paying all expenses and a little more, not including the $100 donation, though its object is not to make money, but to afford a place for harmless amusement for our men under the supervision of a regular Y. M. C. A. Secretary and to reduce drinking and rowdyism. This plan certainly adds something to life in isolated places such as most mining camps are.

Now gentlemen, all this is not done for profit. Neither is it done in order that we may say: "I am more righteous than thou," but because the Company takes a personal interest in the welfare of its employees individually and collectively and believes that it is good business policy to get in close touch with the employee, give him comfortable quarters, living wages, and show him that we realize and know he is a human being and not merely a machine performing so many hours' labor.

We intend to build a Y. M. C. A. for our colored population also, and it is hoped that it will have an influence for good among them, and tend to reduce drunkenness, gambling, etc.

We have also planned to build a miners' wash house but have not yet reached the point of actual construction; a small park to be used as a general recreation ground is under consideration. We have now under construction a hotel to be steam heated, electrically lighted

*General superintendent, Wisconsin Steel Co., Benham, Ky.
Note—Abstract of paper read before Kentucky Mining Institute, May 17, 1913.

and equipped with modern comforts in the way of hot and cold water, baths, etc.

Industrial Accident Insurance

The Company has an Industrial Accident Department which provides the payment of one-half wages for not more than two years on account of accident. This plan also provides for three years' wages in case of death from accident and a specific amount for other serious accidents, such as loss of eye, loss of foot, etc.

All the benefits provided by this plan and all expenses of its administration are paid by the Company, except one-half of the disability benefits during the first 30 days, which is paid out of a fund to which the employee contributes the nominal sum of from six to ten cents per month according to his wages.

Since the inauguration of this plan by the International Harvester Company, of which the Wisconsin Steel Company is a constituent part, several states have enacted compensation laws, and in the states of Illinois and Wisconsin, where such laws have been enacted and where the Harvester Company has industrial plants, the Company has filed its acceptance of these laws and is now operating under same.

I think I have said enough of Benham, but in closing I would like to get before this body a statement concerning this workingmen's compensation legislation, which is now attracting so much attention.

Compensation Laws Promote Harmony

The experience of our Company has demonstrated that operation under carefully prepared Compensation Laws has a decided tendency to promote more harmonious relations between the employer and the employee, reduce personal injury litigation to a minimum, and increase efficiency to a noticeable extent, as one indirect effect of compensating for all accidents is an increased effort on the part of employers to reduce accidents. These advantages are, of course, aside from the distress and suffering of the injured employee of the dependants of those who are fatally injured, which are to some extent relieved by the compensation, including necessary medical, surgical and hospital service provided for under Compensation Laws.

The object of so called Workmen's Compensation Laws is to provide adequate and definite compensation to employees who become disabled as a result of accidental injuries received in the course of their employment, also to the dependants of employees who meet with fatal accidents while on duty. The underlying principle for legislation of this kind is that an industry should bear the burden of its industrial accidents in the same way as it bears the burden of fire insurance and replacement of machinery and equipment. This compensation should be provided regardless of who is to blame for the accident, and practically all the compensation laws abolish the usual common law defenses, namely:

1. That the employee assumed the risk of his employment.
2. That the accident was due to the negligence of a fellow servant, or
3. That the accident was due to the contributory negligence of the injured employee.

Prior to this year, fourteen states enacted Workingmen's Compensation Laws, including, Illinois, Michigan, Massachusetts, New Jersey, Ohio and Wisconsin. In addition to these laws, the legislatures of fifteen other states are considering bills providing for similar laws, a number of which have passed both houses. Among these states are Minnesota, Missouri, New York and Pennsylvania.

The Compensation Laws which have stood the tests of the highest courts and in practical operation, include several important provisions, namely:

1. Employers and employees are given the option of electing to accept or reject the provisions of the law; if rejected, the employer is not permitted to plead the common-law defenses.
2. A definite and fair schedule of compensation for certain serious injuries other than death.
3. The creation of an Industrial Commission or Industrial Accident Board to administer the law and to settle all disputes.
4. Payment of compensation to be assured by requiring the employer to furnish evidence of his financial ability to meet the obligations of the law, or on the other hand to require the employer to insure his liability in some mutual or other insurance company authorized to do business in the state.

Favorable Aspect of Such Laws

With a law of this kind you as operators would know that you would have to pay in case of certain accidents, no lawsuits to defend, no liability insurance to carry and at the same time the welfare, or humanitarian idea, if you will, is there just the same because the injured party would get his benefits and in case of death of husband and father the wife and children would get their benefits, without litigation and long delay, but promptly and at the time when it is most needed and will be of greatest benefit; further it will deprive the so called ambulance chaser, both legal and medical, of his job and his parasitic livelihood.

I also wish to call the attention of the operators present to our plan of safety committees. We have a committee of three men on each entry who serve without pay and whose duties are to observe any and all things which may be dangerous, contrary to the rules of the company or the mining laws of the state. These committees are provided with suitable badges and these are worn all the time. Each committee of three men is changed by retiring one man every month and putting in a new man. We feel that in this way we can ultimately interest all our men in preventing accidents.

The Coal Deposits of Holland

A coal seam 6 ft. 3 in. thick has been discovered at the Beringer Veld, near Helden (Limburg), at a depth of 3280 ft. Boring operations are now in progress near Mill and Aploo (Limburg) and in the Zeeland province, and further discoveries are expected shortly.

At present the Dutch coal basin covers an area of 205.8 square miles, including 85.5 square miles in southern Limburg, and 53.2 square miles in the Peel. In addition to this there are 63.9 square miles of coal, which is too deep to be worked. Recent discoveries have been made in the Overyssel province, under an important bed of salt. In the eastern part of this province it is estimated that the coal area, consisting mainly of gas coal, extends over 7.6 square miles.

Thanks to the reduced railway tariffs and to the low rates of freight by the Rhine, German coal practically commands the home market. The total coal consumption by the Dutch industries varies between 10 and 12 million tons annually.

WHO'S WHO—IN COAL MINING

There are few instances in which the careers of ambitions hard-working men of limited means and education stand out as strongly for the uplift of their fellow workers as does that of John Mitchell. The plain unvarnished tale of his forty odd years of life is an inspiration to loyalty and devotion to a noble cause.

John Mitchell was born, of Irish parentage, in Braidwood, Ill., Feb. 4, 1870. He was left an orphan at an early age, and when ten years old went to work on a farm; at thirteen he entered the mines at Braidwood, and from that time until his twenty-sixth year he was employed in the coal mines of Illinois and in those of several of the Western states, which his desire to see something of the world led him to visit. In 1892, Mr. Mitchell returned to Illinois and was married to Miss Catherine O'Rourke, of Spring Valley.

JOHN MITCHELL

As early as 1885, he had joined a Local Assembly of the Knights of Labor, and from that time on his entire sympathies were enlisted in behalf of organized labor. John Mitchell's education, in so far as it can be measured by actual school attendance, was meager; he read with interest, however, many of the standard works on sociological questions, and by study at night endeavored to overcome the handicap which his lack of opportunities produced. He became president of the Local Assembly of the Knights of Labor; and upon the formation, in 1890, of the organization known as the United Mine Workers of America, he identified himself with that body.

Mr. Mitchell was, successively, secretary-treasurer of the Northern Illinois subdistrict of the United Mine Workers of America; member of the legislative committee of the Illinois miners' organization, member of the state executive board of that organization, and finally was appointed national organizer for the United Mine Workers of America. In 1898, he was elected national vice-president, and that same year, upon the resignation of the president of that organization, he was appointed acting president, being later elected to that position, in 1899. He was unanimously reëlected each year until 1908 when, on account of seriously impaired health, he declined to again become a candidate for the office. Mr. Mitchell's first official connection with the American Federation of Labor was in 1898, when he was elected fourth vice-president; he was unanimously reëlected to that position the following year, and in 1900 was elected second vice-president, to which position he has been reëlected each year since that time.

When Mr. Mitchell was made president of the United Mine Workers of America, that organization consisted of 43,000 members; and when he retired from the presidency, it had a membership of more than 300,000 mine workers. Aside from its enormous increase in membership, the achievements of the organization regarded by Mr. Mitchell as of the greatest moment are the great advance secured by joint conference with the coal operators, in 1900, when wages of bituminous-mine workers were increased 21 per cent.; the increase of 24 per cent. in the wages of the anthracite-mine workers, secured as a result of the successful strikes of 1900 and 1902; the establishment of the eight-hour workday in central and western Pennsylvania, Ohio, Indiana, Illinois, Michigan, Iowa, Kentucky, Alabama, Missouri, Kansas, Arkansas, Oklahoma and portions of Tennessee and West Virginia.

At present Mr. Mitchell is a member of various nonlabor organizations for the study of social and industrial conditions and for their betterment, namely, the National Child Labor Committee; the American Academy of Political and Social Science; and the American Association for Labor Legislation. He was a member of the New York Commission on Workmen's Compensation, and is the Trustee representing Labor on the Nobel Peace Prize Fund—the Foundation for the Promotion of Industrial Peace, which Theodore Roosevelt gave to be devoted to the promotion of industrial peace.

In the summer of 1908, Mr. Mitchell was strongly urged to become the democratic candidate for governor of Illinois, as well as to be a candidate on the same ticket for vice-president of the United States. Politics has never attracted Mr. Mitchell, however, and he declined, in both of these instances, to become a candidate. He then moved to New York, and became actively identified with the National Civic Federation, as Chairman of the Trade Agreement Department of that organization. Mr. Mitchell terminated his connection with the National

Civic Federation in March, 1911, because of an unfounded prejudice of the United Mine Workers organization in respect to the work undertaken by the National Civic Federation; thereby proving his great loyalty to the rank and file of the order with which he was still identified. Mr. Mitchell has maintained his membership in the United Mine Workers of America, and has never lost his keen interest in the mining industry, in its affairs, and the men engaged in it, whether as miners, operators or otherwise. For the past two years, Mr. Mitchell has been on the lecture platform; he has spoken in practically all the large cities of the country, and in a large number of the smaller cities, and has addressed many Chautauqua assemblies.

How Best to Handle the Dry or Dusty Mine

By David Victor*

I believe with Frank Haas, consulting engineer of the Consolidation Coal Co., that an explosion may be largely propagated by the gas distilled from the coal in the ribs of the mine during an explosion. Moreover, seeing that it is impossible to get the large quantity of air necessary for combustion in immediate contact with the coal, I feel confident that the explosion is not a true combustion of the coal dust but of the gas distilled from the coal when it is heated.

It is easy to show, without taking any extreme figures, that it is not possible to make a mine free of dry dust by the use of water cars or sprays from water pipes even if these devices are competent to wet dust and not merely create pools of standing water, surrounded by undampened coal powder.

Suppose a mine circulates 100,000 cu.ft. of air per minute and that the intake current shows a dry-bulb temperature of 32 deg. F. and a wet-bulb reading of 29 deg. F.; this shows that the moisture content is only 69 per cent. of capacity. The space occupied by the intake air passing into the mine every minute holds 2.496 gallons.

When the air leaves the mine we will suppose that the wet and dry bulb both read 60 deg. F. This shows that saturation has been reached. The 100,000 cu.ft. of space contains 9.813 gal. of water and the water removed from the mine must be 9.813 — 2.496 = 7.347 gal. per min. = 10,579 gal. per day.

Boilers for Moistening Air

The Consolidation Coal Co. is using exhaust steam from the fan engine and other engines near the drift mouth. Where this is not sufficient, live steam is taken from the boilers, and in a few cases boiler plants are being installed solely to complete the humidification of the air. Every operator should provide each of his foremen with a thermometer, barometer, psychrometer, anemometer and water gage, and see that he understands how to use them.

I believe a charge limit of 2.5 lb. should be fixed for blasting powder and of permissibles no more should be used than will produce a result equal to that of 2.5 lb. of black powder. When the coal is too thick to be broken with the prescribed charge, it should be shot in two benches, the lower bench being shot and loaded out before the holes in upper bench are fired.

All heavy rock shooting or work requiring dynamite should be done when the miners are out of the mine and when only enough men are underground to do work of that kind.

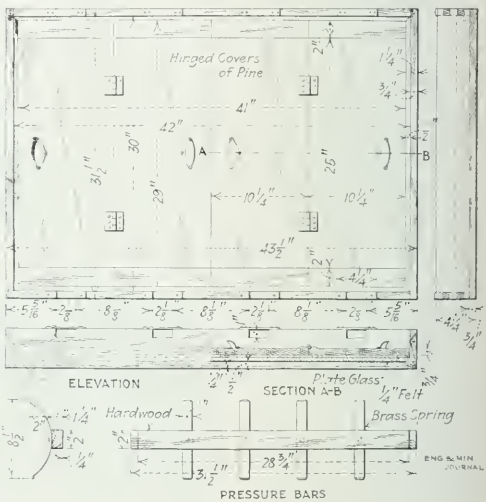
*Chief mine inspector Consolidation Coal Co., Fairmont, W. Va.

Abstract of paper read at meeting of Kentucky Mining Institute, Kentucky State University, Lexington, Ky., May 16 and 17

Blueprint Frame

The accompanying illustration is a working drawing of a blueprint frame for prints up to 29x41 in. in size. "This is a standard type of commercial frame," says the *Engineering and Mining Journal*, of May 24, "but circumstances may arise where it becomes necessary or desirable to make such a frame at the mine."

The most important and expensive single item entering into the construction is the plate glass. This is



Working Drawing of Standard Blueprinting Frame

usually of a gage approximating ¼ in., but should be heavier rather than lighter for a frame of this size. The frame proper should preferably be made of hard wood, which should be as thoroughly seasoned as possible. If even a small amount of warping takes place, the glass will be cracked. The same consideration makes it imperative to protect the wood from the absorption of moisture, which is also capable of distorting the frame and breaking the glass.

To avoid accident and save time, it is advisable to have large frames mounted so as to run either on tracks or on a floor and to revolve upon a horizontal axis, and if possible, upon a vertical one, thus obtaining the full value of the sun's light at any time. Such a mounting can usually be constructed out of scrap iron or a good carpenter can make one of wood. A small unmounted frame, similar to the one here illustrated, will, however, be found extremely convenient for handling small tracings.

EDITORIALS

A Generous Public

Sometime ago we read with some surprise that Congress had on the advice of the director of the Bureau of Mines voted Mrs. Cora K. Evans $1320 compensation for the loss of her husband who died performing valiant service for the country in the mines of the Price-Pancoast Coal Co. where, with other members of the Bureau of Mines, he had gone to rescue the unfortunates who were trapped in that mine.

How Congress expects the rescue men of the Bureau to disregard their lives, the happiness of their wives and families and plunge into places of extreme danger with with such a paltry compensation as a reward for heroism in case of death, we cannot tell. Congress and the people are alike niggards when the private purse is concerned, and it is little creditable that the widow had to wait two years for a moiety or less of her just claim.

We are not surprised seeing that the public will not have to pay the bill that the people of Pennsylvania are arranging that wives like Mrs. Evans shall be compensated with $1904 if their husbands die in the coal mines without any of the accompaniments of heroism or that in the state of Washington a compensation of $20 for life has been awarded in a recent act, the limit being placed at $1000.

We do not wonder seeing the subtle distinction between "ours and yours" which the people are making, that the Bureau of Mines which pays compensations of $1320 reckons each life lost as worth $5000. We do indeed somewhat question its estimate of the annual death loss especially in the case of single men.

Most men have so regulated their affairs, that when they die no anticipated gain is lost to the state. They have spent all they made and if they continue to live the outcome will be the same; their consumption and their production will balance so that if they are single the world is hardly the loser when the passing bell is tolled as far, at least, as things of sense are concerned.

We turn with pleasure from the unkind views of the public taken hitherto in this editorial to view the generosity of those same people in gently emptying the pockets of the cruel operator when an accident occurs. We note that the St. Paul Coal Co. of Chicago wound up the last claim against it for $6900. This was not paid without reason. The company knew it was safer to pay Andrino Muzzarelli than to contest the suit. The Cherry mine disaster had already cost that corporation $500,000 for the 256 miners who lost their lives—far more being paid to the wives of men who accepted an ordinary risk than the nation paid to appease the sorrows and remove the want of the widow of a hero who had gone bravely to his duty where death seemed certain.

We would not shame the people by holding up before them a trust—above all the United States Corporation and its subsidiary coal companies. But the temptation is too strong. The wife of a common miner, not a hero, but a woman married to just a plain coal hewer or loader, fresh perhaps from a land where wages are far lower, would get 18 months pay or one half more than Mrs. Cora Evans received and in addition funeral expenses not to exceed $100 from that industrial organization without even filing a claim. The company would not be as good to her as to some others as she had no children and her husband had not worked five years for the trust but still it would be much more liberal than the representatives of the people.

We hope we may escape a charge of *lese majesty* to our sovereigns, the electorate, if we point out that John Hays Hammond who is not even a coal magnate or expert gave $250 to Evans' widow as part of the contribution of the Pittsburgh Coal Operators Association which totaled $375.

In conclusion we may be pardoned if in a table we record the compensation to which Mrs. Evans would be entitled under the compensation acts of several of the states assuming, so as to be well within the mark, that the Bureau employees are paid for 52 "weeks" in the year.

COMPENSATION SET BY STATE LAWS

State	Compensation	State	Compensation
Arizona	$4,000	Massachusetts	$3000
California	3,960	Michigan	3000
Indiana under	10,000	Nevada	3000
Kansas not more than	3,600	New Hampshire	3000
Maryland	3,960	New Jersey	1904

Judging by recent legislation, we conclude that while it may be true that corporations have no souls, it seems generally understood that they possess pocketbooks. The people reluctantly and adequately pay their dues to the dead but in righteous indignation they are now determined that the corporations shall not be equally penurious. Of course, they are right; who is it that shall rise and condemn the common people?

Spontaneous Combustion of Coal

A careful investigation shows that in a single recent year, there were 103 cases reported in Lloyd's list of vessels with bunkers on fire, and also 24 cases of vessels with cargoes on fire. The investigators concluded that the occasional spontaneous development of heat is due to chemical changes, which iron pyrites and some carbohydrogen compounds occurring in coal undergo through the agency of atmospheric oxygen.

There is no doubt but that oxidation of pyrites is accompanied by the development of heat, which may increase to such an extent as to lead to the ignition of the coal. It is also a fact that carbon itself, in a finely divided condition, has the property of condensing within its pores large volumes of certain gases, including oxygen. Wood charcoal, for instance, will absorb from the air nine times its volume of oxygen and seven times its volume of nitrogen, which condensation of gas is attended by the development of heat. In such cases, if the heat is allowed

to accumulate, chemical action may be promoted and the carbon be heated to the igniting point.

It is certain, therefore, that the presence of water would diminish the power of coal to absorb oxygen, and, as a consequence, be antagonistic to the oxidation of the carbon of the coal, although it would accelerate the oxidation of the iron pyrites present. Another precaution in the matter of safeguarding stored coal is to have efficient surface ventilation to remove into the open air the gases rising from the coal; however, any attempt to ventilate the bulk of coal by drawing air through it would favor the production of a violently explosive mixture of gas and air.

When coal is being carried on long sea voyages, the temperature in the various portions of the cargo should be tested periodically by a thermometer and registered in the ship's log. In order to guard against an explosion, free and continuous egress to the open air, independently of the hatchways, should be provided for the explosive gases by means of a system of surface ventilation which would be effective in all circumstances of weather.

Some years ago, interested parties conducted an inquiry into a casualty sustained by a sailing ship, through the spontaneous ignition of her cargo of coal and coke. They reported:

1. Artificially dried coal absorbs oxygen with great avidity.

2. Ordinary air-dry coal absorbs oxygen, though less rapidly.

3. Damp coal absorbs oxygen less rapidly, and when piled in heaps does not rise in temperature any faster than dry coal.

4. Thoroughly wet coal is practically protected against the action of the air insofar as the production of spontaneous heating is concerned.

One authority has said that "the heat given off by the oxidation of pyrites is only one-fourth of that evolved by the oxidation of the same weight of coal." Moreover, the oxidation of coal goes on more rapidly than that of pyrites so that it would be expected that the cause of heating in any particular case is the oxidation of the coal rather than that of the pyrites.

It is significant that both Richter and Fayol established the fact that dry coal oxidizes more readily than wet coal, whereas the reverse is the case with pyrites, and yet numerous cases of spontaneous heating occur with dry coal. For all practical purposes, therefore, pyrites is not an agent in the spontaneous heating of coal. In ship's cargoes of large coal the only danger is in the heap of small coal under the hatchways.

The explanation of this is that the rise of temperature in a heap depends upon two factors: The heat must, in the first place, be generated, and in the second, it must not be allowed to escape. Amongst large coal, with much interstitial space, the circulation will be too great to allow of overheating.

If there are any parts of bunkers in which, owing to the proximity of boilers, uptakes, or recesses through which steam pipes, etc., are carried, there is likely to be a higher normal temperature, these parts should, if possible, be stowed with large lump coal and should be worked out as soon as possible. The shoots should be arranged not to deliver small coal into these places. Small coal which accumulates under shoots, etc., should be worked out as soon as possible and not left till the last.

If any coal is left in a bunker when a fresh charge has to be taken in, it should be trimmed into a position to insure its being used on the next voyage. It cannot be too strongly impressed upon those responsible that danger of overheating and spontaneous combustion increases with the length of time the coal remains in a ship.

There is no risk entailed by the coal being wet when put on board. In fact, in cases where coal is known to be of a fiery nature, it is of advantage for the small coal to be dampened when charging the bunkers.

In conclusion, it is well to remember that although some kinds of coal have proved to be more liable to spontaneous heating and combustion than others, it should be realized that all coal, even anthracite, is liable to these occurrences.

The Uninstructed Foreigner

We shall not repeat the time-honored story that the foreigner who now enters our mines is an agricultural laborer and not a miner, and that he cannot be taught by the foreman because he cannot be instructed by the latter in his own language. We leave these banalities of the office and the institute, and ask instead what can be done about it.

Much can be effected we think by the Bureau of Mines. An opportunity is given that organization, it seems, to put the industry still further in its debt for coöperation and assistance. We believe it could engage men who have a good working knowledge of foreign tongues to travel from mine to mine with vitagraphs, stereopticans and models showing how mining work should be performed. Any one who had attended the course could be given a certificate. Such a man would not necessarily be made thereby a miner, but he would be better fitted to be so regarded than a man who had not received such instruction.

Some of these teachers would, of course, talk English, and these could hold day sessions in the schools educating the scholars in the work of safe mining wherever the sons and daughters of miners were to be found.

At the several stations of the bureau, teachers could be kept who would teach elementary mining to all comers. In time, it would probably come about that no man would be allowed by state law to enter the mines without such training and certificates. Moreover, when the compensation law gets fully into operation, the mine owner himself may demand "papers" before admitting the raw product of European farms to the imminent dangers of his mine. It is a wonder that some of the larger companies have not taken that stand already. It would be a hardship to the miner, but its very requirement would make him realize the importance of taking care of his safety.

We are aware that such learning will be condemned as being unequal to that afforded by experience, but to learn by maiming is expensive, and training which results in death is unavailable to the person who suffers it. So it may be conceded that perhaps the inferior training of a school is more to be sought than the rougher education of the mine.

The presence of blackdamp, a mixture of carbon dioxide and nitrogen, will often neutralize the effect of firedamp on a flame. Analyses of mine gas, which gave only a faint cap when tested with a safety lamp, have shown 4 per cent. of methane mixed with blackdamp.

SOCIOLOGICAL DEPARTMENT

Concrete Houses at Lackawanna Mine

SYNOPSIS—The Coal Department of the Delaware, Lackawanna and Western R.R. Co. has constructed twenty double houses of poured concrete for its miners. These houses are perfectly fireproof, the floors, roof and staircases being of concrete. They have 6 rooms and rent at $8 per month.

At Nanticoke, Penn., the Delaware, Lackawanna and Western R.R. Co.'s Coal Department has built twenty concrete double houses by a new and interesting process. It has long been anticipated that before many years, houses would be built by pouring concrete into forms, and perhaps Thomas A. Edison was the first person of record to make this suggestion.

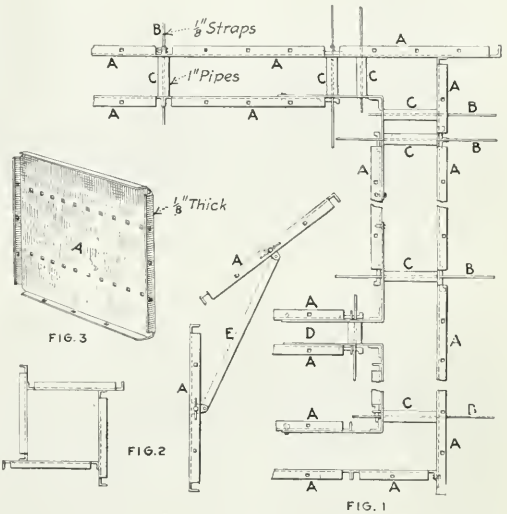
The Edison Plan

That inventor estimated that an equipment of heavy cast-iron molds would be necessary, costing $30,000 for each design. His suggestion could hardly have commended itself to those who are interested in the improvement of dwellings, because a distressing uniformity would inevitably have resulted, and the designs would in many cases have been entirely unsuited for the tenants of the houses thus built. Moreover, so heavy would the molds have been that it is probable that it would not have been possible to have shipped them from place to place economically where only a few buildings were to be constructed.

Contrast this heavy expenditure for molds, the inflexibility of design and the weight of material to be transported, with the simplicity, tightness and portability of the Morrill molds which are illustrated in this article.

Steel-Plate Molds

The plates used are 2 ft. square and are made of ¼-in. cold-rolled steel, all four edges of these plates being slightly flanged as shown. Two horizontal rows of square holes are punched in each plate, and three square holes are punched in each of the small flanges. These plates are arranged around the building with their flat sides back to back and set at a distance equal to the width of the wall which it is desired to construct.



FIGS. 1, 2 AND 3. SHOWING HOW PARTS ARE ASSEMBLED

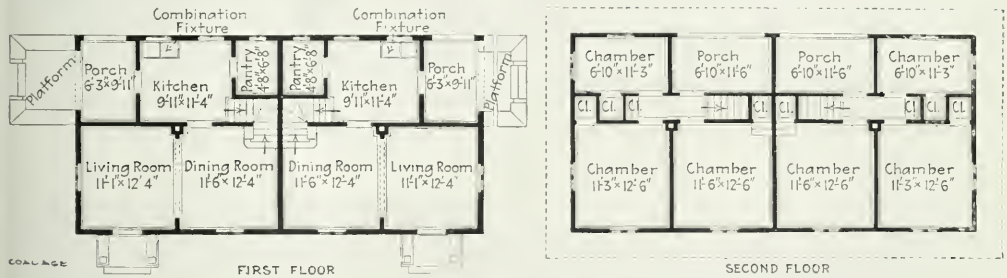


FIG. 4. PLANS OF THE DOUBLE SIX-ROOM DWELLINGS AT CONCRETE CITY

In order to maintain a uniform width of wall, straps of ⅛-in. cold-rolled steel punctured with square holes are passed through the opposing belts of plates and through a pipe distance piece. The straps are secured in places by wedge pins which are lightly driven into position. Thus the walls are prevented by the pins and straps from becoming too large, and by the pipes provision is made that they are not less than the required width. In Fig. 1 is shown the method of constructing the outside wall of a house. Fig. 2 shows a plan of the forms arranged for a post, and a side view of a plate being lifted from the inferior to the superior belt. Fig. 3

shows a mat plate. The binding strips are marked *B* and the pipes for regulating the width of the wall *C*. The space *D* forms, when filled with concrete, a narrow partition wall.

How the Sizes of the Houses Can Be Varied

It will be seen that it is possible, when turning an angle, to connect the plates to one another at any point desired. Consequently, it is not necessary that the dimensions of the building shall be any even multiple of the width of the plates. For all kinds of houses the same molds will do, the only variation consisting in the variant use of the same plates. As will be seen in the figure which shows the plates in detail, they can be used for the construction of a small concrete post, as well as for molding the lines of the building proper.

Where several houses have to be constructed at one time, it is usual not to use more than two belts of plates around the building. The lower belt serves to protect the concrete which has already been placed, and the upper is used for the molding of the new concrete which is poured in. Where, however, only one house is to be built and consequently a delay of this kind would be expensive, sufficient plates are obtained so that the building can be constructed wholly in one day. Such a building needs to be covered, as shown, with plates from the ground to the roof.

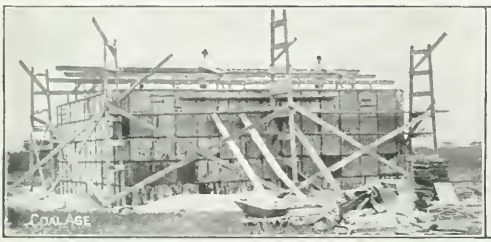


Fig. 5. Plan Adopted Where Rapid Construction Is Desired

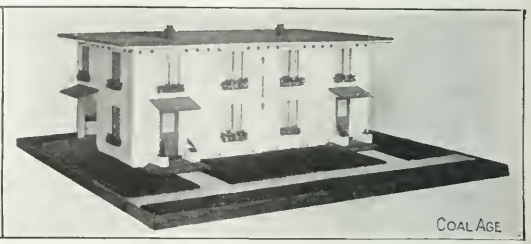


Fig. 6. House Model Showing Cheerful Yet Simple Effect

Fig. 7. Raising a Belt. Note Window and Door Frames

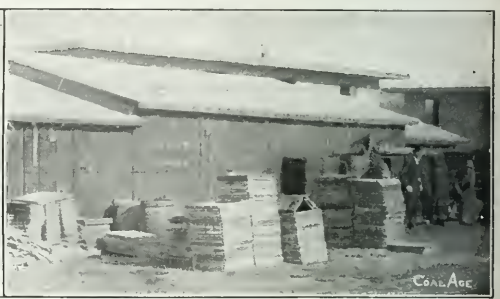


Fig. 8. Piling Frames for Trans-Shipment

Fig 9. Pouring Concrete Into the Forms

Fig. 10. The Architect's Building Scheme

A most important feature in the method of construction is that the belts of plates which surround the building do not need to be entirely separated by the withdrawing of all connecting wedge pins when it is purposed to raise a belt to a higher elevation. Each series of belts is connected with the belt below it by cross-arms connected to the square perforations in the flanges of the plates.

Thus, as will be seen in one of the illustrations, several

of the plates in a single belt can be lifted with ease at one time. It will be noted that the inner belt in this particular illustration has already been lifted into position, and the outer belt is being placed ready for the pouring of the mixture, which will raise the wall another stage.

The arrangement for openings is extremely simple. As soon as the mixture is at the right level for the casings to be inserted they are placed in position and the filling with concrete continues as before.

Provisions for Warmth and Dryness

In most climates it is not necessary to leave any air space in the wall. It is well, however, to make the concrete as porous as possible. In this way the interstitial spaces serve to make the concrete a good nonconducting material. Such a wall would, however, be extremely damp and cold unless coated with a good coat of paint inside and out. To this end it is the practice of the patentees of this system of building to use two coats of paint, one a primer which will not be affected by the alkali in the cement, and the other coat, one which will improve the appearance of the building.

Resistance to Fire

There are many advantages in connection with these houses. They are entirely incombustible except insofar as the window frames, doors and any moldings which may be inserted are concerned. A fire would not in any way destroy the building, though, of course, as a result, it would be somewhat disfigured by smoke. In fact, in a suburb near Washington, it has been the habit of a concern which is engaged in exploiting a piece of available suburban land, to start a fire in a house of this construction, having previously announced that this experiment would be made and thus gathered a crowd to attest the fire resistance of the structure. Another advantage is that the house is entirely sanitary, and should an undesirable tenant occupy the building, it is extremely easy to clean it out with a water hose when vacated.

Income Derivable

Accustomed as we are to wooden floors in all our dwellings, it is perhaps necessary to point out that some of the finest hotels in New York City have concrete floors in their lobbies, which are covered with rugs.

Fig. 11. Living and Dining Rooms

Fig. 12. Kitchen and Pantry

In order to insure further the dryness of the structure, the mixture of cement and cinders is made nonabsorbent by the use of hydraulic lime, the proportions of the ingredients being as follows: One-half part of lime; one part of cement; six or seven parts of cinders. In order to prevent water from rising from the foundations upward into the building, the lowest course is mixed with crude oil.

The Concreting Train

It will be seen that the houses are arranged around a park or playground which measures 300x600 ft. A railroad track was laid around the entire group, and a mixing plant was mounted upon a flat car with an elevator for hoisting concrete attached. Cars of sand, cement and cinders were attached to the mixing car, and the concrete was hoisted from the mixer to an elevated hopper, from which spouts conducted the mixture into steel forms at various parts of the building. As soon as the concrete was placed so as to complete one belt around the building, then the mixing train was moved to the next house and a belt of concrete was placed there.

Each side of the houses which the Delaware, Lackawanna & Western R.R. have built, contains 7 rooms including the pantry, and rents at $8 a month, and we are informed by the company that there is no difficulty in filling these dwellings. The cost of construction has been from $1800 to $2000 for each side of the house.

The profits, therefore, of the investment will probably not exceed 5 per cent. under the most favorable circumstances. It certainly would not pay in direct material dividends to build such houses, if it were not for the fact that they need no repairs and are not subject to fire losses. In order to meet the objections raised to the concrete floors, wooden strips were laid so that carpets could be attached to them. This has removed all difficulties.

It is worth noting that a combination fixture is placed in the kitchen. This serves the duplicate duty of a wash tub and sink.

The introduction of these houses is due to desire of E. E. Loomis, President of the Delaware, Lackawanna and Western R.R., to furnish model buildings for the workers of the coal department. The intention is also

to arrange, not only for uptodate dwellings, but for model surroundings. Much loss of life has occurred from non-fireproof buildings in the mines, but it may be safely said that still more lives are being lost annually by the lack of fireproof buildings. This loss will be entirely removed when the walls, floors, partitions, roofs and stairways of dwellings are constructed of concrete as are those in these buildings.

The patentees of this system of construction are Reed & Morrill, Inc., of 179 Joralemon St., Brooklyn, N. Y. They are providing the molds for several workingmen's dwellings, which are about to be erected near Budapest, Hungary.

We are indebted to them for some of the illustrations to this article but also to C. E. Tobey, Vice-President and General Manager of the D., L. & W. R.R., who kindly had several photographs taken for this issue of COAL AGE. That company has long been most energetic in promoting safety in mines and is about to be equally active in devising new plans for promoting the health and comfort of its employees above ground.

Sincerity and Safety

By THOMAS MOSES*

Before the motto "Safety First" can have any real meaning, the employer must sincerely and honestly believe in it. If he, as many do, paints it on his property in big signs, places it on his stationery in bright letters, speaks of it in public gatherings, and does nothing more, the words are meaningless, and rather oppose than advance the cause which he should desire to be aiding by their use, but if he sincerely believes in the maxim, makes it his religion, and under no circumstances deviates from its meaning, he will obtain more profit from its preaching than from any other device.

It is important that the employees realize the sincerity of the superintendent in promoting safety. I am informed that only the old men in the industry can recall the times when profits could be made. But when markets are good, and there *is* a profit in the coal business, if you go into your mine and discover some broken bars, loose rock, an accumulation of gas, bad tracks, or any one of the numerous dangers to which a coal mine is heir, it seems a hardship to be obliged to stop operations until the dangerous condition is removed.

THE ADVANTAGES OF THE COMPENSATION LAW

When an accident happens the conditions must be studied with an open mind free from selfish desires. You must find out exactly what caused it, and then make sure that similar conditions are removed from all parts of your mine, if indeed such a provision is possible.

No man can urge safety on his men, if he speeds up the fan or sends special men into the mine to shut doors or to operate his regulators so as the deceive the mine inspector when he makes his visits of inspection. If you would discipline your men, you must first of all discipline yourself. You, yourself, must obey without question the instructions of the mine inspector.

The compensation law is doing a great deal in Illinois to reduce accidents. When the operator knows that he must pay for every accident, he is indisposed to misrepresent the causes of its occurrence in order to make a good defence against liability, and the injured man is equally free from a desire to misrepresent the manner in which he was injured.

THE COST OF SAFETY

It is hard to discover just how much it takes to promote safety in a mine. All the men who are employed to make inspections, serve not only to make the mine safe, but also to make its operation efficient. Good tracks and safe timbering are needed as much to maintain the output of a mine and to save repairs as to protect the miner. Safety and efficiency run so completely hand in hand that it is impossible to classify duties exclusively under either of those heads.

In the nine years previous to the inauguration of "Safety First" as a motto at the mines of the Bunsen Coal Co., there was one fatal accident to every 135,827 tons of coal mined. In the best year of those nine years, there was one fatal accident to every 188,387 tons of coal. During that year very little coal was mined, less than one quarter of the amount now produced.

During the first year of the "Safety First" campaign, one fatal accident occurred to each 132,452 tons of coal mined. During the second year, we had one fatal accident to every 329,474 tons of coal, showing an increase of 192,022 tons of coal mined per fatal accident.

THE "SAFETY FIRST" CAMPAIGN DID NOT INCREASE COSTS

Notwithstanding the fact that an increase of 10.8 per cent. in wages took place during this time, the coal cost less per ton for labor at these mines than it did the year previous to the inauguration of the new slogan. The cost to this company for safety during the period it has been operated under the compensation law of Illinois has been approximately 1½c. per ton, which charge covers all money spent in first-aid instruction to employees, ambulance and hospital service to all who need it, medicine and doctors' services, and the salaries of persons in charge of the compensation department and compensation for all injuries received.

*General superintendent, Bunsen Coal Co., Westville, Ill. Abstract of paper entitled "Safety First from the Standpoint of the Operator," read at a mining conference, State University of Illinois, Urbana, Ill., May 9, at the dedication of the Transportation Building and the Locomotive and Mining Laboratories.

Mine Rescue Work in the State of Washington

By D. C. BOTTING*

Up to Jan. 1 1911, 46 men had taken helmet training in the state of Washington and received certificates of competency. This number has been considerably increased for we now have 304 men trained as follows: In the use of the helmet only, 64, in both helmet and first-aid work, 146, in first-aid work only, 94. The Bureau of Mines issues no certificates for first aid only but men who take this training are qualified to receive a certificate from the Industrial Branch of the American Red Cross Society.

It is the intention of the Department of Mines to arrange for the organization of Red Cross Societies in as many of the mining towns as possible, during this year and we also hope to have sufficient men trained in both helmet and first-aid work, in every coal-mine town in the State, to enable us at all times to make up a team of at least 6 men who could render efficient service in case of need.

*Chief mine inspector, Seattle, Wash.

DISCUSSION BY READERS

Conditions in the Cincinnati Mine

The recent disaster in the Cincinnati mine calls to mind some recollections in my own experience in the mines in that vicinity, where I worked nearly forty years ago. The mining methods at that time were generally crude; butt entries, in many instances, were driven single and draft facilities (ventilation) were of a low order. Fans were almost an unknown feature of the equipment of the mines located along the west bank of the Monongahela River, and small furnaces and natural draft were almost the sole dependencies for ventilation. There was gas in the mines, but the quantity was small, and the air current, though feeble, was sufficient to dilute the gas below the danger point. Occasionally, explosions occurred, but they were of comparatively little force and mostly local.

With the inauguration of the inspection service in Western Pennsylvania, a general and steady improvement in mining and ventilating methods began; and, apparently, from the mine inspectors' reports, the Cincinnati mine has kept abreast with the progressive movement. The report for 1907 shows 186 men employed in the mine, which is about the same number that was in the mine on the day of the recent explosion. A ventilating fan produced a current of 42,000 cu.ft. of air per minute against a 2-in. water gage. The report states "The ventilation has been improved and is well conducted to the face of the workings." The report adds that the "8-ft. Stine fan driven by a 40-hp motor was installed to be used temporarily, until a shaft could be put down near the face of the workings, when it is the intention of the management to place a more powerful ventilator at the shaft." The report of 1911 shows that these improvements were made, and that the mine at that time was ventilated by an electrically driven Capell fan, which, running at 150 r.p.m., produced 129,000 cu.ft. of air against a 3-in. water gage.

In my opinion, it is worthy of note that under the primitive methods of working and ventilating this mine and the subsequent gradually improved methods no explosions involving great loss of life occurred; but, after the draft facilities had been improved to an unusual extent, producing a greater air volume than ever before in the history of the mine and when the mine appeared to be better and safer in every way, a great disaster has occurred. The situation suggests the question: Did the effects of these commendable and desirable improvements contribute, in any manner, to the occurrence and magnitude of the explosion? I believe they did.

Some time since, experiments were made by T. E. Richards, Aberdare, South Wales, to ascertain what effect, if any, the speed of the ventilating fan had upon the flow of gas from more or less constant feeders in the mine. While the experiment showed that the effect of reducing the speed of the ventilator on a number of such feeders was to almost invariably lower the level of the igniting line of the gas; there were, however, two blowers that acted otherwise, a feature that could not be explained, but was thought to be the result of opposing factors.

In a recent paper on Analysis of Mine Air, Mr. J. W. Hutchinson states that the slowing down or stopping of the fan when exhausting resulted in an increase of pressure throughout the mine; and, as a result, the outflow of gas from the strata was materially checked for a time; and the fan was again started the outflow of gas increased at once, owing to the decrease of pressure caused by the action of the fan.

Now, applying these facts to the ventilation of the Cincinnati mine, the water gage produced by the old fan was 2 in., which the new fan increased to 3 in. The increased depression in the mine favored a larger emission of gas from the strata.

I have repeatedly called attention to the fact that the most disastrous explosions have occurred in mines with ventilating arrangements of a superior order, where large air currents were produced by powerful fans. I believe that explosions of great force and magnitude are of much less frequent occurrence in mines having less facilities for producing draft. In my opinion a review of the conditions and events in the Cincinnati mine during the many years of its existence presents a striking illustration of this fact

I am impressed with the thought that the great improvements made in recent years, in the methods of mine ventilation, have created a danger that could be readily minimized or eliminated entirely, if the existence of such danger were generally appreciated and its nature better understood. I believe the danger is greater because its presence is generally unsuspected, under the improved conditions of ventilation in mines. In order that the commendable work done by mine operators and owners, who have provided more than sufficient means for producing ample and efficient ventilation in mines, may have its due reward and that these efforts to secure greater protection to health, life and property may bring, in the fullest measure, the desired beneficial results, a better understanding of the existing danger and how it may be overcome is necessary.

The alarming frequency of great explosions in well arranged mines where the ventilating facilities are far above the average, and the apparent immunity from such explosions in mines working the same seam of coal under practically identical natural conditions but having greatly inferior ventilating arrangements, in my opinion, cannot be reasonably regarded as a matter of mere chance. There must be a general and fundamental cause to account for their persistent occurrence under conditions generally considered as acting to prevent such occurrences; and it seems decidedly worth while to discover this cause, if possible.

JOHN VERNER.

Chariton, Iowa.

Danger in Rapid Firing

Some time since my attention was drawn to a statement in COAL AGE, referring to the rapid manner in which shotfirers must perform their work. In most cases, these men must fire from 150 to 300 shots a piece. They go into the mine at 3:30 and start firing, often finishing their work by 5 o'clock but seldom later than 6:30 p.m., no matter what the size of the mine may be or the number of shots to be fired. I believe this rapid work is too often the cause of local explosions, which at times result in loss of life.

If shotfirers would take into consideration the dangers to which they are subject, I believe they would, in most cases, change their method of working. Instead of doing this work in 3 or 3½ hr., if shotfirers would allow themselves a longer time, say 5 hr., to do the same work there would be less danger of trouble.

Many explosions have originated in the firing of shots in quick succession, or in the firing of two or more shots in a close working place or heading. The firing of such shots is, in many instances, absolutely unsafe and, rather than perform the work in this manner, shotfirers should make a second trip to such places.

JOHN SUTTON, Fireboss,
Wizard Mine.

West Terre Haute, Ind.

The Geyser at Equality

I note in the editorial of your paper reference to the accident to the mine of the Gallatin Coal company. I once experienced a phenomenon somewhat similar. About 1900 or 1911, No. 1 mine belonging to what was then the James W. Ellsworth & Company, Ellsworth, Penn., took fire and to put it out the mine was flooded. The fire destroyed the tipple and timbering in the shaft.

Mine No. 1 was connected with mine No. 2 by two entries, 1800 ft. in length. The average depth of each shaft was about 215 ft. The water entered at mine No. 2. Above the highest point in the mine, a bore-hole was drilled to act as a vent.

To unwater the two mines, buckets were swung in the No. 2 shaft. After the work of unwatering had been in progress a short time, a stream of water was noticed to shoot up out of the bore-hole driven for a vent. At times it would rise fully fifty feet in the air. This action continued at least two days and then gradually ceased.

My theory is that the borehole acted as a steam ejector, compressed air being the power in place of steam, the air being compressed by the water used to flood the mine. I believe the Equality outburst has a similar cause.

G. M. SHOEMAKER,
General Manager, Virginia-Lee Co., Inc.

St. Charles, Va.

Study Course in Coal Mining

BY J. T. BEARD

The Coal Age Pocket Book

Combining equations (1) and (4), we have

Velocity due to fall through height h. $$v = g\sqrt{\frac{2h}{g}} = \sqrt{2gh} \quad (5)$$

Height to produce a given velocity. $$h = \frac{v^2}{2g} \quad (6)$$

EXAMPLES TO ILLUSTRATE

1. What is the theoretical velocity that a freely falling body will attain in eight seconds?

Solution—$v = gt = 32.16 \times 8 = 257.28$ ft. per sec.

2. What is the theoretical velocity a freely falling body will attain and what is the time required in falling through a height of 2000 feet?

Solution—The final velocity or the theoretical velocity due to this height is

$$v = \sqrt{2gh} = \sqrt{2 \times 32.16 \times 2000} = \sqrt{128{,}640} = 358.66 \text{ ft. per sec.}$$

The time required for this fall is

$$t = \sqrt{\frac{2h}{g}} = \sqrt{\frac{2 \times 2000}{32.16}} = \sqrt{124.37} = 11.15 \text{ sec}$$

3. What height of fall is required to produce a theoretical velocity of 500 ft. per sec.?

Solution—

$$h = \frac{v^2}{2g} = \frac{500 \times 500}{2 \times 32.16} = 3886.8 \text{ ft.}$$

4. Through what height will a body fall from rest in 30 seconds?

Solution—

$$h = \frac{gt^2}{2} = \frac{32.16 \times 30 \times 30}{2} = 14{,}472 \text{ ft.}$$

Velocity Due to Any Given Height—Since a body falling under the influence of gravity attains a certain velocity and falls through a certain height, in a given time, the velocity attained is said to be due to the height through which the body has fallen. Roughly, the velocity attained by a falling body, disregarding the resistance of the air, is eight times the square root of the height from which the body falls; the body falling from rest, and the height being expressed in feet and the velocity found in feet per second. This relation is expressed by the formula

$$v = 8\sqrt{h}$$

For example, disregarding the resistance of the air, which acts to retard the fall, a leaden bullet dropped from the top of a tower 100 feet in height would strike the ground with a velocity of $8\sqrt{100} = 80$ ft. per sec.

The Coal Age Pocket Book

The following are the values of the force of gravity at sea level, for different latitudes, as determined by experiment and subsequent calculation:

By experiment,	New York,	lat. 40° 30′;	$g = 32.160$ ft. per sec.
	Paris,	lat. 48° 50′;	$g = 32.183$ ft. per sec.
	Greenwich,	lat. 51° 29′;	$g = 32.191$ ft. per sec.
By calculation,	Equator,	lat. 0° 00′;	$g = 32.091$ ft. per sec.
	Parallel 45,	lat. 45° 00′;	$g = 32.173$ ft. per sec.
	Poles,	lat. 90° 00′;	$g = 32.255$ ft. per sec.

For the purposes of general calculation, the value first given above, being the value for New York at sea level and a fairly average value, is commonly used. But where greater accuracy is desired, this value must be corrected for latitude and for elevation above sea level.

Calculation of Gravity—The calculation of the force of gravity for any latitude (L) and any elevation (h) above sea level, is based on the value determined for the 45th parallel; namely, $g = 32.173$ ft. per sec. The formula used for making this calculation is

$$g = 32.173 - 0.082 \cos 2L - 0.000003h$$

Example—Calculate the value of gravity at Mexico City, latitude 19° 26′ N.; elevation 7600 ft. above sea level.

Solution—

$$g = 32.173 - 0.082 \cos 2(19° 26') - 0.000003 \times 7600$$
$$= 32.173 - 0.082 \times 0.7786 - 0.0228 = 32.086 \text{ ft. per sec.}$$

Effect of Change in Gravity On Weight of Bodies—Since the action of gravity on bodies at or near the earth's surface gives to them weight, any change in the force of gravity produces a like change in the weight of bodies. For this reason, a body weighs slightly more in the higher latitudes at sea level than on a lofty mountain near the equator. The difference, however, is very slight, and, in the use of balances, is wholly eliminated, because both the body and the balancing weights are affected alike.

Gravitation of Bodies—All bodies free to move fall, under the influence of gravity, and are then said to "gravitate." The movement is always downward. The force of gravity acts, in this case, to create a certain velocity each second or unit of time. The same increase of velocity is imparted to each particle of mass so that if there is no resistance to the fall, a small body will drop as fast as a large body.

In a vacuum, a feather is found to fall with the same speed as a lead bullet, because there is no air present to resist the fall. Resistance decreases the velocity of fall.

Acceleration Due to Gravity—The gain per second, in the velocity of a falling body, is called the "acceleration due to gravity." It is the velocity imparted to the body by gravity, each second or each unit of time and is estimated in feet per second. In like manner any force acting on a body free to move produces acceleration. A constant force produces a constant acceleration.

INQUIRIES OF GENERAL INTEREST

Calculating Electrical Currents

The power supplied to an electric motor is 35 kw., the pressure, 250 volts; find the current in amperes; also the horsepower of the current. Kindly give the formulas for these calculations.

ELECTRICIAN.

Michel, B. C., Canada.

In electricity, the power, in watts, divided by the pressure of the current, in volts, gives the strength of the current, in amperes. Therefore, since 1 kw. = 1000 watts and 35 kw. = 35,000 watts, the strength of the current is, in this case

$$amperes = \frac{watts}{volts} = \frac{35{,}000}{250} = 140\ amperes$$

Since 746 watts are equivalent to 1 hp., the power of this current is

$$horsepower = \frac{watts}{746} = \frac{35{,}000}{746} = 46.9,\ say,\ 47\ hp.$$

*

Coal Underlying an Acre

Being interested in lignite coal land in this state, I want to learn the method of calculating the number of tons of coal underlying an acre of land. I have seen, recently, a chart published by COAL AGE, giving the weight of coal underlying an acre of land, for different thicknesses of the seam; but I think this table applies only to hard or anthracite coal and bituminous coal. Can the same table be used for lignite coal?

WILLIAM HENDERSON.

Cameron, Texas.

We reproduce in the figure below, a portion of the chart to which correspondent refers. As explained in

TABLE I - TONS OF COAL UNDER ONE ACRE OF SURFACE
Calculated for a Specific Gravity of 1.50 or 93.7 lb. per cubic foot

INCHES	ONE FT.	TWO FT.	THREE FT.	FOUR FT.	FIVE FT.	SIX FT.	SEVEN FT.	EIGHT FT.	NINE FT.	TEN FT.
0	0[2]3.00	3646.00	5469.00	7292.00	9115.00	10938.00	12761.00	14584.00	16407.00	18230.00
1	191.91	379.91	569.81	759.72	949.63	1139.53	1329.44	1519.34	1709.25	1899.16
2	383.82	767.63	1151.45	1535.26	1919.08	2302.89	2686.71	3070.52	3454.34	3838.15
3	575.73	1151.45	1727.18	2302.89	2878.63	3454.34	4030.07	4605.79	5181.52	5757.24
4	767.64	1535.26	2302.89	3070.52	3838.15	4605.79	5373.42	6141.05	6908.68	7676.31
5	959.55	1919.08	2878.63	3838.15	4797.68	5757.24	6716.78	7676.31	8635.84	9595.39
6	1151.46	2302.89	3454.34	4605.79	5757.24	6908.68	8060.13	9211.58	10363.03	11514.48
7	1343.37	2686.71	4030.07	5373.42	6716.78	8060.13	9403.49	10746.84	12090.20	13433.56
8	1535.28	3070.52	4605.79	6141.05	7676.31	9211.58	10746.84	12282.10	13817.36	15352.63
9	1727.19	3454.34	5181.52	6908.68	8635.84	10363.03	12090.20	13817.36	15544.52	17271.68
10	1919.10	3838.15	5757.24	7676.31	9595.39	11514.48	13433.56	15352.63	17271.68	19190.73
11	2111.01	4221.96	6332.96	8443.94	10554.92	12665.90	14776.88	16887.86	18998.84	21109.78

To find the weight in long tons for a coal of any specific gravity other than 1.5 it is only necessary to multiply the figures shown in these tables by the ratio of the given specific gravity to 1.50.

For Example The weight of coal underlying a 10-acre tract, when the seam is flat, 2 ft. 6 in. thick, and the specific gravity of the coal 1.30 (Bituminous) is $\frac{1.3}{1.5} \times 45{,}574\ 6 = 39498$ *lg tons*

On a pitch of 60 deg. this seam would contain double this amount or practically 79,000 long tons Expressed in short tons, these amounts should be $\frac{2000}{2240} = 1.12$ *or say ⅛ greater.*

The top horizontal column of TABLE I, gives the thickness of coal seam up to ten feet. The extreme left hand column shows inches. For example: to find the number of tons of coal in a 10-acre tract, where the seam has a thickness of 2 ft. 6 in. run down the 2 ft. column until opposite 6 in. and you will find 45,574.60 long tons Multiply by 10 and the result is 455,746 long tons

COAL AGE

CHART SHOWING WEIGHT OF COAL UNDERLYING AN ACRE, FOR A LEVEL SEAM

the note accompanying this chart, the weight of coal is given in long tons, for each inch of thickness of a level seam, from 1 in. to 10 ft. 11 in. in thickness and underlying one acre of surface. The figures on the chart refer to a coal having a specific gravity of 1.5, which is the average specific gravity of anthracite coal.

The figures of this table may be made to apply to coal of any other specific gravity, by dividing the weight given in the table by 1.5 and multiplying that result by the specific gravity of the coal in question. This will give the weight of such coal in long tons per acre for a level seam, and to find the weight in short tons (2000 lb.) it is necessary to multiply by 1.12 or, say add one-eighth to the weight given in the table.

When the seam has a considerable inclination it is necessary, in order to obtain the quantity of coal underlying an acre on the surface, to divide the weight given in the table for the given thickness of seam, by the cosine of the angle of inclination. For example, a level seam of coal 5 ft. 6 in. thick contains 10,026.46 long tons of coal having a specific gravity of 1.5. If the specific gravity of the lignite coal, in question, is 1.2, the weight in short tons, of this lignite underlying an acre is

$$10{,}026.46 \left(\frac{1.2}{1.5} \times \frac{2240}{2000} \right) = 8983.7\ tons$$

If this seam of lignite coal had an inclination of 26 deg. from the horizontal, it would contain

$$\frac{8983.7}{cos\ 26^\circ} = \frac{8983.7}{0.89879} = say\ \ 10{,}000\ tons\ per\ acre$$

When great accuracy is desired, it is always necessary to ascertain the exact average specific gravity of the coal in question, since this varies for different qualities of all grades of coal.

*

A Suggestive Inquiry

I want to make a suggestion that may help to save lives, and would be glad to see the same discussed in COAL AGE. The question is as follows:

Would there be any benefit derived by connecting the two shafts of a mine (upcast and downcast) by means of a heavy masonry air course built on the surface and provided with iron doors in such a manner that the air current in the fan drift could be conducted to either shaft? It frequently happens that the air shaft with which the fan is connected, is damaged in an explosion and choked with débris to such an extent as to practically incapacitate the fan, although this may not have been injured by the blast. In such a case, would not the proposed arrangement enable the ventilation to be restored in the mine more quickly and expedite the work of rescue?

GEORGE DAVIS

Shenandoah, Penn.

[We give space to this suggestion, which no doubt has some value in its relation to gaseous mines or dusty mines, liable to explosion. We shall be glad to have the question discussed further by practical mining men.

There are many questions similar to this one, asked by correspondents, from time to time, that are deserving of the most careful consideration on the part of mine officials. It often happens that what seems a good scheme is proved by the discussion of practical men to be unsafe. Hence the value of a thorough discussion.—ED.]

EXAMINATION QUESTIONS

Examination for Mine Managers, Mine Examiners and Hoisting Engineers Held at Springfield, Ill., April 14, 1913

(*Selected Questions*)

Ques.—To light a mine with 200 lamps of 16 cp. each, what amount of mechanical energy would have to be available for conversion into electricity?

Ans.—A 16-cp. lamp may be assumed to consume from 50 to 56 watts of energy. Estimating on the maximum amount, the total electrical energy required would be $200 \times 56 = 11{,}200$ watts. The efficiency of the dynamo may be taken as 90 per cent. and, since 1 hp. is equivalent to 746 watts, the power transmitted by the belt running the dynamo is

$$H = \frac{11{,}200}{0.90 \times 746} = 16.68\ hp.$$

Now, assuming the efficiency of the engine driving the dynamo as 85 per cent., the total indicated horsepower (i.hp.) is

$$i.hp. = \frac{16.68}{0.85} = 19.62,\ say\ 20\ hp.$$

Ques.—A siphon has its short leg, 10 ft. vertical, and long leg, 20 ft. vertical, and is 6 in. in diameter, with a total length of 100 yd. Find the flow, in gallons per hour, allowing for frictional resistance.

Ans.—It is never safe to calculate the discharge of a siphon without first ascertaining whether this siphon will run dry or, in other words, tend to empty itself, which will always be the case if the flow of water in the short leg, under atmospheric pressure, is less than the discharge in the long leg, under gravity. At sea level, the water column supported by the atmospheric pressure is practically 34 ft.; and, assuming that the short leg, in this case, is 100 ft. long and the long leg, 200 ft. long, while the uniform diameter of the pipe is 6 in., the relative flow in each leg of the siphon, calculated independently, is as follows:

$$\text{Short leg,}\quad \frac{34 - 10}{2.08 \times 6 + 100} = \frac{24}{112.48} = 0.213$$

$$\text{Long leg,}\quad \frac{20 - 10}{2.08 \times 6 + 200} = \frac{10}{212.48} = 0.047$$

There is, therefore, no danger of the siphon running dry, in this case.

The discharge of a 6-in. siphon 300 ft. long, having a rise of 10 ft. and a fall of 20 ft., is calculated thus:

$$G = 6^2 \sqrt{\frac{800 \times 6\ (20 - 10)}{2.08 \times 6 + 300}} = 36 \sqrt{\frac{48{,}000}{312.48}}$$

$$= 446.18\ gal.\ per\ min.$$

The discharge of this siphon per hour is, therefore, $60 \times 446.18 = 26{,}770$ gal. per hr. It is important that both ends of the siphon be submerged and that an air trap be provided at the crown or summit to collect the air given up by the water.

Ques.—If water weighs 62.5 lb. per cu.ft., and steam at atmospheric pressure has 1640 times the volume of the water from which it was generated, what weight of steam would be used per hour by a pair of engines, 30-in. cylinders and 5-ft. stroke, making 30 r.p.m. and discharging steam at atmospheric pressure?

Ans.—In general steam practice, the terminal pressure in the cylinder, at the moment of release when the exhaust valve opens, is considerably above the atmospheric pressure, for noncondensing engines, which is the usual type of hoisting engines at mines. For this reason, the only assumption that will make possible an intelligent answer to this question is that the steam in the cylinder expands down to atmospheric presure at the moment of release. Even on this assumption, the calculation would be practically worthless since no allowance is made for condensation and clearances, which always form a very considerable percentage of the total quantity of steam consumed.

However, ignoring these two factors, condensation and clearances, and assuming there are four compressions in the steam in the cylinder previous to cutoff, if the engine cuts off at ¼ stroke, the steam will have expanded down to atmospheric pressure, at the moment of release, very nearly. Under this assumption, the cylinder displacement, in cubic feet per minute, or per hour, will give approximately the volume of steam consumed in that time, measured at atmospheric pressure; and if this is 1640 times the volume of the water from which it is generated, the weight of steam is found by dividing the cylinder displacement, in cubic feet, by 1640 and multiplying that result by 62.5.

In the present case, the area of each 30-in. cylinder is $0.7854 \times 30^2 = 706.86$ sq.in. The piston displacement per stroke for the two cylinders is then $2 \times 5 \times 706.86 \div 144 = 49.09$, say, 50 cu.ft. An engine running at 30 r.p.m. makes 60 strokes per min., which gives for the total piston displacement per hour, in this case, $50 \times 60 \times 60 = 180{,}000$ cu.ft. On the assumed basis, the weight of steam consumed per hour is, then, $180{,}000 \div 1640 \times 62.5 =$ say, 6860 lb.

Ques.—How would you open and close the valves to start and stop an engine, as quickly or as slowly as possible? Give reasons.

Ans.—Steam is compressible, and the effect of the sudden arrest of the flow of steam is not like that when a flow of water is suddenly arrested by the closing of a valve. The sudden opening or closing of the steam valve or throttle will produce no other effect than a possible derangement of the rope connections on the cage or the position of the rope on the sheave or drum, provided the momentum of the cage is such as to produce a slack rope when the winding drum is arrested too suddenly by shutting off the steam and applying the brake. It is important, however, in hoisting, to start the engine slowly, so as to overcome the inertia of the cage gradually and not produce an undue strain on the rope connections and other parts of the winding gear.

COAL AND COKE NEWS

Washington, D. C.

According to information made public by the Department of Justice a modified final decree of the Supreme Court in the Government's case against the Philadelphia & Reading Coal & Iron Co. has been filed in Philadelphia. The so called 65 per cent. contracts made by the defendants severally with other named producers before the court for the purchase of anthracite coal mined or owned by the producers, as set forth in the pleadings and evidence, "from the times they were entered into have restrained and monopolized trade and commerce among states."

The exceptions already referred to were a contract dated Mar. 1, 1902, between the Pennsylvania Coal Co. and the Elk Hill Coal Co.; a contract dated Nov. 1, 1900, between the New York, Susquehanna & Western Coal Co. and John Jermyn and Joseph J. Jermyn; a contract dated Oct. 21, 1903, between the Hillside Coal & Iron Co. and the Lackawanna Coal Co., Ltd.; a contract dated Oct. 26, 1899, between the Lackawanna R.R. and the People's Coal Co., and a contract dated May 1, 1907, between the Lackawanna and the George F. Lee Coal Co.

The so called 65 per cent. contracts, therefore, with the exceptions stated, are canceled by the decree of the court, and the defendants who are or were parties thereto, including their officers, directors or other agents or assignees are "perpetually enjoined and prohibited from further executing them directly or indirectly, and from entering into any like agreements or arrangements restraining or monopolizing interstate commerce in anthracite coal."

The decree of Dec. 20, 1910, is modified, so as to dismiss the petition as to the alleged acquisition and holding by the Erie of a majority of the capital stock of the Susquehanna R.R. This is done, however, without prejudice to the right of the United States to institute any other suit or proceedings.

The same dismissal of petitions, but without prejudice to the United States government, is made in respect to the charge based on the alleged acquisition and holding by the Reading company of a majority of the capital stock of the Central R.R. of New Jersey.

Reduction Ordered in Freight Rates

In a decision handed down on May 23, the Interstate Commerce Commission, upon the complaint of Wayne R. Brown, orders the Boston & Maine, Delaware & Hudson, Lehigh Valley, New York Central, New York, Ontario & Western and West Shore R.R., to reduce the rates on anthracite coal from points in Pennsylvania to Scotia, New York. The roads have been charging $2.15 per ton on prepared sizes, which rate was ordered to be reduced to $2 from Packerton, Peckville and Scranton, Penn., to Scotia, by July 15.

Rates on coal of other sizes were ordered reduced proportionately. In this instance it was found that rates were so arranged as to permit merchants in Schenectady to deliver coal in Scotia. The commission held that both points were in the same traffic area, and that Scotia should be placed upon the same rate basis as Schenectady.

Coal Will Probably Be on Free List

Thus far efforts in the Senate Finance Committee to secure the elimination of the item coal from the free list have entirely failed. Coal men and various others have lately seen members of the committee for the purpose of securing some duty if possible upon the item. There appears, however, to be a strong disposition to avoid the odium which would, it is supposed, come from a restoration of coal to a dutiable status.

The argument has been made that in order to have a good basis for reciprocity negotiations with Canada it would be only fair to arrange matters, so that coal could be used as makeweight in the negotiations. This argument has not had much effect, so far as can be learned, and it now seems probable that the item will remain on the free list throughout the history of the tariff bill not only in the committee itself, but probably also in the later discussion on the floor of the Senate.

WILKES-BARRE, PENN.

Plans for the new office building which the Lehigh Valley Coal Co. several months ago decided to erect, have been completed by D. H. Burnham and Co. of New York, and the contract in all probability will be awarded by June 1. The structure will be six stories in height, and will be built on North River St., north of the Laurel Line tracks. It will be a handsome edifice of white granite and terra cotta, and will probably mark the beginning of a group of modern buildings in the neighborhood of the Luzerne County court house. It is hoped to have the building ready for occupancy by April 1, 1914.

It will be built upon specifications providing absolute safety from fire. The skeleton structure will be of steel, the interior walls of tiling and the floors of concrete. It will be lighted by electricity and heated by steam, both the power and the heat are to be obtained from the Dorrance Colliery, about 3000 feet away. A conduit along the Lehigh Valley Railroad tracks will carry the necessary conductors.

he outside measurement of the structure is 60x125 ft., over 40,000 sq.ft. of floor space being available. The offices will be of varying size, to suit the requirements of over two hundred employees.

The offices of the vice-president and general manager, the mining superintendent, and the mining engineer, will be on the sixth floor. In the basement there will be, in addition to the storage and stationary rooms, a large dressing room with showers, baths, lockers, etc., for such employees of the office whose work takes them into the mines.

The first floor will be occupied by the paymaster's office, the chemist's office and laboratory, the office of the retail coal shipper, the telephone exchange and information booth, and a large room to be used for conference of officials, or if desired, for employees as a reading room. The second floor will contain the two division offices, that of the Wyoming and that of the Lackawanna. The latter is now located at Pittston, but will be moved to Wilkes-Barre when the change is made. The fourth floor will remain unoccupied for some time, being reserved for future needs. The offices on the fifth floor will consist of those of the mechanical and electrical engineers, of the inspector of equipment, of the legal department, and of the real estate department.

PENNSYLVANIA

Anthracite

Wilkes-Barre—The concrete wall constructed last December to seal off a mine fire in the Kidney Vein of the Buttonwood Colliery, was recently broken down and the fire found to have been smothered by the gases generated by combustion. The work of unsealing the fire area was done by Mine Inspector D. T. Davis, of the Ninth Anthracite District, Superintendent Lewis J. Davis, Mine Foreman William Powell, and five firebosses. This fire had burned for several weeks before the plan of bulkheading it was decided upon, and about 300 acres of coal land were in danger. The colliery is now operated by the Lehigh & Wilkes-Barre Coal Co.

Bituminous

Somerset—The big power plant and tipple owned by the Consolidation Coal Co. at Houghton, near Ralphton, have been destroyed by fire.

VIRGINIA

St. Charles—Plans for the extensive development of the Monarch coal mines near St. Charles, Va., have been completed by the Old Virginia Coal Co., which was formed recently at Chattanooga, Tenn. W. F. Hutcheson is at the head of the company. H. B. Bonney, J. R. Barnes, W. W. Mullen and W. B. Miller are other Tennessee mining men who are identified with the new company.

ALABAMA

Montgomery—Chief Mine Inspector C. H. Nesbitt has asked Governor O'Neal to add another man to the present force of mine inspectors. The term of W. R. Ray, district mine inspector at Blocton, expired Apr. 30. It is believed he will be reappointed.

TENNESSEE

Obey City—Work of opening the large coal seam near Obey City, Tenn., has been begun. The operations are being conducted by the Young Coal & Coke Co. This is the most pretentious effort that has ever been made to develop the coal deposits in Overton County. E. C. Young is at the head of the company, and John McDaid has charge of the mine.

KENTUCKY

Louisville—By a recent ruling of the Interstate Commerce Commission the Louisville & Nashville R.R. Co. was given authority to establish rates on coke in carloads from Benham, Ky., at which point the great coking plant of the Wisconsin Steel Co. is located, to various other points the same as rates concurrently in effect from Appalachia, Va.

Shafer—The East Jellico Coal Co., of Shafer, Ky., which was recently in effect deprived of the possession of its mines by a decision of the Kentucky Court of Appeals in favor of the Bennett-Jellico Coal Co., a suit involving the title to the property upon which the mines were located being sent back to the lower court for a new trial, has opened new entries on a part of its property regarding which there is no dispute, and expects to be able to get out coal by June 1 or thereabout.

Elkhorn—The Elkhorn Fuel Co., in accordance with its plan for the acquirement and development of coal lands on a large scale, has recently purchased of the Long Fork Coal Co. several thousand acres of coal property in Letcher County. Development work will begin at once, and it is believed that coal will be shipped within the next 12 months.

McRoberts—A full recovery from the scarcity of labor which resulted from the shutdowns necessitated by the April floods at McRoberts, Ky., is indicated by the report from that point that the Consolidation Coal Co. is getting out an average of about 54 cars a day.

Middlesboro—A meeting of Harlan County operators was held recently at Middlesboro, Ky., for the purpose of taking steps to present to the Louisville & Nashville R.R. Co. the request of the operators in that field for the same rates on coal to all points as are given the Bell County operators. The removal of the 10c. differential as to all points north of the Ohio River was recently announced, but it is reported that the operators have not had like success with reference to points within the State.

OHIO

Columbus—Both Ohio mine inspectors and the Federal Government investigated the cause of the explosion at the Imperial mine at Belle Valley, Noble County, recently. Two inspectors representing the National Government came from Pittsburgh. After a thorough investigation it was announced by John C. Davies, state mine inspector of Ohio, that insufficient ventilation was the cause. This permitted firedamp to accumulate and this was ignited by a spark.

A number of coal operators met at the Neil House in Columbus, May 23, and discussed the antiscreen bill, which is expected to come up at the extraordinary meeting of the Ohio General Assembly, to be convened some time in the winter. The operators will make a determined effort to prevent the passage of the bill and plans are being laid to bring this about. At the last session of the General Assembly the bill was side-tracked by the adoption of the Thomas resolution, providing for a commission to investigate all the conditions surrounding wages for mining coal in Ohio.

Coshocton—Miners employed at the Morgan Run mine in Coshocton County again went out on a strike because of a controversy over the prices to be paid for driving entries. There was a difference between the men and the operator, according to the miners, of 68c. per yard. An effort is being made to settle the trouble.

Lorain—In the presence of over 200 out-of-town operators the new freighter, "Arnold C. Dustin," built at the Lorain yards of the American Ship Building Co., for John Mitchell, of Cleveland, was recently launched. The vessel is 545 ft. long, and will be used in the coal and ore trade.

McArthur—The fire which destroyed the tipple, engine house and plant of the Starr-Hocking Coal Co., at Coonville, Vinton County, Ohio, caused a loss of $100,000. The fire was discovered in the yard office at 7 p.m. in the evening, and every effort made to stop the flames proved fruitless. Charles Hargray, who controls the mine ownership, announced that the tipple and engine house would be rebuilt at once.

INDIANA

Indianapolis—Attorney-General Honan, of Indiana, has given an option to Frank J. Pearce, state mine inspector, interpreting the law of 1905 to mean that firebosses in Indiana mines are compelled to examine mines for firedamp that are known to contain, or are supposed to contain that gas, but are not required to examine all working places in mines for firedamp.

Miners employed at the Washington-Wheatland mine near Washington, Ind., have returned to work after being out several days, contending that the mineboss did not make careful examination for firedamp, and they feared accidents. They returned to work after the state mine inspector and deputies had made careful investigation.

Petersburg—The S. W. Little Coal Co. officers were surprised, after pumping out the Blackburn mines, three miles north of this city, to find the motors dry and in usual condition. Before deserting the motors during the recent rush of water into the mines, the drivers took them to the highest point in the mines. It is believed the water forced the air in the mines to the top of the slope and so compressed it as to keep the water back from the motors. It was expected the machines would be ruined by long immersion, and the company was glad to escape a loss of several thousand dollars.

Boonville—The Warrick County Coal Co., recently organized, has bought the Polk Patch mine properties in this country from the J. Wooley Coal Co., and will introduce the strip mining process. The properties have a daily output of 1000 tons. The deal carries with it the conveyance of 5000 acres of coal lands east of Boonville. W. H. Hays, L. E. Fischer and R. R. Hammond are the directors. The capital stock of the new company is $350,000, all from Chicago.

ILLINOIS

Marion—A fire, which started about six o'clock on the evening of May 22, at the mine of the Illinois Hocking Washed Coal Co. at Marion, continued until about three o'clock on the afternoon of the following day. Two supply men, who were distributing powder in the mine at the time of the fire, were taken from the mine on the afternoon of the 23d. They were Ed and John Duncan, brothers, 19 and 30 years old, respectively. John was dead when found and Ed was unconscious, was able to tell of his experience the next morning. One mule of the 17 owned by the mine was saved, the other 16 having perished in the fire. The air shaft, the fan and fan house were also destroyed. It is not known how the fire originated, but is supposed to have started in an old tool house, which was being used as a wash room.

Springfield—Fire destroyed the plant of the Royal Collieries Co., at Virden. The loss is estimated at $125,000.

OKLAHOMA

McAlester—After a three months' shutdown the Adamson mine of the Union Coal Mining Co., of McAlester, Okla., has been reopened. Orders from the district tributary to this mine are expected to be heavy enough to keep the property in operation without interruption until February or March. W. E. Beaty is president of the company.

TEXAS

Palestine—Anderson County, Texas, coal deposits are being examined by New York engineers. Prospect holes are being sunk on several of the outcrops and diamond drilling is being done. Considerable secrecy surrounds the operations, but it is understood that Palestine interests have an option on a considerable acreage of coal lands.

Loving—The Sallie-Alice Mining Co. has opened a coal shaft on the W. S. Purselley lease and has installed its machinery. The firm is working night and day shifts to get the entries sufficiently advanced to enable it to begin filling a large contract at an early date. The coal is considered as good as any in the state, being a 5-ft. bed of bituminous found at a depth of 100 ft. under a rock roof and carrying just enough water to keep down the dust.

WYOMING

Lander—The Gebo coal lands, near Hudson, in Fremont County, amounting to 2200 acres, were formally restored to public entry on May 12. These lands are regarded as some of the most valuable in the district and already a number of filings have been made. This tract has been classified by the Government and entrymen will have to pay from $30 to $50 an acre to secure their claims.

MONTANA

Glendive—R. W. Snyder Coal Mine has been purchased by C. J. Bohannon and Geo. B. Williams, the consideration has not been made known. Experts have been employed and after a brief examination they state that the public has no idea of the tremendous amounts of coal in this mine. The Northern Pacific Ry. will build a spur leading to the mine from Stipek, a distance of two miles and will carry 100 tons of coal per day for the first year.

WASHINGTON

Astoria—J. C. Brooks, representing a big coal company, located in the Middle West, was in Astoria last week for the purpose of investigating conditions relative to the establishment there of a big coal dock to provide coal for steamships coming to the Columbia River. Astoria is at the mouth of the river and bunkers there would be in good position to furnish

coal for outbound vessels which, as a rule, now proceed to British Columbia to fill their bunkers for long voyages.

Chehalis—J. E. Leonard has found a vein of coal 250 ft. west of Coal Creek. The height is 8 ft. and the quality is superior to most coals that have been uncovered in the vicinity.

PERSONALS

E. F. Mullin, for many years engineer for the Jeffrey Manufacturing Co., and previously with the Heyl & Patterson Co., has severed his connection with the former concern to join the engineering staff of the Link-Belt Co., Philadelphia.

Mr. Mullin has had extensive experience in the design and construction of tipple equipment and general coal handling machinery, particularly in the West Virginia and Pennsylvania coalfields.

J. F. Healey has resigned his position as general manager of the operating department, Davis Colliery Co., Elkins, W. Va., effective May 31. Mr Healy is considering several offers of similar positions, but may open a consulting office in Charleston, W. Va.

A. M. Campbell, formerly of Louisa, Ky., and recently engaged in mining and development work in eastern Kentucky, has been made general manager of the Elkhorn Fuel Co.'s operations, and is at present in the Boone's Fork district looking over the ground for the purpose of planning for the beginning of active work.

The announcement is made that W. H. Warner will be in charge of the offices of the Pan-American Coal Co., of Newark, Ohio, which will be moved to the Schultz Building, Columbus, about June 1. The Pan-American Coal Co. recently took over a large number of mining properties in Ohio and West Virginia, making it one of the largest operating concerns in the Buckeye state. W. M. Fulton will be president of the company which will have an authorized capital stock of $500,000.

PUBLICATIONS RECEIVED

Cornell University, Ithaca, N. Y. The Sibley Journal of Engineering: vol. XXVII, No. 8, May, 1913. 30 pp.: 6⅝x9⅜ in. Annual subscription, $2.50; single copies, 25c.

West Virginia Geological Survey, Coal, Oil, Gas, Limestone and Iron Ore Map. This new edition is the joint publication of the State Geological Survey and the State Semi-Centennial Commission. It contains all the special features of previous editions brought up to date and shows the approximate areas of the several coal series, operating mines and their post-office addresses, as well as the oil and gas pools. Size, 35x44 in. Price, 50c, postpaid.

CONSTRUCTION NEWS

Latrobe, Penn.—Tony Colangelo had been awarded the contract to build 80 ovens for the Marietta company, at its plant, near Wilpen, in the Ligonier Valley.

Youngstown, Ohio—Julian Kennedy is at the head of the Poland Coke Co., which is building a plant of 100 ovens on its 1100-acre coal tract on Dunkard Creek, near the Monongahela River in Greene County, Pennsylvania.

Coshocton, Ohio—William Powers, who operates a mine five miles southeast of Coshocton, is contemplating opening up a new mine near Kimbolton Guernsey County, on 140 acres which he has under lease.

Athens, Ohio—A force of men is now at work in mine No. 210 on Sugar Creek, making ready to put that shaft in operation as soon as possible. This mine has been idle for the past six years, although in all that time its owners, the Sunday Creek Co., has at all times kept it pumped out

Bicknell, Ind.—The American Coal & Mining Co., recently organized, has purchased a large acreage of coal land near here, and is preparing to sink two mines. The first vein is 7½ ft. thick. Hal R. McClelland, of Clinton, Ind., is vice-president and manager of the company.

Buffalo, N. Y.—The Cascade Coal & Coke Co., an adjunct of the Rogers-Brown Iron Co., of Buffalo, has awarded the contract for an increase of its coal-mining plant at Sykesville, Penn., which will include two 300-hp. boilers and engines, and which is a practical duplication of the present equipment. The addition is to be finished by July 1.

Moundsville, W. Va.—Contractor R. J. McFadden announces that he will start the work of the new shaft on the Ball property back of Glendale, for the Hitchman Coal Co., to be used in connection with the Glendale mine now in operation.

Ragland, Ala.—The Ragland Coal Co. is preparing to open new mines on their property at Coal City in the near future.

Lexington, Ky.—It is reported that on account of the great increase in coal operations along the lines of the Lexington & Eastern, the Louisville & Nashville R.R., which controls that road, is preparing to spend $1,000,000 in improving the property, cutting down heavy grades, shortening the curves, and the substitution of wooden trestles and bridges with steel work, covering the entire distance of 95 miles between Lexington and Jackson, Ky. These improvements are considered necessary in order to handle the traffic which is expected, heavier engines and longer trains being planned.

Altoona, Penn.—Vast coalfields, containing deposits estimated at 475,000,000 tons situate in northern Blair and Cambria Counties, and traversed by the Altoona Northern R.R., now in a state of construction, will soon be tapped. Expert mining engineers declare that the deposits of the new field are sufficient to keep 10,000 men constantly engaged during the next ten years.

The branch of the New York Central into the Cambria fields and at Frugality, and further construction of ten miles of trackage will be necessary to tap into the Gougherty-Patton field.

NEW INCORPORATIONS

Nashville, Tenn.—The Fern Hill Mining Co., Grundy County, capital stock, $25,000. Incorporators: H. L. Gregg, W. G. Dillon, E. W. Patterson, W. P. Stone and W. E. Robertson.

Cleveland, Ohio—The Tice Coal Co., of Cleveland, Ohio has filed papers with the secretary of state changing its name to the Kirk-Dunn Coal Co. and at the same time increasing its capital stock from $10,000 to $300,000.

Columbus, Ohio—The Stalter & Essex Coal Co. of Columbus, Ohio has been incorporated with a capital stock of $25,000 to mine and deal in coal. The incorporators are Calvin Essex, James R. Stalter, Fred Essex, Robert R. Stalter and Charles Essex.

Huntington, W. Va.—The Sharon Coal & Coke Co., of Newton, Penn., chief works to be located in Pike County, Kentucky; to engage in the mining of coal and the manufacture of coke, authorized capital stock, $100,000. Incorporators: Z. T. Vinson, W. R. Thompson, T. J. Bryan, E. M. Watts and A. E. Bush, all of Huntington, W. Va.

INDUSTRIAL NEWS

Scranton, Penn.—New mining is to be done by the Scranton Coal Co. in the hill section between Irving Ave. and Nay Aug Park and Vine and Myrtle Sts

Pittsburgh, Penn.—Charles T Topping has been appointed agent for the Phœnix boilers and engines in the Pittsburgh district His office is room 816 Bessemere Building

Windber, Penn.—M. C. Yoder, Chas. Estep and John Reese have taken over the property of the Salem Coal Co., near Salem, Ohio. The mine is being equipped with modern machinery

Pottsville, Penn.—The Philadelphia & Reading Coal & Iron Co. will soon place in operation in its Suffolk Colliery an 8-ton electric mining locomotive ordered from the General Electric Co.

Moundsville, W. Va.—A big coal deal was consumated here May 10, when the tract lying in Cameron and Liberty districts, comprising a total of 556 acres, was sold to S. W. Booher for $40,600.

Sullivan, Ind.—The Rood mine, near Farmersburg, has been sold by Receiver J. T. Akin to Ralph Sharp, trustee, for

$2035, which will pay the preferred claims. There is due miners for wages $6000.

Bollvar, Penn.—J. W. Miller, representing the company which recently acquired the coal underlying about a thousand acres south of here, has also purchased the John A. Campbell farm, near West Fairfield.

Birmingham, Ala.—The Alabama Mineral Land Co. announces the purchase of 12,000 acres of coal land situated in Walker County, near Jasper, the county seat. C. C. Huckabee, of the Alabama Mineral Map Co., states that the purchase was made from J. F. Andrews, of New York City.

New Orleans, La.—Contracts have been signed in New Orleans for a year's supply of Alabama coal for the vessels of the United Fruit Co., which ply between Mobile and Central America. The vessels landing cargoes at New Orleans will use Pitsburgh coal.

Columbus, Ohio—Application has been made by the Middleport & Northeastern Ry. Co. before the Ohio Public Utilities Commission for permission to issue secureties for the extension of the railroad line through the southeastern part of Athens County to open a rich coal area.

Tamaqua, Penn.—Baird Snyder, of Pottsville, former head of the Lehigh Coal & Navigation Co., is to be president of the corporation that will reopen Silver Brook in a few months. C. M. Dodson Coal Co. is to back Mr. Snyder, and will own a good part of the stock of the new concern.

Pottsville, Penn.—New York City capitalists, who have organized the Bloomingdale Valley Coal Co. have just bought the individual coal operation known as the Phillips Colliery, in the southern part of Middleport, in the Schuylkill Valley. The new owners will develop it to its fullest capacity.

Welch, W. Va.—Jairus Collins, of Bramwell, has purchased the holdings of the Kimbal-Pocahontas Coal Co., for the sum of $35,000. The property is unimproved. At this time we have been unalbe to learn whether Mr. Collins bought the property for the Pocahontas Consolidated Co. or not, although it is supposed he did.

Washington, Penn.—Several coal tracts in the neighborhood of Old Concord, Morris Township, and East Finley Township, have been optioned at a uniform consideration of $200 per acre. Persons taking the options represent that they are agents of Waynesburg people, who are able to finance the deals should they decide to accept the coal.

Birmingham, Ala.—The interests of P. B. Thomas in the Montevallo Mining Co. were acquired May 19 by Henry L. Badham and W. S. Lovell, following the purchase of the Thomas stock by two well known industrial men. Robert J. Badham was elected vice-president, and D. A. Thomas, a son of the retiring president, was elected secretary.

Fostoria, Ohio—The Seneca Coal Co. has brought suit against the Ohio Coal & Coke Co., of Cleveland in the courts at New Philadelphia, Ohio, claiming that a contract for the purchase of certain coal lands in Warwick and Mill Townships in Tuscarawas County has not been carried out. The plaintiff asks for immediate possession of the property.

Wilkes-Barre, Penn.—The Delaware & Hudson Co., will place in operation a new 300-kw. motor-generator set and switchboard in its Baltimore Tunnel Mine. This company will also install a motor-generator set with switchboard of the same capacity in its Pine Ridge Mine at Parsons, Penn. Both machines and apparatus will be furnished by the General Electric Co.

Uniontown, Penn.—A large coal deal involving more than $150,000 and conveying 757 acres of Gilmore Township coal from the Enterprise Realty Co. to Judge R. E. Umbel, Hon. B. F. Sterling, et al, is about to be consummated. The deal was engineered by Kobert & Bradley, J. H. Zimmerman, representing the Realty company and Carter Bros., representing the purchasers of the property.

Chicago, Ill.—The Cleveland, Cincinnati, Chicago & St. Louis Ry. (Big Four Route), through their chief engineer, G. P. Smith, awarded a contract to the Roberts and Schaefer Co. this week, for five large Holmen coaling plants to be built immediately at Paris, Ill., Lynn, Ind., Anderson, Ind., Lilly, Ill., and Dayton, Ohio. This company has also secured a contract for two large 400 ton capacity, reinforced concrete, fireproof Holmen coaling plants which are to be built immediately at Chicago.

Columbus, Ohio—Columbus will be the headquarters of a new coal company, which is expected eventually to rank in size with the Sunday Creek Co. and the Lorain Coal & Dock Co. The new organization is being formed by the merger of the Pan-American Coal Co., the Granger Coal Co. and the Buckeye Coal Co., of Murray County, the Sedalia company, of Jacksonville, Athens County, and others. The new company will control 12,000 acres, employ over 900 men, and have a daily capacity in the start of 8000 tons.

Tiffin, Ohio—The Seneca Coal Co., a company composed of local capitalists, organized a number of years ago to operate coal mines and leases in Tuscarawas County, has brought suit in New Philadelphia, claiming that the Ohio Coal & Coke Co., of Cleveland, has failed to carry out its contract to purchase the property, which is located principally in Warwick and Mill townships, Tuscarawas County, for $50,000. The terms of the sale were $6000 down and $2000 the first of each month until the balance was paid. The Seneca company claims that $35,000 is still unpaid.

Washington, Penn.—During the past two weeks coal tracts in the neighborhood of Old Concord, Morris Township and East Finley Township have been optioned at $200 an acre. The options are being taken by parties who claim to be acting as agents of Waynesburg interests. More than a dozen bore holes are being drilled at various points in the tract known as the Dawson block and should the coal seams prove to be of uniform thickness and the coal of good quality it is believed the options will be taken up. The Dawson block extends over a large portion of Morris and East Finley Townships, a portion reaching across the line in Morris Township. This tract surrounds most of those recently optioned and it is announced that should the Dawson block which is optioned at $240 an acre be accepted the smaller tracts will be sold at the consideration previously named of $200 an acre.

Columbus, Ohio—The international officers of the United Mine Workers of America have given a decision on the strike of the Hisylvania Coal Co. at the Trimble mine at Glouster, Ohio. The men after being out for four months went back Apr. 22 pending an adjustment of the trouble. The original cause of the strike was the discharge of three men, for failing to set posts while driving entries. After an investigation by a representative of the international officers of the organization, during which evidence from the company was admitted tending to show that the posts were on the ground and had been buried by the men, the three men were reinstated at their old positions. Both the men and the company were held equally guilty in violating the state laws relative to safety. J. W. Blower, general manager of the company is trying to have the case re-opened in order to show that the company was blameless in the matter.

Butler, Penn.—W. S. Wagner who has been in the cement business for several years past but who formerly had worked a quarter of a century as a coal miner recently purchased the coal rights on the Redick farm in the Bonnie Brook district. He has recently completed his explorations for coal in that vicinity and has taken up options for the coal rights on several farms adjoining. One of the seams found is 3 ft. 2 in. thick and is pronounced the best coal that has been discovered in this country for some years past. Chemists who have examined the coal declare that it is entirely free from sulphur and superior to the Pittsburgh coal which is extensively used in the Butler district. The old mine taken over by Mr. Wagner is being rapidly developed the new workings having been already extended several hundred feet. There is a nice grade on the roadways that favors the movement of the loaded cars. This is a rare occurrence in mines in this section. It is stated that arrangements have been made and work will be commenced at an early date by the Rochester company for the building of a switch from their main line to the mouth of the mine, a distance of about 500 feet.

Galveston, Tex.—It is confidently expected that this city will be the Texas gateway to South America for both Atlantic and Pacific ports when the Panama Canal is opened for traffic. The outlook is promising for the establishment here of many new lines of business. Inquiries are being received daily and merchants and manufacturers are visiting the city with a view to securing locations. One of the latest evidences in this line concerns coal interests operating in Illinois, Arkansas, Kansas, Oklahoma, Missouri and Colorado. S. W. Sorat, president of the Star Coal Co., and E. R. Dusky, general sales agent for that concern, have been recently looking over the ground relative to the establishment of a mammoth marine coaling station. It is thought to make Galveston a base for supplying bunker coal to ships of all nations. With favorable freight rates the way will be clear for bringing additional industries into the entire Trans-Mississippi territory through the port of Galveston.

The daily production of the mines operated by the Star Coal Co. is 110,400 tons. This company can bring coal to Galveston to supply every ship that floats in the Gulf of Mexico, engaging in the coastwise and foreign commerce.

COAL TRADE REVIEWS

GENERAL REVIEW

The month of May has closed with the hard-coal business in a fairly satisfactory condition. Shipments are coming forward slowly, but small dealers have a liberal supply and a normal amount of orders are on hand for June. The main demand continues to center on stove, egg and nut being comparatively easy and some of the steam sizes now going into storage.

The strong tone still continues in the Eastern coastwise bituminous market, with buyers unusually anxious for tonnage, even at the new high level established for this year; prospects are excellent for a profitable season. All Hampton Roads coal not required in the coastwise trade is being readily absorbed in the export business and on Government colliers. Shipments, all-rail, are barely up to requirements and mining is much below capacity in some districts. Many of the large agencies are declining further orders except when same are from old customers, and the increased buoyancy in the market is being felt even on the lower grades.

New business in the Pittsburgh district is light, but that being done is invariably at an advance on the season circular. The market undoubtedly occupies a strong position with the producers in full control of prices, and will in all probability continue so as long as present conditions prevail. But should the car and labor shortage be relieved, the increased production would probably bring about a rapid reversal in conditions as noted in these columns last week. Indications are, however, that the situation will continue indefinitely, or, at any rate, until the winter trade opens up. The railroads are moving heavy tonnages with good dispatch, but it is becoming apparent that they are up to about full capacity.

Railroad equipment is also becoming scarcer in Ohio, and it is believed that the customary fall car shortage will develop much earlier than usual this season. The Lake trade continues the main feature in the local market, while steam coal is also active and some stir is evident in domestic, although dealers are not as yet beginning to stock. The tonnage handled at Hampton Roads fell below that of the previous week, but was, nevertheless, heavy. There is a strong demand in the spot market, but producers are inclined to hold any surplus tonnages for the purpose of applying these on contracts which soon become effective. Alarm is still felt over the car situation in the Southern markets and fears are expressed that this will not be cleared up before the usual fall shortage develops.

The situation in the Middle Western market remains unchanged, with prices at a low level and likely to continue so. There was, however, some slight stiffening on the steam grades, due probably to the advance in Eastern coals. In the Rocky Mountain region there are rumors that some of the oil-burning railroads and manufacturing industries will again resume coal burning. No authentic information is available regarding this point, but the effect on the coal business there, would be quite material.

BOSTON, MASS.

Bituminous—There is almost no news beyond the general firmness reported last week. Some of the large buyers are engaged in a still hunt for some shipper with a volume of Pocahontas and New River to sell, even at the $2.85 price, but by far the most of the agencies are out of the market, at least for the time being. What coal at Hampton Roads is not being moved coastwise is readily absorbed for export or by government colliers. The tone is strong and the prospect excellent for the whole season.

For Georges Creek and the better grades from Pennsylvania there is steady request and no accumulation is heard. Practically every anthracite cargo from Philadelphia includes at least a bin-load of bituminous. Stocks at this end are small rather than large. All-rail supplies are barely keeping up to requirements. Mining is less than normal for most of the districts and operations in most cases are becoming infrequent. The loading continues slow and with vessels arriving here already on the point of demurrage there is small encouragement for dividing up cargoes.

Water Freights share the generally firm tone of coal prices; 75c. is the prevailing figure on large vessels, Hampton Roads to Boston, with 5@10c. advance on smaller tonnage.

Anthracite is coming forward very slowly, and with many restrictions on the proportion of sizes. There is practically nothing being shipped to the storage depots in New England and dealers are most urgent in their calls for coal. The smaller retailers have had a liberal proportion of their season's supply in April and May, but large distributors in the cities are still anxious over their smal receipts. To still others it is embarrassing not to be able to take the apportionment of egg and nut they are asked to absorb in order to get stove. All told, however, there is a reasonably good amount of anthracite business in hand for June.

Current bituminous quotations are about as follows:

	Clearfields	Cambrias Somersets	Georges Creek	Pocahontas New River
Mines*	$1.05@1.40	$1.25@1.50	$1.67@1.77	
Philadelphia*	2.30@2.65	2.50@2.75	2.92@3.02	
New York*	2.60@2.95	2.80@3.00	3.22@3.32	
Baltimore*			2.85@2.95	
Hampton Roads*				$2.85
rovidence†				$3.73@3.78
oston†				3.78@3.90

*F.o.b. †On cars.

NEW YORK

Bituminous—Local conditions in the bituminous trade continue about the same as the previous week. No further recessions in prices have occurred except in few instances where demurrage coal, particularly in the cheaper grades, were offered at $2.45 and $2.50. The market prices on various grades were as follows: West Virginia steam, $2.50@2.60; fair grades, Pennsylvania, $2.65@2.70; good grades of Pennsylvanias, $2.75@2.80; best Miller, Pennsylvania, $3@3.10; Georges Creek, $3.25@3.30.

Contract tonnage still continues in demand, although the majority of large consumers have already arranged for their yearly requirements. The present situation from all ponits of view indicate a fairly healthy condition, which is probably accounted for by the limited car supply and shortage of labor in some of the Pennsylvania and West Virginia fields. Operators, on the other hand, avoid sending surplus tonnage to tidewater in fear of a repetition of past occurrences when they received ruinous prices for their product. The general trade opinion, notwithstanding the anxiety experienced by certain manufacturers over the tariff question, seems to indicate a decided expectation among operators that there is going to be a lively and active fall and winter season.

Anthracite—From all indications the hard-coal trade is in splendid shape, especially on prepared sizes. The demand for egg and stove coal has created a shortage with most of the operators on these particular sizes, and nut, which up to this writing was hard to dispose of, is beginning to move more rapidly. Local dealers are busy delivering their spring orders, but most of them express a certainty that summer conditions this year will not be different from previous years.

Heavy shipments are being forwarded to the Lakes and Western markets. The individuals are finding difficulty in disposing of pea coal with their line trade, which accounts for the cut price on this size at tidewater. Buckwheat still continues to be a drug and hard to dispose of, in many instances it is offered by the individuals at low prices. Barley and rice coal in the better grades are decidedly short, due, no doubt, to the heavy contract demand on this quality, but the Schuylkill grades of rice size are beginning to get long, although no real difficulty is experienced in making dispositions where a slight cut in price is offered. The Schuylkill grades of barley are not as freely offered as in the past month, but what tonnages happen to be available are still offered at cut prices.

The following is the local market on hard coal:

	Circular	Individual—Lehigh	Individual—Scranton
Broken	$4.60	$4.45@4.55	$4.50@4.60
Egg	4.85	4.70@4.80	4.85
Stove	4.85	4.80	4.85
Chestnut	5.10	4.95@5.05	5.00@5.10
Pea	3.50	3.20@3.45	3.25@3.50
Buckwheat	2.75	2.15@2.45	2.50@2.75
Rice	2.25	1.85@1.95	1.75@2.25
Barley	1.75	1.40@1.70	

PHILADELPHIA, PENN.

The month of May closes with the anthracite trade in a comparatively satisfactory condition. Most of the large companies will have considerable business go over into the month

of June at the advance of 10c per ton; they claim that the prospects look as favorable as May, when the mines were worked to their full capacity, and little or no coal went into stock, outside of the small or steam sizes. Broken, egg, stove and nut are still holding their own, as far as demand is concerned. There has been a trifle less demand for pea, which is essentially a domestic size in this market, while buckwheat and rice show little or no improvement. A large proportion of the three last sizes are going into stock.

The retail business is fairly good, although still in the hand-to-mouth state as far as orders are concerned. The demand here is in marked contrast to some of the large Eastern cities. Prompt shipments are demanded, the claim being made that coal is going out faster than received, which seems to be an indication that the lesson learned last fall and winter has had its effect. In this market, the experience of last year has had exactly the opposite effect. It is almost safe to say that the business now being done by the retailers is the same that they have been doing from year to year in the early spring months. There is comparatively little new business from householders anticipating a possible shortage in the fall and winter, and the consequence is, that there is no particular snap or activity to the trade. Most of the dealer's solicitations are along the lines of trying to prevail upon the consumers to take advantage of the present, when coal is comparatively easy, but the results are not as satisfactory as they would like. They will all wait until the last moment, and then it will be again the same committees, investigations, etc., that characterized the business during the last year.

The bituminous market still remains about the same as last reported.

PITTSBURGH, PENN.

Bituminous—While new transactions are relatively light, the major portion of current sales seems to be at an advance of 5c. over the regular season prices, with some large operators refusing to sell except at a 10c. advance. There has been a moderate amount of lake coal sold to the smaller shippers at $1.47½, or a 5c. advance. As noted before, the local coal market appears to be very strong, but there is question how much allowance must be made for the definite policy of many operators not to sell up to the full productive limit except at an advance. The labor and car supply will determine how close to capacity the mines will be able to operate, and these factors are largely indeterminate at this time. With the supply scant the present market position can easily be held, but a fairly full supply of cars and labor might put more pressure upon sellers than is now in evidence. We quote regular season prices as follows, subject to frequent premiums, particularly for ⅜-in.: Slack, 90c.: nut and slack, $1.05; nut, $1.25; mine-run, $1.30; ¾-in., $1.42½; 1¼-in., $1.52½, per ton at mine, Pittsburgh district.

Connellsville Coke—The market continues relatively inactive, but with still greater evidence of underlying strength. With a limited demand for prompt furnace, the market has been held at close to the asking price, $2.25, of several weeks, indicating that operators as a whole are closely regulating their output to contract requirements. Foundry coke has sold quite well on contract, being more active than for some time, and $3 does not seem to have been shaded in any instance, sales at slightly under this figure being only of odd prompt lots. While details are lacking, it is understood that the Pittsburgh Steel Co. has closed for at least the major portion of its requirements against the two blast furnaces it is completing at Monessen, the first to be blown in about the end of June and the second about the end of July, shipments to start about a fortnight earlier. It is assumed that the contract was placed at a concession from the usual asking price of $2.50, which price the furnaces thus far have shown no inclination to pay. We quote: Prompt furnace, $2.15@2.25; contract furnace (nominal asking) $2.50; prompt foundry, $2.85@3.25; contract foundry, $3@3.25, per ton at ovens.

BALTIMORE, MD.

There is every indication that the local trade has entered into a period of activity which will continue indefinitely. The demand is becoming more insistent, with the result that prices are stiffening, and many companies are finding it necessary to refuse further orders, except to oldest customers. Spot coals in the line trade are particularly strong, especially the better grades, while the off qualities are bringing higher average prices than for some time past. Coal which has been selling at 70c per ton has now advanced to 80c., and tonnages are scarce even at this new high level.

The labor situation is one of the principal features in the market at the present time. The scarcity of miners has caused the general impression that the market may advance rapidly until even the high level prevailing during the strike in Great Britain is reached. Many large consumers who have kept out of the market are now buying readily for stocking-up purposes, and indications are that they will continue doing so until substantial surpluses have been accumulated. Operators seem to be in good cheer and say they expect a very satisfactory year. They are busy now making or renewing contracts for steam grades.

The unusually cool weather has had a tendency to create some activity in anthracite, although not of any great extent. Coke operators claim that production has been restricted recently, and is now just about equal to the demand, with no surplus in the market.

BUFFALO, N. Y.

There is all of the former firmness in the bituminous trade and operators are expecting to maintain this position through the season. All the reasons for a continuation of the demand are still in full force and the output cannot well be increased under present conditions. The chief efforts are directed toward increasing production, but that is difficult to accomplish and about the best possible now is to make sure it does not fall off. In some districts there is a growing scarcity of cars which is decreasing the tonnage of the mines. The scarcity of men is also becoming more acute; it extends into all branches of the trade. Anthracite shippers find country jobbers and retailers complaining that they cannot unload their consignments, for it appears that men are harder to get in small towns than anywhere else.

The only weak spot is still coke, which is none too strong at $4.75 for best Connellsville foundry. Quotations of bituminous coal continue on the basis of $2.80 for Pittsburgh lump, $2.65 for three quarter, $2.55 for mine-run and $2.15 for slack, with Allegheny Valley about 25c. less. It is often hard to get Pittsburgh coal at all, as so much of it is tied up in contracts and the lake trade. There is no coal on track unsold and it looks as if the utmost service is being obtained of the cars where the roads are moving them with good dispatch. Consumers are buying promptly and not haggling about the price if they know the quality of the coal. Control of prices seems to have gone entirely over to the seller.

It is now believed that conditions are such in the bituminous trade that nothing short of a general break-down or other business can injure it very much. While iron is not at its best the crop situation is so good that it will counteract almost any bad feature. If labor difficulties fail of an early settlement they will reduce the demand for coal, but they ought to subside before long. The demand for anthracite is still light, with not much promise of early improvement. Lake shipments for the week were 147,000 tons.

HAMPTON ROADS, VA.

While the dumping at tidewater has not been so heavy the past week as the previous one at the same time there has been a good supply of vessels and all piers have been working constantly. Some few of the suppliers are short of coal which has held up a number of vessels a few days but the beginning of next week should see these all loaded and away. There has been a heavy demand for spot coal during the entire week, a number of inquiries coming from the foreign buyers but few sales have been made owing to the fact that suppliers having coal on hand are holding same for contract tonnage about due.

On account of the unrest in the New River field suppliers from that district are making few contracts prefering to hold off until matters are more settled.

Prices offered by buyers have ranged from $2.80 to $2.85 for June cargoes but the latter figure has been refused by the operators as it is expected quotations will go higher during the coming week. Prices for high volatile coals have been quoted from $2.40 to $2.50 but only one or two small sales have been made, there being little inquiry for this grade.

COLUMBUS, OHIO

Despite a growing car shortage which is affecting a number of mining districts in Ohio, the trade has been fairly active during the past week. Reports from Eastern Ohio show a scarcity of cars and this is having an effect on the production from that region. There is also some car shortage reported from other mining districts in the state. Coal men are predicting an acute shortage later on and it is believed it will develope earlier than last year.

The lake trade is active in every way and the demand from the Northwest is strong. Dock prices are 10c. higher than last year and that fact is stimulating the trade. The congestion caused by the ice and scarcity of unloading machines in the upper lake ports is passing away. Toledo docks of the Hocking Valley company loaded 113,000 tons for the week ending May 23 and since the opening of navigation the docks have handled 504,000 tons. Another strong point in the market is the demand for steam tonnage. Factories engaged in making iron and steel products are busy and their fuel

requirements are large. The railroads are also taking a large tonnage since the freight movement is increasing. Most of the railroad contracts have been made and many of the steam contracts with manufacturing establishments have been closed.

Some stir is being felt in domestic sizes. While the stocking season has not opened, retailers are placing small orders. Preparations are being made to take care of the stocking demand earlier than usual. Most of the dealers in this section have very light stocks and they are placing their orders now.

Quotations have been well maintained in every mining district and on all grades with the possible exception of fine coal, on which there is a slight weakness. This is due to the larger tonnage of nut, pea and slack and coarse slack resulting from the Lake trade. Mine-run and three-quarter inch are the strongest sizes in the market.

The output in Ohio fields has been fairly large during the week although the car shortage has decreased it in certain localities. In the Pomeroy Bend district where the operators are slowly recovering from the effects of the flood the production is gradually increasing. In Eastern Ohio it is estimated at about 65 per cent. of normal while in the Hocking Valley it is about 85 to 90 per cent.

Quotations in the Ohio fields are as follows:

	Hocking	Pittsburgh	Pomeroy	Kanawha
Domestic lump	$1 50		$1 50	$1 50
4-inch	1 35	$1 25	1 35	1 30
Nut	1 15	.....	1 25	.....
Mine-run	1 15	1 10	1 15	1 10
Nut, pea and slack	0 70	.....	0 70	0 70
Coarse slack	0 60	0 65	0 60	0 60

LOUISVILLE, KY.

A between-seasons lull seems to be prevailing over the local market. This is due probably to the reluctance on the part of the dealers to begin laying in their winter stock.

The local market has undergone a direct reversal of form within the last ten days, particularly in the steam-coal branch. The scanty supply has been abruptly relieved and there are plenty of tonnages available now. With railroad conditions again practically restored to normal, there is a good, strong movement; dealers are stocking quite heavily, and there appears to be plenty of slack coal available.

The Illinois Central R.R. is taking a very heavy tonnage, a great deal more than normal, at any rate, probably for the purpose of accumulating some surplus supplies in case of an emergency. Because of this condition, mines along this line are finding themselves with more slack on hand than they are able to market and as a consequence quotations have fallen off to ridiculously low points.

BIRMINGHAM, ALA.

Considerable alarm is felt among the local operators lest the car shortage, which has gradually grown worse for the past few weeks, will not be remedied before fall. The labor situation is also apparently growing more serious from week to week. The domestic coal market is possessed of a little more interest than during the few weeks preceding, owing principally to the fact that many of the mines have not been furnished with sufficient equipment to keep up with monthly specifications on contracts with dealers.

The market for steam coal is quiet, but quotations have not changed materially during the past three weeks. A good deal of interest is added to the steam market, as this is the season of the year when most annual contracts are being closed for shipments to begin July 1.

Foundry coke maintains a stiffness decidedly above other kindred markets on which it so often depends. Record high prices are now being obtained and the market has been extended over the entire Western States. The demand for furnace and smelter coke is well balanced with the production.

INDIANAPOLIS

The mine situation here is about what it usually is in June and July. While there is fair demand for steam grades, there is nothing doing in domestic. Prices are at the bottom and no prospect for an advance. Some buyers, however, say they note a stiffening in the price of steam grades, probably due to the higher tendency in Eastern coals, which throws more inquiries to Indiana operators. Wholesalers in this city say there is not as much free coal in the market as there was a year ago and they are having continued trouble to place orders for their requirements. The largest consumers of steam grades have placed their orders for next season, and contracts are being made quite liberally with those that take wagon delivery. A slight advance is looked for the first of June in eastern coals. Retailers say deliveries to householders for next winter's consumption, is up to the average for May, if not somewhat above that. The experience of these domestic consumers the past seson was such as to make them more eager to buy earlier than usual.

DETROIT, MICH.

Bituminous—The contract market in this vicinity is showing increased strength, but spot sales are somewhat off. An embargo against lake coal, which was established by two of the large carriers has diverted a great deal of fuel here on consignment, with the result that this had been forced on the market and a reduction in prices has consequently followed; however, the indications are that the slump is only temporary. Buyers are also showing only a slight inclination to purchase believing apparently that a decided slump is in prospect.

The following is approximately the Detroit market:

	W. Va. Splint	Gas	Hocking	Cambridge	No. 8 Ohio	Pocahontas	Jackson Hill
Domestic lump	$1.50		$1.40			$2 00	$1 90
Egg	1 50		1.40			2 00	1 90
1½-in. lump	1 25						
3-in lump	1 10	$1 10	1 10	$1.10	$1 10		
Mine-run	1 00	1 00	1 00	1 00	1 00	1 25	
Slack	1.00	0 75	0 75	0 75	0.75		

Anthracite—Buying of hard coal in the local market has been gradually improving, due, of course, to the demand for storage coal. The demand for this purpose customarily starts somewhat earlier than this, but has been delayed this season by the late shipments. The local dealers are reporting a good business for the current month.

Coke—The demand for this commodity is strong and the market firm in every respect, with local ovens working to their maximum capacity and behind on shipments. Connellsville is quoted at $2.80; Semet Solvay, $3; gas house, $2.75, all f.o.b. ovens.

ST. LOUIS, MO.

Conditions are about normal as they have been for the past few weeks, with perhaps a similar demand for bituminous coals. In connection with this, the price has also gone down. Standard 6-in. lump has gone down to 85c. and 87½c. at the mines, while 2-in. lump is at from 80c. to 85c.

These prices not only prevail in the city, but also in the country to some extent, on demurrage coal. In the Carterville sizes the lump and egg are being sacrificed at $1, both in the city and outside, while screenings have not increased any in value. Some of the washed sizes are a drug on the market, and are being sold at the same price as unwashed coals.

The prevailing circular is:

	Carterville and Franklin Co.	Big Muddy	Mt. Olive	Standard
2-in. lump	.....	.....	.....	$0.90
3-in. lump	.....	.....	$1.20	.....
6-in. lump	$1 15 @ 1 20		1 25	1 05
Lump and egg		$2 25	.....	.....
No. 1 nut	1.05 @ 1 15		.....	.....
Screenings	0.90 @ 0 95		.....	0.85
Mine-run	1 00 @ 1 10		.....	0.80
No. 1 washed nut	1 35		.....	.....
No. 2 washed nut	1 20		.....	.....
No. 3 washed nut	1 25		.....	
No. 4 washed nut	1 25		.....	
No. 5 washed nut	1 00		.....	

St. Louis prices on May anthracite are: Chestnut, $7.50; stove and egg $6.80; grate $655. Smokeless lump and egg is $4.45 and mine-run $4. Byproduct coke is $5 and gas house $4.75.

OGDEN, UTAH

There are probably instances where a low price would be an inducement to a large consumer to place an order, and this would offer temporary relief, but the bulk of the coal goes to dealers who at present are only buying single cars, and then only when absolutely necessary. In other words, the mines are working short time, which increases the cost.

Reports indicate that some coal will be stored during June and that July will probably be up to standard; however, this will be caused by the season of the year, and not by the low price. Present quotations for the entire territory are: Lump, $2.25; nut, $1.75; mine-run, $1.75, and slack, $1.

PORTLAND, ORE.

The mines in the Centralia district are all preparing to increase their output for which there is a good demand both in the Puget Sound cities and in Portland. One company is now putting out about 1500 tons daily and another has an output of 500 tons. The Rainer company's mine has an output of about 100 tons daily but this will be increased as rapidly as possible. Development work is now under way.

The coal market here is unchanged and as we now have

summer we be there is little probability of any great volume of business until consumers begin putting in coal for next winter under the storage rates, which are about 50c. per ton lower.

PRODUCTION AND TRANSPORTATION STATISTICS

NORFOLK & WESTERN RY.

The following is a comparative statement of the coal and coke shipments over the lines of the N. & W. Ry. for the month of April and the first four months of 1912 and 1913 in short tons:

	April		4 Months	
Destination	1912	1913	1912	1913
Coal				
Tidewater, foreign	223,220	147,917	589,202	535,211
Tidewater, coastwise	315,076	326,920	1,137,359	1,300,671
Domestic	1,325,259	1,068,383	5,395,002	5,401,914
Coke				
Tidewater, foreign	7,744	6,950	25,147	16,984
Domestic	108,601	122,675	509,919	561,469
Total	1,979,900	1,672,845	7,656,629	7,816,249

COAL MOVEMENT

The following is a summary of the fuel movement over the principal roads during March and the first three months of this year and last:

	1913			Three Months	
Anthracite	January	February	March	1913	1912
B. & O. (a)	195,667	161,676	77,049	434,392	571,754
C. & O. (a)	378	1,480	309	2,167	11,227
Erie	673,614	612,281	672,153	1,958,048	2,179,941
Penna. (a-b)	1,014,259	988,036	741,209	2,743,504	3,288,737
Virginian	89	56	166	311	
Total 5 roads	1,884,007	1,763,529	1,490,886	5,138,422	6,051,659
Bituminous:					
B. & O. (a)	3,187,956	2,633,197	2,710,031	8,531,184	8,761,578
B. R. & P. (c)	774,052	752,999	766,576	2,293,627	2,299,829
B. & Susq. (c)	143,814	150,344	155,706	450,064	468,079
C. & O. (a)	1,263,892	1,304,748	1,392,590	3,961,230	4,306,586
Erie	60,373	62,941	61,538	184,852	113,335
H. & BTM (a-c)	150,149	129,114	102,337	381,600	402,070
NYC&HRR (c)	886,742	787,078	770,165	2,443,985	2,392,196
N. & W. (a-c)	2,069,874	1,873,544	1,751,158	5,694,576	5,258,008
Penna. (a-b)	4,210,196	3,857,304	4,050,247	12,117,247	12,169,935
P. & L. E. (a-c)	1,033,330	920,183	956,138	2,909,651	2,876,295
P. S. & N. (c)	228,426	224,215	220,344	681,982	563,772
Virginian (c)	453,886	399,267	380,091	1,233,244	903,966
W. M.	241,021	248,078	271,286	760,985	722,775
Total 13 roads	14,703,711	13,343,812	13,597,204	41,644,727	41,238,424
Coke:					
B. & O. (a)	109,620	371,355	405,220	886,195	1,080,472
B. R. & P. (c)	57,831	50,265	55,911	164,007	113,478
B. & Susq. (c)	28,153	22,209	27,401	77,763	81,971
C. & O. (a)	30,764	29,643	32,207	92,614	59,951
NYC&HRR (c)	7,548	4,106	5,775	17,429	23,248
N. & W. (a-c)	148,251	152,847	147,730	448,828	418,721
Penna. (a-b)	1,288,514	1,220,360	1,247,451	3,756,325	3,111,786
P. & L. E. (a-c)	668,392	579,360	612,095	1,859,847	1,488,430
P. S. & N. (c)	3,212	2,096	3,084	9,292	4,817
W. M.	6,643	6,014	6,381	19,038	19,283
Total 10 roads	2,348,928	2,439,155	2,543,255	7,331,338	6,402,112

Southern Railway handled during January 358,386 short tons; February 345,206 short tons of bituminous coal.

a. Includes coal received from connecting lines.
b. Does not include company's coal hauled free.
c. Includes company's coal.

THE CAR SITUATION

American Ry. Association reports surpluses and shortages of coal equipment for two weeks ended May 15, as follows:

	Surplus	Shortage	Net*
New England Lines	76	0	**76**
N. Y., New Jersey, Del., Maryland; Eastern Penn	2,640	1,054	**1,586**
Ohio; Indiana; Michigan; Western Pennsylvania	789	934	**145**
West Virginia, Virginia, North & South Carolina	781	1,500	**719**
Kentucky, Tenn., Miss., Alabama, Georgia, Florida	226	503	**277**
Iowa, Illinois, Wis., Minn., North & South Dakota	2,622	10	**2,612**
Montana, Wyoming, Nebraska	367	0	**367**
Kansas, Colorado, Missouri, Arkansas, Oklahoma	2,032	75	**1,957**
Texas, Louisiana, New Mexico	305	6	**299**
Oregon, Idaho, California, Arizona	2 254	138	**2,116**
Canadian Lines	175	58	**117**
Totals	12 267	1,226	**8,041**
Greatest surplus in 1912 (Apr. 25)	94,692	2,144	**92,548**
Greatest shortage in 1912 (Oct. 10)	6,191	14,897	**8,406**

*Bold face type indicate a surplus

NORFOLK & WESTERN RY.

The following is a statement of tonnages shipped over this road from mines in West Virginia and the commercial and company coal, for the month of April, in short tons:

Field	Shipped	Tipple	Total	Commercial	Company
Pocahontas	861,724	13,947	875,671	865,154	95,271
Tug River	183,995	2,498	186,493	156,336	30,157
Thacker	189,004	10,359	199,363	142,167	57,196
Kenova	48,839	5,042	53,881	45,713	8,168
Clinch Valley				130,565	12,493
	1,283,562	31,846	1,315,408	1,339,935	203,285

Shipments of coke entirely from the Pocahontas field, were 96,659.

BALTIMORE & OHIO R.R.

The following is a comparative statement of the coal and coke movement over this road or April and the first four months of this year and last year:

	April		4 Months	
	1913	1912	1913	1912
Coal	2,516,367	2,122,285	10,638,227	10,434,855
Coke	400,317	390,228	1,616,070	1,470,655
Total	2,916,684	2,512 513	12,224,297	11,905,510

FOREIGN MARKETS

GREAT BRITAIN

May 16—The market is somewhat unsettled owing to the uncertain position after the holidays. Business is quiet, but there is no alteration in values—which are approximately as follows:

Best Welsh steam	$5.40@5.52	Best Monmouthshires	$4.74@4.86
Best seconds	5.28@5.40	Seconds	4.62@4.74
Seconds	5.04@5.28	Best Cardiff smalls	3.60@3.72
Best dry coals	5.04@5.28	Seconds	3.36@3.48

The prices for Cardiff coals are f.o.b. Cardiff, Penarth or Barry, while those for Monmouthshire descriptions are f.o.b. Newport; both exclusive of wharfage, and for cash in 30 days—less 2½%.

PENNSYLVANIA RAILROAD

The following is a statement of shipments over the P. R.R. Co.'s lines east of Pittsburgh and Erie for April, and first four months of this year and last year in short tons:

	April		Four Months	
	1913	1912	1913	1912
Anthracite	930,592	290,865	3,674,096	3,579,602
Bituminous	3,796,432	3,291,985	15,914,179	15,461,920
Coke	1,230,979	1,079,046	4,987,304	4,190,832
	5,958,003	4,661,896	24,575,579	23,232,354

COAL SECURITIES

The following table gives the range of various active coal securities and dividends paid during the week ending May 24:

	Week's Range			Year's Range	
Stocks	High	Low	Last	High	Low
American Coal Products	87	87	87	87	87
American Coal Products Pref	109¼	109¼	109¼	109¼	109¼
Colorado Fuel & Iron	31½	30¼	31	41½	30¼
Colorado Fuel & Iron Pref	....	....	155	155	150
Consolidation Coal of Maryland	102½	102½	102½	102½	102½
Lehigh Valley Coal Sales	225	210	215	....	....
Island Creek Coal, com	52	51	51	....	....
Island Creek Coal Pref	85	84	84	....	....
Pittsburgh Coal	17¾	17⅜	17¾	24⅜	17¼
Pittsburgh Coal Pref	82½	81	82½	95	79¼
Pond Creek	22¼	19¼	19¼	23¾	19¼
Reading	163	159½	162½	168½	152½
Reading 1st Pref	91	90	90	92½	89¼
Reading 2nd Pref	89	89	89	95	87½
Virginia Iron, Coal & Coke	43	43	43	54	43

	Closing		Week's Range		Year's Range	
Bonds	Bid	Asked	or Last Sale			
Colo. F. & I. gen. s.f.g. 5s	95	97	97	97	95	99¼
Colo. F. & I. gen. 6s	....	....	104½	June '12	..	..
Col. Ind. 1st & coll. 5s, gu	79	81	78½	79½	78½	85
Cons. Ind. Coal Mc. 1st 5s	....	80	85	June '11	..	..
Cons. Coal 1st and ref. 5s	..	94	93	Oct. '12	..	..
Gr. Riv. Coal & C. 1st g. 6s	..	100	102½	April '06	..	..
K. & H. C. & C. 1st s.f.g. 5s	..	96	98	Jan. '13	98	98
Pocah. Con. Coll. 1st s.f. 5s	86½	87½	87¼	Mar. '13	87¼	87½
St. L. Rky. Mt. & Pac. 1st 5s	..	78	76	Mar. '13	76	80
Tenn. Coal gen. 5s	100	101½	100	May '13	100	103
Birm. Div. 1st consol. 6s	101½	103½	101	April '13	101	103
Tenn. Div. 1st g. 6s	..	102	102	Feb. '13	102	102
Cah. C. M. Co. 1st g. 6s	..	104	110	Jan. '09	..	..
Utah Fuel 1st g. 5s	..	..	....	....	..	..
Victor Fuel 1st s.f. 5s	..	80	80	May '13	79½	80
Va. I. Coal & Coke 1st g. 5s	93	95	93	May '13	93	98

No Important Dividends were announced during the week.

COAL AGE

Vol. 3 NEW YORK, JUNE 7, 1913 No. 23

A time keeper who had been in the employ of a coal-mining company for three years, remarked on quitting his job that of the 400 men then enrolled on the company's pay sheet there were only 10 who were on the roll when he first entered service at that mine, although during all that time the average number of employees had been nearly constant.

Time keepers at most of our camps would have to make a similar statement if asked to investigate.

Coal miners are in demand everywhere; wages, living conditions and surroundings in general are pretty much alike at all mining camps, so why should a man remain at a place if he becomes dissatisfied? Of course it takes money to move, but if one's household possessions are few the money involved is a small consideration, especially to the average miner whose ability to value small sums of money hasn't been developed.

A little thought and investigation will convince most any one that the average miner could buy a cosy cottage with the money he wastes in moving, added to the loss of time incident to moving, during a period of 20 years.

What is being done to change these conditions? Much by the few, little by the many.

The few are beginning to realize that if a man's family can be induced to take an interest in a garden, a school, a church or a community, they will take enough interest in the man to see to it that he becomes satisfied with the community in which they live. Some have gone a step farther and arranged to reward a man for each additional year's residence in the camp; this appeals to the man as well as to the family and the interest aroused is spontaneous.

The most satisfactory system so far developed for accomplishing this, is to inaugurate old-age pensions with benefits directly proportional to the years of service preceding the arrival at the age limit. Upon the same principle, sick and accident benefits may be established whose benefits are governed by the years of service of the injured man. When interest is once aroused and the workers realize the benefits of such a system, it takes more than a misunderstanding with a driver or a drunken brawl with a "buddie" or a row with a check clerk to make a man pack up bag and baggage that he may try his luck in a new town.

To this plan of pensions one dissenting voice has been raised: John A. Fitch of "The Survey" objects to them on the ground that it gives the employer an unfair advantage over the employee in compelling him to remain at work *continuously* or lose the benefits of his years of service. To quote him: "This effectively prevents any stoppage of work as a protest against anything considered unjust by the workmen."

In trivial disputes, undoubtedly the pension would make itself felt, and its restraining influence would be beneficial to both employer and employee. In serious misunderstandings, however, its influence would probably be nil. "Give me liberty or give me death" is woven into the creed of too large a portion of Americans from all walks of life, to leave room for doubt as to what would occur if an unscrupulous employer attempted to ride roughshod over his employees.

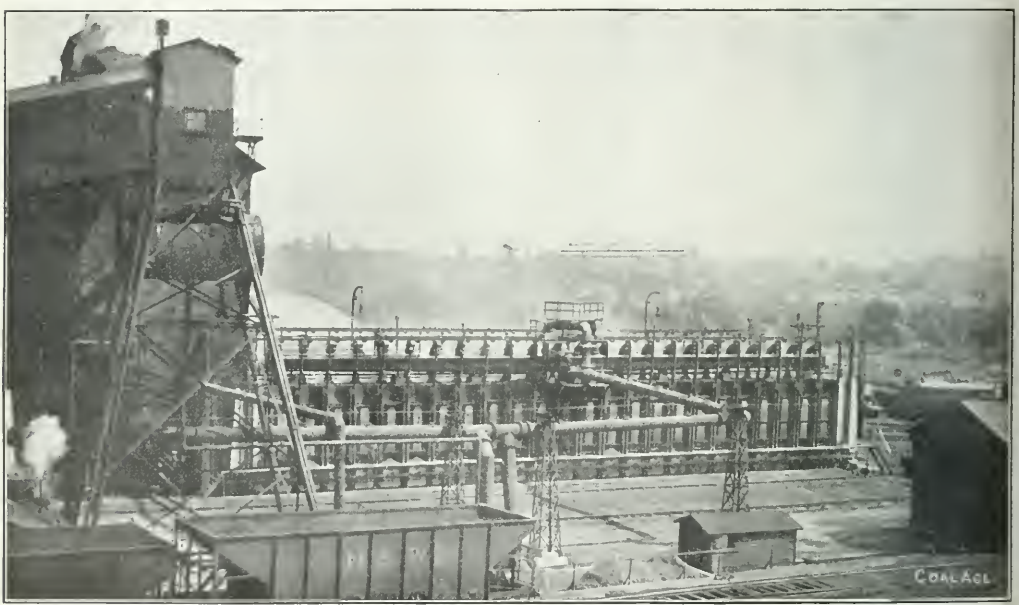
Semet-Solvay Coke Plant at Cleveland

By T. E. Pierce*

SYNOPSIS—A description of the plant and methods employed for the production of a metallurgical coke with the recovery of such byproducts as gas, tar, ammonia and benzol.

The Semet-Solvay Co., in April, 1909, entered into a contract with the Cleveland Furnace Co. to rebuild the coke-oven plant, which had been constructed about 1903 by Wilcox and Wagner, known at that time as the Retort Coke Oven Co. This plant had a series of irregular operations, which were never successful and in the fall of 1904, Dr. Rothberg rebuilt the ovens and the plant was run until about March, 1907, when it was shut down, as it was considered a failure.

The plant as rebuilt has 49 Semet-Solvay, silica-lined, recuperative ovens, known as the five-high, with necessary machinery for handling coal and coke, and apparatus for the recovery of tar, crude ammonia, gas and benzol. The capacity of the plant is about 600 tons of dry coal per day, producing approximately 430 tons of coke. This latter is used for metallurgical fuel by the Cleveland Furnace Co.



A Block of Byproduct Ovens

How the Coal Is Handled

All the coal comes in by rail and is unloaded at the track hoppers, from whence it flows to be crushed in a Williams hammer pulverizer and elevated by belt conveyors to the charging bin over the ovens. Due to a fire on Dec. 21, 1911, the coal-preparation plant is at present only temporary. The present practice is to mix approximately 70 per cent. high-volatile coal and 30 per cent. of low-volatile Pocahontas. To insure against shortage in coal deliveries the Cleveland Furnace Co. carries a stock of from 20,000 to 35,000 tons, which is handled by their ore bridge.

The ovens are of the well known Semet-Solvay type, the most characteristic feature of which is the system of horizontal heating flues in the oven linings which constitute the retorts. These are so constructed that they are entirely independent of the main structure of brick work and carry no load except their own weight. They can thus contract and expand independently of their surroundings and a single oven can be completely repaired while those adjacent to it are in full operation.

The ovens are heated by gas admitted to each of the top four flues through external pipes. The air for combustion is preheated by the recuperation system underneath each oven. The waste gas, after preheating the air, passes to waste-heat boilers and generates some of the steam for the operation of the plant. The gas and air entering each flue are easily regulated, as is the chimney suction on each tier of flues.

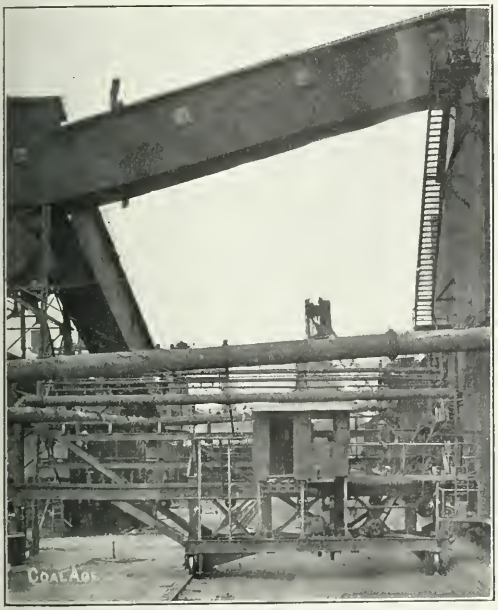
Coal from the larries is charged through the holes in the top of the ovens and leveled by an electrically driven leveler carried on the pusher. The oven is sealed and the coking process proceeds undisturbed for from 18 to 20 hr., the gases passing to the collector main on top of the ovens. When this process is finished, the coke is discharged in a single operation by the pusher, and distributed in the sloping-bottom quenching car where it is quenched.

*General superintendent, Semet-Solvay Coke Plant, Cleveland, Ohio.

The temperature of the oven flues is easily controlled at every point, thus insuring uniformity of product, which is essential in metallurgical fuel.

The easy control of the flue temperatures makes it possible to vary the daily production of coke and gas, excellent results being possible whether the coking time be shortened to 17 hr. or lengthened to 26 hr. or 28 hr. This flexibility of output is obtained without interfering with the uniformity of the product.

The horizontal-flue system makes it possible to maintain any desired temperature in the gas space above the coke without interfering with the complete coking of the coal. This is a matter of great importance, as the temperature to which the gas is exposed, after being driven



Coal Conveyor, Gas Mains and Coke-Pusher with Leveler Attached

out of the coal, controls the secondary reaction, upon which, to a great extent, depend the quantity and quality of the gas and tar as well as the quantity of ammonia and benzol which may be recovered.

Semet-Solvay ovens are described as 4-high, 5-high and 6-high, depending upon the number of superimposed horizontal flues upon either side. The 5-high ovens at this plant hold nine tons of dry coal to a charge.

The Manipulation of the Gas

The gas coming off in the early stages of the coking process is higher in both illuminating and heating power than that evolved later. At some plants there are two independent gas condensers and scrubbing systems, the one for rich and the other for lean gas. Double hydraulic mains are used, so arranged that the products of distillation from any oven may be turned at will into the rich or lean system. This makes it possible to keep the calorific power of the surplus gas very close to any standard which may reasonably be required. At this particular plant however there is but a single main with no arrangement for separating the gas.

The gas from the hydraulic mains is first conducted to air-cooled condensers, thence to water-tube condensers and finally through an intermediate water-tube condenser. The exhausters are placed immediately after the primary gas condensers. From the exhauster the gas goes to the ammonia washer and from thence to the oil washer. This is a tower about 60 ft. high, with wooden grids, onto which oil is fed at the top. The gas, passing up through a shower of oil, is brought into intimate contact with this absorbent, which removes any naphthalene or other condensible hydrocarbons.

The benzolized oil is pumped to the light-oil plant where the benzol and heavier volatile oils are distilled off. The absorbing oil, after being debenzolized, is cooled and returned to the benzol washer.

The debenzolated gas is piped direct to the gas holder, and from thence to the fuel-gas distributing mains for heating at the ovens. The fuel gas going to each block of ovens passes through a Venturi meter, equipped with a recording device, which gives a continuous record of consumption.

Coal Trestle and Track Hoppers

About 425 tons of coke are delivered daily in quenching cars to the Cleveland Furnace Co.'s bins; the cars being hauled direct from the ovens to the bins by a steam locomotive. The quenching apparatus spreads the coke in a thin layer, where it is quickly and thoroughly quenched by means of a large stream of water; this enables the production of a coke containing a low percentage of moisture. The quality of coke produced in these ovens is suitable for blast furnace and foundry purposes, whereas that obtained from the same coal in a gas retort is not adapted to these uses.

The byproducts, ammonia and tar, are recovered in the same way as from coal gas made in ordinary retorts. The quantity of gas and ammonia obtained from a ton of any given coal carbonized in Semet-Solvay ovens is somewhat higher than the quantity obtainable from the same coal when it is carbonized in horizontal or inclined retorts. The quality of tar is slightly different, as it carries less lampblack.

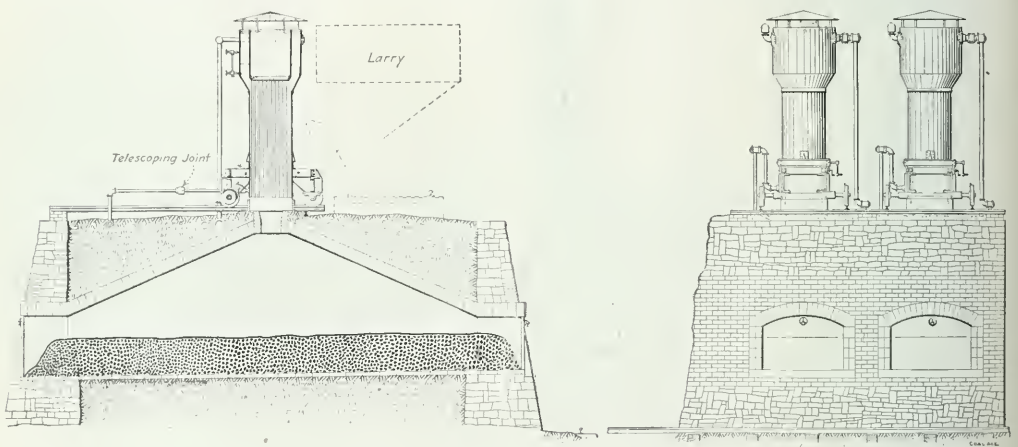
As the conditions of carbonization in a coke oven having horizontal heating flues are quite similar to those existing in a vertical retort, the results obtained with respect to byproducts closely resemble those secured with vertical receptacles of this kind.

A New Device for Waste-Heat Recovery

By A. T. Shurick

SYNOPSIS—It is estimated that the annual loss sustained through waste heat from coke ovens is approximately 30 million dollars. This is undoubtedly one of the gravest menaces to the basic principles of true conservation there is. The apparatus here described introduces a novel innovation by bringing the boiler to the heat instead of the reverse, along which lines all previous attempts at solving this problem have been conducted.

Many different plans have been evolved for the utilization of the waste heat from coke ovens with varying degrees of success. One of the chief disadvantages has been the heavy first cost and the excessive cost of maintenance. Furthermore, most installations of this character have been found notoriously uneconomical, due to the excessive radiation in the flues, it being safe to say that not to exceed 40 per cent. of the gross latent power available being realized.



Longitudinal Section and End Elevation, Showing Application of Apparatus to the Mitchell Oven

The Titlow Apparatus

In the apparatus described herewith, the inventors have ingeniously overcome many of these difficulties by taking the boiler to the heat instead of *vice versa*. The illustrations shown herewith will give a very clear idea of the construction and method of operation. It will be noted that the generators are quite simple, being similar to the ordinary vertical boiler, less the usual equipment of stack, firing door, grate bars, etc.

The generators are mounted on trucks carrying a framework adapted to hold them in an upright position over the trunnel heads of the coke ovens. Ordinary T-rails are laid at right angles to the larry track, one on each side of the trunnel head, and are supported at one end on the foundation wall and at the other by the pillars or wall between each oven, thus avoiding any possibility of any weight resting on the oven itself. These rails act as a track on which the truck or frame work supporting the generators travels. Each truck is equipped with sprockets, chain and crank so that the generators can be quickly and easily moved from their position over the trunnel head and permit the charging of the ovens in the regular manner.

The question of maintaining an approximately constant water level in the large number of small boilers units is, of course, one of prime importance. E. C. Morgan, of Chicago, has proposed a method which consists of placing a feed water main, without static head, located on a level with the proper water level in the boilers and connected to each through pipe with swinging joints. The principle is that the pressure being equal in the boiler and feed-water main the water level will be the same.

It is believed that pre-heating the feed water can be accomplished by a direct-acting heater of special design on the principle of the economizer, permanently locating these heaters at fixed intervals, mounting and regulating them in the same manner as for the boilers. These heaters would be of the closed type, all being served by a common feed-water pump. If super-heated steam is required the boiler design may be easily modified to meet this demand.

One main steam pipe and one main feed-water pipe are suspended under the rails which carry the generator, and flexible connections are made between each generator and the main pipelines. Automatic feed-water regulators are provided with each generator and also non-return valves on the steam and water connections, so that when a generator is moved off the opening over the oven, it does not in any way affect the operation of the balance of the generators on that bank of ovens.

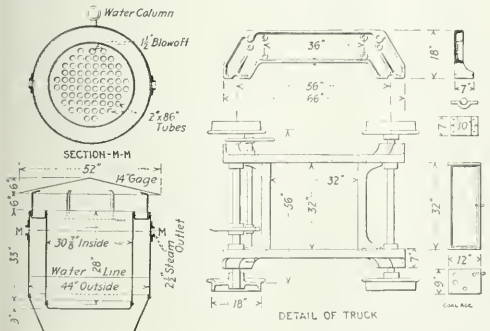
The steam pipe may be suspended outside of the foundation wall of the oven, if desired, but from actual tests it has been found advantageous to place both the main

water and steam pipes in the filling of the oven as it acts as a feed-water heater and also has a tendency to superheat the steam and prevent condensation in the pipes. When desired, a superheater for drying the steam may be placed in the top of each generator.

Operating Expenses and Results Obtained

Large batteries made up of these units can be taken care of by one man. With the arrangement outlined any number of generators may be connected to one feed-water supply pipe without regard to the variation in height of the different ovens. Also one steam pipe will carry all of the steam from a battery of generators direct to the power house.

As regards the efficiency of the apparatus, under practical working conditions, a thorough test of this was conducted at a coke-oven plant at New Salem, Penn. This test showed that each unit is capable of developing about 25-boiler horsepower, which in a modern turbine



Details of Boiler and Truck

would be the equivalent of approximately 50 i.hp. per oven. The inventors contemplate the construction of apparatus having 20 per cent. greater capacity than this.

As compared with the ordinary oven, it was found that the increased draft obtained by the Titlow process accelerated the burning time by 9½ hr. on 18-hr. coke. The yield in coke also showed a slight increase, and the ash was somewhat less. In a test conducted at the Shamrock Works of the Fayette Coke Co., near Uniontown, Penn., it was found that 40-lb. pressure was obtained in the boiler at the end of 30 min., after which it increased at a nearly uniform rate of 5 lb. per min., reaching 90 lb. at the end of 40 min.

Comparison with Byproduct Ovens

It is believed that this apparatus will effect a recovery of 17 per cent. of the heating value of the coal charged into the ovens during the year, and it cannot but compare favorably with the savings of the byproduct oven. In addition to this the comparative cost of the latter and standard rectangular or beehive type of oven must be taken into consideration, as well as the value or quality of the coke produced.

The largest saving from byproduct ovens is in the gas, which amounts to considerable in some territories where a reasonable price can be secured for it and sufficient demand exists. However, in the Connellsville region where the natural-gas resources are so great, it is doubtful if the gas produced from byproduct ovens could be sold except at a loss.

The tests already made have also demonstrated that these generators do not in any way affect the quality of the coke, but on the other hand it was found that an increase in coke yield was given, due to the perfect coking of the coal clear to the bottom of the oven, practically eliminating "soft ends."

Regulation of Power and Cost of Installation

The amount of heat utilized or power generated can be regulated by the number of steam generators placed in position for operation over the ovens. As it is the usual practice to charge one-half the battery of ovens on alternate days there is little variation in the total amount of steam generated per hour or day.

From equipment already purchased and quotations from various manufacturers, the inventors state that it will cost no more to install Titlow Waste Heat Generators and equipment than to construct and equip a regular generating plant of equal capacity. It is at least clear that with this apparatus there will be no boiler house, with its expensive equipment, to construct and maintain.

The cost for labor to operate the plants should be less than that of the regular generating plants, as there are no firemen to employ; one attendant should take care of from 50 to 60 generators; no ashes or cinders to handle, no expense for loading or unloading coal and no fuel to purchase.

The Effect of Knots on Timber

The accompanying table sums up the results of a series of tests made by the U. S. Forest Service, and published by them in *Bull.* No. 108. The tests were made to determine the effect of knots of different classifications on the crushing strength of certain varieties of timber. It will be noticed that in some cases the presence of knots seems actually to increase the strength.

RATIO OF RESULTS OF STRENGTH TESTS ON KNOTTY TIMBER TO RESULTS ON CLEAR TIMBER, STRENGTH OF CLEAR TIMBER TAKEN AS UNITY

	Compressive Strength at Elastic Limit per Sq.In.	Crushing Strength at Maximum Load per Sq.In.	Modulus of Elasticity per Sq.In.
Douglas fir:			
Pin knots	0.95	0.94	1.06
Standard knots	0.87	0.86	0.90
Large knots	0.78	0.78	0.71
Western larch:			
Pin knots	1.12	1.01	1.19
Standard knots	0.98	0.89	1.00
Large knots	0.98	0.85	
Western hemlock:			
Pin knots	0.96	0.97	1.00
Standard knots	0.94	0.91	0.97
Large knots	0.86	0.83	0.81

Pin knots are defined as sound knots ½ in. or less in diameter. Standard knots are defined as sound knots ranging from ½ to 1½ in. in diameter. Large knots are also sound knots from 1½ in. in diameter up.

Connellsville Coke Selling Problems

By W. L. Byers*

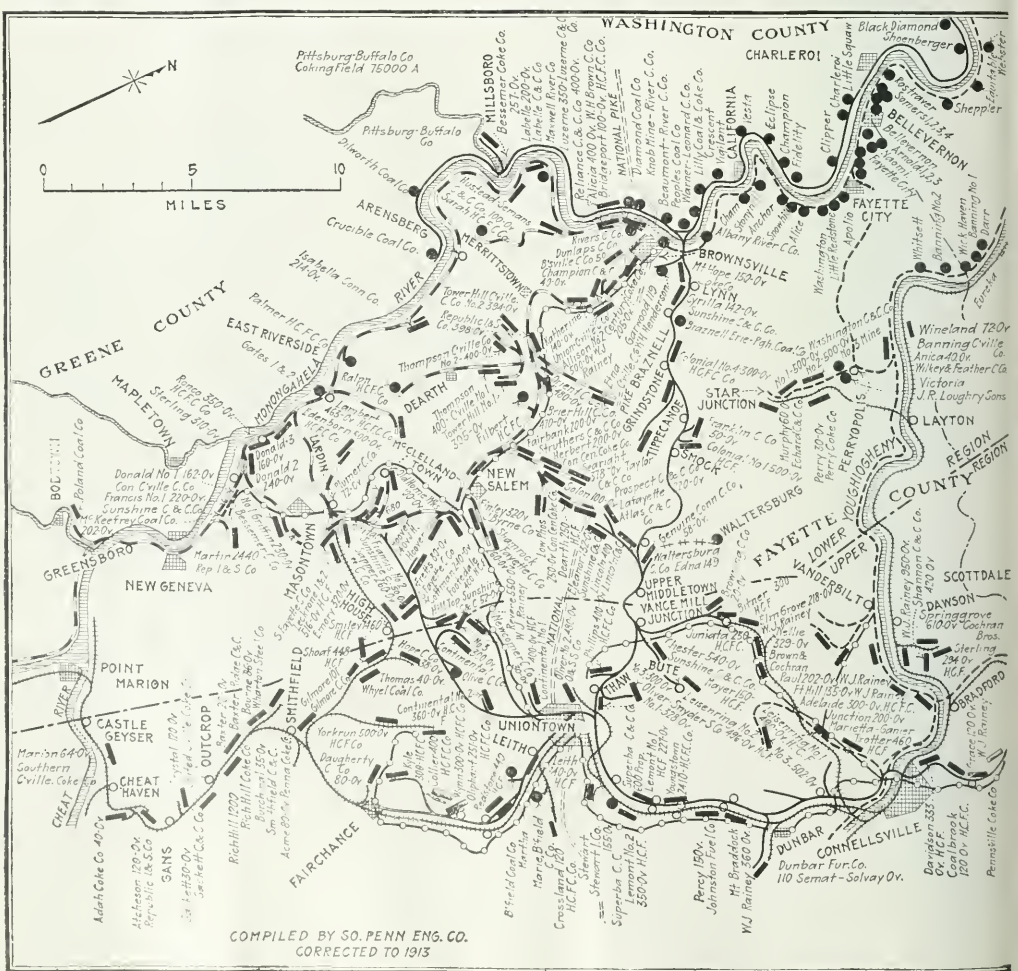
SYNOPSIS—There is probably no other article of the industrial importance of coke that fluctuates in price over such a wide range. The variations in a year have been as much as 200 per cent. Investments in the Connellsville regions have reached an enormous figure and costs of production are advancing rapidly. The demand for the product is erratic and herein lies the advantage of the large sales agency.

The independent or merchant ovens (those not allied with some consuming interest) of the Connellsville, Latrobe, Greensburg and Washington County Regions, can produce approximately ten million tons of coke annually. About eight millions tons of this is ordinarily sold for blast furnace purposes and the remainder for foundry, heating and smelting purposes.

*Sales manager, Producers' Coke Co., Uniontown ,Penn.

Distinguishing Features between the Upper and Lower Regions

By far the largest tonnage of blast furnace coke is supplied by the Connellsville Region which is divided into two divisions known as the Old Basin and the Lower Connellsville Region. The Old Basin Coal Fields are largely owned and operated by the United States Steel Corporation and the most of the merchant coke is supplied by the Lower Connellsville Region. The principal difference in the cokes is that Old Basin product is larger in size and higher in phosphorus than the Lower Connellsville Region, while the better grade of the latter



A Detailed Map of the Connellsville Coke Regions, Showing Location of Railroads,

is lower in phosphorus, ash and sulphur. The Lower Connellsville Coke is smaller in size but has equally good burden-bearing qualities or structure.

The terms size and structure are often erroneously confused and it should be understood that they are entirely different. Upon the cell structure of coke depends its qualification for bearing the burden in the furnace, but this has nothing to do with the size of the pieces. Uniform small-size pieces of strong cell structure give the best results in the furnace if thoroughly cleaned of ashes and breeze. Some concerns are now crushing coke to standard size for blast furnace use. The chemical specifications mentioned in sales of blast furnace coke are usually the Bessemer Limits of not over 12% ash, 1% sulphur and 0.02% phosphorus.

The largest tonnage of blast furnace coke is sold through sales agencies. Sales direct from producer to consumer would seem to be the logical method, but unless the producer has a large output, the sales agency gets the better results. First, because the risk of shipment being suspended can be distributed over a greater number of furnaces with a large tonnage. A great many sales contracts are made subject to the operation of the furnaces; on account of accidents at the furnaces, the uncertainty of the life of linings, conditions of the iron market and many other unusual circumstances, the consumption of coke at the stack is more uncertain than the work at the ovens. Therefore, if a coke plant has a contract with one or two furnaces alone and they hold up shipment, the operations are either compelled to shut down temporarily at a heavy expense or go into the spot market. Whereas, if a sales agency has contracts with a number of furnaces, well scattered in different iron markets, it is improbable that they will all suspend operations simultaneously.

The Advantages of Large Sales Agencies

Sales agencies to be successful must be well financed

Trolley Lines
Coal Operations
Coke Ovens
Pennsylvania P.R.
P&L E.R.R.
Monongahela R.R.
B&O.R.R.
Other R.R.
Ocean No. 1
Youth Slope
RIVER
WEST JUNCTION
West Newton
Euclid C&C Co.
Port Royal
Navery C&C Co
Eureka
Osborne Nos Coal Co.
Ocean Coal Co. No 1
No 2
DARRAGH
Yukon 50-Ov
YUKON
Magee Westmland C Co
Madison Keystone C&C Co
Keystone C&C Co
WALTCE MILLS
Carbon 57 Ov Keystone C&C Co
HUFF
GREENSBURG
Crows Nest Keystone C&C Co
Greensburg No 3 Keystone C&C Co
Jamison No 6
Jamison No 2
CRABTREE
Salem 218-Ov Keystone C&C Co
Huron 100-Ov Keystone C&C Co
Jamison No 5
Duna hue C&C Co
Jamison No 4
Jamison No 3
SOWASH
DONOHUE
CARNEY
BEATTY
LOYALHANNA
CREEK
KISKIMINETAS RIVER
SALTSBURG
WHITE
TUNNELTON
NEW ALEXANDER
Leland C&C Co
CONEMAUGH RIVER
INDIANA COUNTY
WESTMORELAND COUNTY
Bethany 50-Ov Majestic Coke Co
HUNKER
RUFFSDALE
Carolyn Peerless Cville C Co 320-Ov
TARR
Alverton No 2 104-Ov HCF
Stoner C Co
ALVERTON
AMBURST
UDELL
BRINKERTON
BOYER
UNITED
CRAUGER
STAUFFER
MT. PLEASANT
Ammonth No 2 193-Ov HCF
Run C&C Co
Jamison No 1 305-Ov
Jamison No 7 180-Ov
Jamison No 8 400-Ov
Jamison No 9 305-Ov
Jamison No 10 305-Ov
Jamison No 11 305-Ov
Jamison No 12 305-Ov
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Jamison No

so that they can pay the operation promptly on the twentieth to the twenty-fifth of the month following shipment. The furnaces do not always pay promptly but as a rule the credits in the furnace coke business are good and the losses small compared to the volume of business. It often takes the output of two small operations to supply one large furnace with fuel while the furnaces usually want their contracts placed, for at least the entire requirements of one stack, with one source of supply.

Furnaces require heavier shipments in the fall and winter than in the spring and summer largely because of the slowing up of the movement of cars due to the advent of bad weather, and a consequent greater number needed *en route*, especially on long hauls. When the furnaces are not getting delivery, no matter how many cars they have *en route*, they order more coke and then hold up shipment when the weather becomes better and the railroads begin to gather up the stretch. A sudden change in the weather may make a difference of fifty to one hundred cars needed in transit for one concern to furnish a supply or avoid car service.

Foundry, heating and smelting coke is generally sold through local wholesalers near the point of consumption. The most insistent complaints come from these men. They apparently take the stand that for 35c. above the price of run-of-oven furnace coke, in open-top cars, they should receive the heart of the oven, on 72-hr. charges, carefully wrapped in tissue paper and loaded in box cars. They want it to look good enough to eat, no matter how it works in the cupola. Some will insist on the coke being 1 ft. long and 6 in. thick and then pay a man two dollars a day to break it up with a sledge. Others want it small but thoroughly polished. It not infrequently happens that one car is refused at a foundry and another accepted when both have been loaded at the same ovens the same day, side by side. Some of the big foundries now have solved the problem of costs and quality and buy high-grade run-of-oven 72-hr. coke loaded in open top cars and gondolas if they do not have trestles for unloading. It is a wonder to the coke man they do not all do this.

The best furnace ovens do not make a practice of loading foundry coke. The foundries require selected 72-hr. coke, that is, the fronts and jambs taken out of ovens which have burned over from Friday until Monday, or, over an extra day during the week. This selection makes considerable coke which is not quite as hard and bright as the best and must either be sold as heating coke or put into the furnace grade, which is not fair to the latter, and the well posted furnace men will not buy what is left if they know it.

Smelters usually buy good structure coke, low in ash but not limited as to sulphur or phosphorus, although some smelting processes require regular blast furnace coke. Considerable smelting coke is shipped to the piers for vessels loading for points in Mexico and South America. A large trade in Pennsylvania and West Virginia coke is anticipated for smelting purposes on the western coast when the Panama Canal is opened. It is thought the freight rate will be lowered by $1 per ton under the present all-rail rate.

THE WASHINGTON MINE, AT STAR JUNCTION, A TYPICAL CONNELLSVILLE SURFACE PLANT

COSTS OF PRODUCTION

The cost of making coke has been advancing constantly in labor supplies, coal land and plant construction. Although not generally known there has been an advance in wages in the Connellsville Region since the first of the year. Pit timber is becoming more scarce while oil, wire rope and all supplies are showing substantial advances. Good coal land is also becoming more scarce each year, and as most of the new development is now at considerable depth, expensive shafts and power equipment for handling the coal and water are necessary. Washers are being installed as the lower grades of coal are developed.

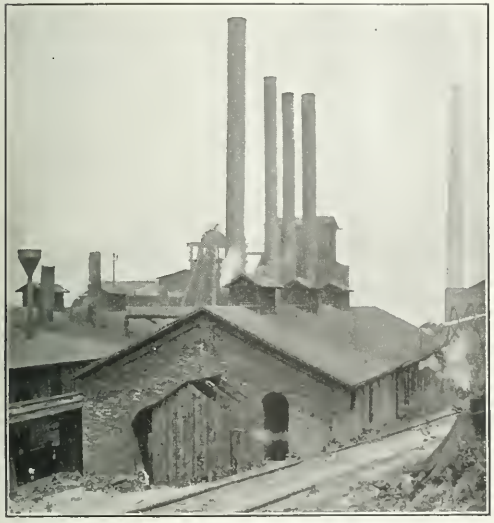
It now costs some modern plants 80c. per ton of coke in fixed charges for depletion of coal land, sinking fund for plant and equipment, interest, replacement and general expense which with a labor cost of $1.20 and 20c.

for supplies makes the total $2.20 net ton at the ovens.

The employers liability act now before the Pennsylvania Legislature, if passed, will add considerable to the present cost. One large mine explosion will put most of the present operators out of business. It is, however, excellent for the insurance people, who, it is understood, are pushing the bill.

In general it might be said that the capital invested in local coal land and equipment is enormous, and out of all proportion to the stability of the business. Plants with a fair coal acreage and oven capacity sufficient to supply one furnace frequently stand one million dollars and good-sized operations involve as high as seven million dollars capital. Sometimes they yield high returns but over a period of years the profits are not great.

The tricks of a trade are always interesting and the



Boiler Plant at the H. C. Frick Coke Co.'s Leisenring No. 2

coke business has a brand of its own. The oven owners say the coke brokers are all rascals, while the brokers retaliate by saying that the owners are farmers (*some* farmers, surely, as far as the capital is concerned). The brokerage business has in the past been profitable but with easy profit came also the greed which tempts men to overstep the bounds of honesty and fair dealing. Brokers at one time used to speculate on the producers coke under the conditions that if the spot price went above contract quotations, then the producer is compelled to ship the full tonnage, but when the reverse occurred only part of the tonnage would be taken. This has, however, about been discontinued and the producer now wants the profit if he takes the risk.

Brokers have frequently sold a brand of coke without either having the agency or any of the brand bought, expecting to get the order first and cover with the producer afterwards. Not infrequently they were caught and made to pay dearly for the coke or else they shipped other brands under the name of the one sold. Misbranding coke has frequently been practiced by the brokers on the furnace men and they are sometimes detected, which would be easily done if the furnace men would have their freight bills checkd with their notice cards. By buying one good brand of coke and two or more inferior brands the brokers can often "sweeten up" and get business by being able to quote a lower price than first-class coke brings and hence furnaces frequently buy some inferior coke in order to establish a low price.

Speculation in the coke market is very hazardous. In an active market it has been known to advance 75c. a ton in one day and a fluctuation of 200 per cent. in a year is certainly greater than occurs in any commodity of like industrial importance. In a general way it follows the demand for steel but labor conditions plays a most important part since it constitutes about 55 to 65 per cent. of the gross cost of coke on board the cars.

Susquehanna Relief Funds

A new kind of benefit fund, in which the mine workers themselves contribute a percentage of their wages for one day and the operators the rest, is being successfully tried at three of the subsidiary collieries of the Susquehanna Coal Co. in the anthracite region of Pennsylvania. Usually the miners remain idle on the day of a funeral. At these collieries the custom has been instituted of having the men work and contribute 20 per cent. of that day's wages to a fund for the family of the deceased while the company contributes $200.

The Susquehanna Coal Co. has had a relief fund in its main collieries at Mineral and Nanticoke ever since 1887, under which it pays out about $20,000 a year. This fund, which is managed by the company free of charge, consists of a graduated scale of assessments on the wages of the mine workers who are members, the company contributing an equal amount.

Membership is open to all employees, inside and outside, and the members are divided into four classes: Those receiving between $2 and $2.50 a day, those receiving between $1.50 and $2 a day, those receiving between $1 and $1.50 a day, and those receiving less than $1 a day. Members of the first class contribute $2.25, those of the second $1.75, those of the third class $1.25 and those of the fourth $0.75. The contributions are assessed as needed.

In case of accidental death $50 is paid from the fund for funeral expenses, $3 a week to the widow for one year and $1 a week for each orphan under twelve years of age for a like period. In case of accidental injuries, not fatal, $6 a week is paid to members of the first class, $4.60 a week to members of the second class, $3.30 a week to members of the third class, and $2 a week to members of the fourth class for a period of three months. No payment is made for injuries which do not incapacitate the member for a longer period than two weeks.

The existence of this relief fund for over two score years is the best recommendation of its value. The anthracite mine workers of Pennsylvania have a keen sense of perception and do not perpetuate any plan which does not work to their manifest benefit.

What is claimed to be the largest steam turbine in existence today is being constructed by Messrs. Brown, Boveri & Co., of Mannheim. It is a 35,000-hp. unit and will be coupled to a generator. It is intended for the extension of the municipal central electric-lighting station in the town of Hagen.

Coke-Crushing and Screening Plants

By F. W. Hetzel*

SYNOPSIS—Typical coke-crushing and screening plant used in western Pennsylvania. It is designed for a capacity of 300 tons in 10 hr. and costs about $3500 in place. Among the special features is feeding the elevator buckets directly, instead of into an elevator boot, which latter causes excessive wear.

Within the past five years a number of cheap and efficient coke-crushing and screening plants have been built for various coal and coke companies in western Pennsylvania. These have usually been placed between the ovens and the shipping track, so that the coke can be wheeled to the plant with a minimum of labor. These plants take the cleanup of the coke yard, or coke which is not salable for furnace or foundry use, and reduce it to the various sizes for domestic trade; or in case of delay in getting cars a portion of the total output can be crushed and elevated to the bins for storage. Fig. 1 shows such a plant and Fig. 4 gives a good idea of its construction. The crusher is usually set a little below the yard level for convenience in dumping in the coke. The crushing rolls are not large, 20 in. in diameter by 24 in. face being a common size and running at about 100 r.p.m. One of the rolls is fixed and the other backed up by springs. They are provided with teeth, which, to resist the abrasion of the coke, are cast in chills.

Fig. 1. General View of a Typical Western Pennsylvania Coke-Crushing and Sizing Plant

Mechanical Details

The crushed material falls down into a collecting hopper, which, for greater durability, is sometimes lined with hard cast-iron plates. A chute or nozzle on this hopper directs the flow of coke into the buckets of a vertical elevator, care being taken in the design to deliver the material directly into the buckets and not into the elevator boot; this saves wear on the buckets, which would otherwise have to dig the coke out of the boot, and at the same time it avoids unnecessary crushing of the coke and the production of too much "breeze."

The elevators designed for this service must be simple and durable. The steel buckets are of the continuous type fastened to a strong chain which has hardened steel renewable pins and bushings. As a further precaution against wear and to insure long life to the elevator, the sprocket wheels are of the flint-rim type manufactured by the Link Belt Co., with rims and teeth cast in chills. In order to avoid making "breeze" the buckets are shaped so as to pour the coke out instead of throwing it. A steel chute leads the coke from the head of the elevator into the rotary screen; sometimes this chute is

*Chief engineer, Link Belt Co., Nicetown, Penn.

made with a perforated bottom to take out part of the "breeze," but as the perforations are apt to clog with small bits of coke, it is better practice to leave all the sizing to the rotary screen.

To stand up to the work of sizing coke, a rotary screen must be properly designed and well built. The coke must be kept from contact with the working parts and from the parts which give strength to the screen. The perforated plates are made in sections and these are so arranged that they can be renewed without trouble by taking out a few bolts. The usual practice is to take dust or "breeze" out through 5/8-in. square holes, nut through 1¼-in. square, small stove through 1¾-in. square, stove through 2½-in. square and egg over the end of the screen.

The frame of the screen carries two steel tire rings, which run on chilled rollers, these rollers being mounted on pedestals and base plates to hold them in proper alignment. If these are not properly held, there is unnecessary wear on the rollers and tires and it takes more power

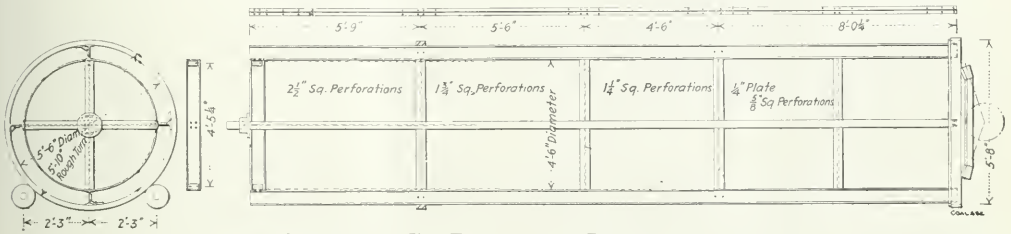


Fig. 2. Detail of 24-Ft., Four-Section, Rotary Coke Screen

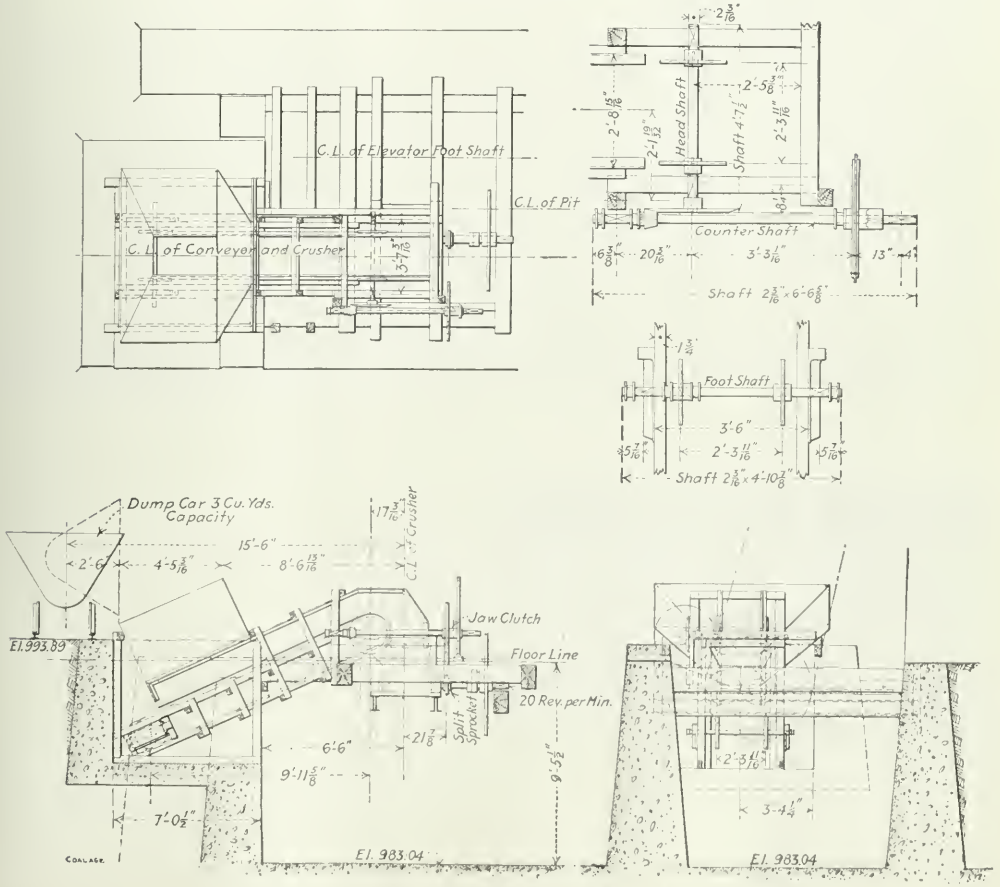


Fig. 3. Detail of Dump Hopper and 24-In. Apron Feeder

to drive the screen. The drive is usually by bevel gearing, the large gear being cast on one head of the screen; at the other end a thrust pin on the axis of the screen works in a fixed bearing and keeps the screen from running down hill. Fig. 2 shows such a screen 4 ft. 6 in. in

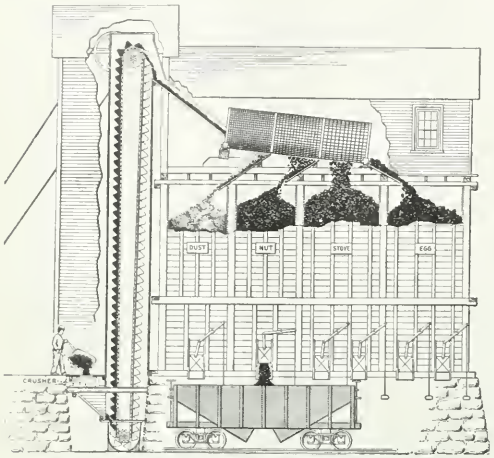


FIG. 4. SIDE ELEVATION, SHOWING METHOD OF SIZING AND LOADING

diameter by 24 ft. long adapted to make five sizes of coke and Fig. 5 shows a similar screen at work.

METHOD OF DRIVING

Referring again to Fig. 4 it will be seen that a single manila rope from the engine drives the whole plant, the rope running from the engine sheave to the top of the elevator, thence to the crusher and back to the engine through a tension carriage or slack adjuster. The screen is driven from the head of the elevator. This plan makes the driving simple and keeps the engine on the ground where it can be easily attended to.

In some plants the coke is received in side-dump cars, and to control the delivery from these cars to the crusher feeding conveyors are used. These consist of steel pans

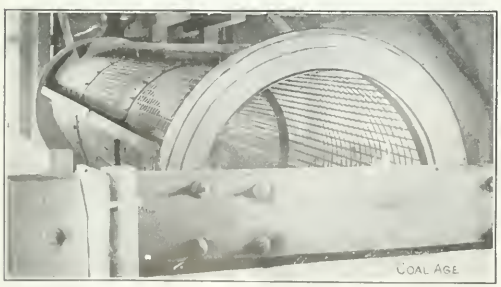


FIG. 5. VIEW OF THE REVOLVING SCREEN IN PLACE

attached to two steel roller chains running at slow speed. Fig. 3 illustrates such a machine. It is of advantage in permitting the cars to be dumped quickly and taken away and at the same time the regular delivery of coke prevents the crusher from being overloaded. If the feeder is not used a jam of coke in the crusher may cause the spring relief roll to yield and this may pass coke uncrushed, hence the advantage of the feeder in getting a better crushing and sizing of the coke.

The feeding, crushing, elevating and screening machinery of such a plant has a capacity of about 30 tons per hour and costs about $3500; when it is erected on a wooden structure with wooden bin it forms a low-cost, compact and efficient means of producing sized coke.

Permissible Explosives in Washington

Considerable progress has been made in the use of permissible explosives in this state, during the past year (1912).

In July, 1911, I took up with Doctor Holmes, director of the Bureau of Mines, the question of securing the assistance of the bureau in the effort to introduce permissible explosives into the mines of this state. Doctor Holmes detailed H. M. Wolfin, division engineer for the bureau in the northwest, instructing him to make a series of tests in several of the mines of the state. Much time and patience was expended in this work. As a result, the Roslyn Fuel Co. is today using permissible explosives exclusively, at their mines at Beekman. The Pacific Coast Coal Co.'s Coal Creek mine, at New Castle, and the Fairfax mine, at Fairfax, also use permissible powders almost exclusively.

Several other companies have used them at different times, but find it difficult to get the miners to adopt them. The miners claim that the use of these powders reduces their earnings. In the majority of cases, however, I do not think the miner has used the permissible powders long enough to thoroughly understand them. Another reason for their dissatisfaction is that a permissible explosive must be given a little more chance than the miner usually gives high explosives.

I sincerely hope that before long, nothing but permissible explosives will be used in the mines of this state; or, at any rate, that their use will be adopted in all gaseous or dusty mines. The following law, relating to powder and other explosives, was passed by the 1911 legislature:

EXTRACT OF WASHINGTON STATE MINING LAW

Be it enacted by the legislature of the state of Washington:

Section 1. Each person, firm, or corporation engaged in coal mining, requiring the use of powder or other explosives, shall provide (subject to the approval of the state mine inspector), at or near the entrance of each coal mine operated or at some suitable place near such work, a suitable distributing magazine for the storage of such powder or other explosives. There shall be posted upon such magazine a notice, printed in letters not less than 3 in. in height, that such magazine contains explosives. No person shall store or keep in any magazine mentioned in this section, any powder or other explosive in excess of one ton. In the case of coal mines, such powder or other explosive shall be issued daily, in quantities not to exceed the average used by each workman in one day, in proper receptacles. Any person or corporation violating or failing to comply with the provisions of this section shall be guilty of a gross misdemeanor.

Section 2. Any person who shall store or keep any powder or other explosive, in a quantity greater than 1 lb., in any occupied dwelling house or residence, or in any outhouse appertaining thereto within 300 ft. of any dwelling shall be guilty of a misdemeanor.

Note—From the advance sheets of the Report of the State Inspector of Mines, for 1912.

Beehive and Byproduct Coke in Alabama

By H. S. Geismer* and David Hancock†

SYNOPSIS—A statement of the quality and quantity of coke produced in Alabama and the coal from which it is made, together with a discussion of the washing of coal for the purpose of reducing the ash in the coke and the necessity for using dry coal for coking.

In 1880 there were 316 coke ovens in Alabama and these ovens produced 60,781 tons of coke, which was consumed in the four coke blast furnaces then in blast in the state.

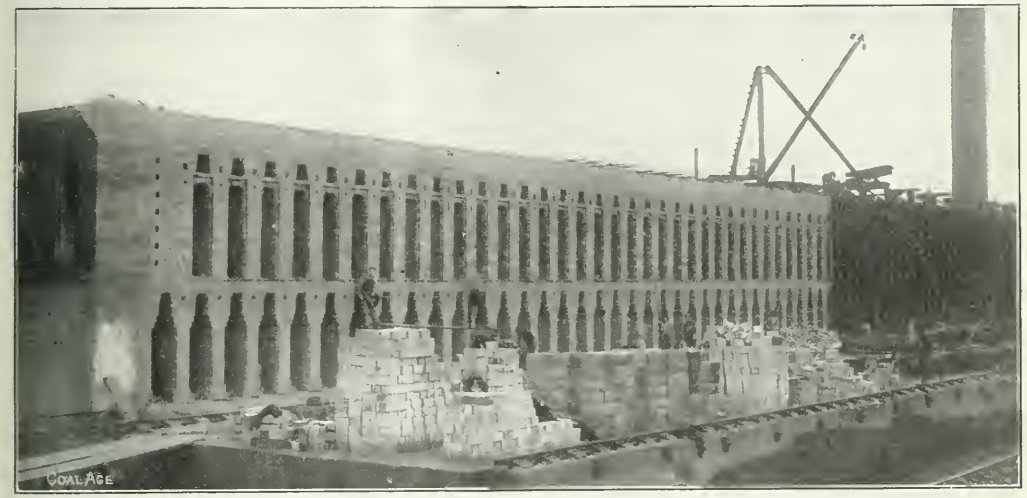
At the present time there are nearly 10,000 ovens of the beehive type in the state and 700 byproduct ovens, 420 of the latter being of the Koppers type and 280 of the Semet-Solvay type. In 1911, the last year for which statistics are available, the total coke production was 2,761,521 tons and by far the larger portion of this coke was consumed by the blast furnaces of the state, a comparatively small portion going to foundries and to markets outside of the state. All but about 1000 beehive ovens are owned by companies operating iron blast furnaces.

The annual capacity of the 10,000 beehive ovens is about 5,000,000 tons, if all were continuously in operation, and the annual capacity of the 700 byproduct ovens is about 2,000,000 tons under the same conditions.

The completion of byproduct plants has put thousands of beehive ovens on the idle list and while no separate statistics are available at the present time there is no doubt that over 50 per cent. of the present coke production of the state is from byproduct ovens. There have been no beehive ovens built in the state since 1907, while 460 byproduct ovens have been built since 1907, and two additional byproduct plants are projected.

Since almost the entire coke product of the state, now, as in the past, goes to local blast furnaces, the annual production follows closely the annual production of pig iron and incidentally follows the fluctuations in the pig-iron market, therefore, no great increase in coke production is to be looked for, but the rapid change from beehive to byproduct coke shows that the Alabama coke manufacturers are in the front rank of progress.

The coal used for coke making comes almost entirely from the Warrior coal field and from two principal seams of coal in that field. The Pratt seam was the first to be extensively developed in the state. This is a seam about 4 ft. thick, ordinarily, with one principal slate parting. It can be mined in a comparatively clean state and for many years mine-run coal from this seam was made into an excellent grade of coke. With the advent of coal washers it has become the general practice to crush and wash this coal, preparatory to coke making with the result that there is now made from this coal a quality of coke probably not surpassed by any blast-furnace coke in the world.



Eighty New Koppers Ovens Being Built at Woodward, Ala., by the Woodward Iron Co.

Seams of Coal Being Mined

The Pratt seam of coal, locally known as the Newcastle, Horse Creek, Blue Creek, Mary Lee, Jagger, etc., all belonging to the same geological horizon, is now extensively mined and the coal made into coke. It is a dirty seam carrying numerous slate partings as well as irregular lenses of slate and requires washing to make a satisfactory grade of coke. With the improved coal-washing machinery now in use a good quality of coke is made from it, the coke being in many cases but slightly inferior to the Pratt. The Big seam is generally from 6 to 12 ft. thick, and, although the loss in washing is large, the washed product is produced at less cost than Pratt washed.

The necessity of washing the Big seam coal has led to a close study of the washing problem and to extensive ex-

*Consulting engineer, Birmingham, Ala.
†Consulting engineer and chemist, Birmingham, Ala.

Byproduct Coke-Oven Plant, Koppers System, Near Corey, Jefferson Co., Ala.

perimenting. Three important washing machines, the Robinson-Ramsay, the Stewart, and the Montgomery were first tried out on a large scale in this state. Other types of coal washers have also been tried and are in successful operation.

As illustrating the extent to which coal washing has been introduced into the state it is interesting to note the character of coal used for making coke in 1911:

15.7 per cent. was mine run coal unwashed.
29.2 per cent. was mine coal crushed and washed.
0.1 per cent. was slack unwashed.
55.0 per cent. was slack washed.

Slack is usually understood as comprising all coal smaller than 2½ in., though the practice is quite varied at different mines. Slack screens as small as ¾ in. are frequently employed, as well as bar screens of 1½-in. opening, which will pass a certain amount of material that will not go through a 2½-in. round perforation. The coal over the slack screen is either crushed and mixed with the slack or else sold for fuel coal.

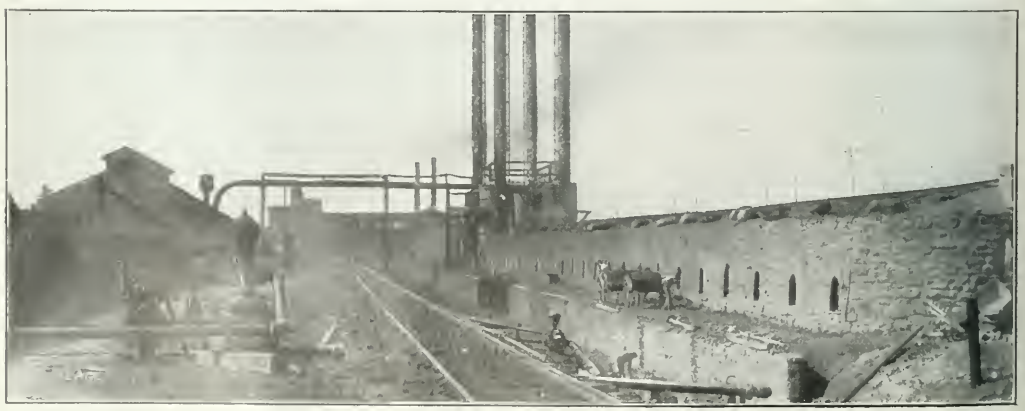
The location of coal washers in close proximity to the coking plant has brought forth a peculiar problem, viz., that of reducing the amount of water in the washed coal to a constant and satisfactory figure.

Necessity for Drying the Coal

The wet coal will contain from 1 per cent. to 13 per cent. of water and for some time after charging one can notice a considerable stream of water running out of the oven door. The oven is thereby chilled and often the yield of coke as well as the quality is affected. Also, the variable quantity of water makes it impossible to keep accurate records of the tonnage of coal charged and consequently no reliable figures as to yield of coke can be compiled. This trouble has been obviated to some extent by allowing the coal to stand in cars or in large storage bins for 24 to 36 hr. before charging into the ovens; in this way a fairly constant though still somewhat uncertain quantity of water is retained in the coal. Experiments on an extensive scale have shown that on an average about 5 per cent. of water is retained in the coal after standing for about 36 hr. This percentage is influenced to some extent by size of the coal, but is fairly constant for coal coming from the same washer.

Recently a centrifugal dryer has been placed on the market by the American Concentrator Co., that will handle 50 tons of washed coal per hour containing 13 per cent. of water and reduce this uniformly to 5 per cent. These machines will be given a try out in the Birmingham district in the next few months.

The average yield of coke from Alabama coal in 1911 was 62.6 per cent., recent years having shown an increase from about 59 per cent. The increase is due largely to the increased percentage of byproduct coke, the yield



Utilization of Waste Heat from Beehive Ovens

Showing Property of the Tennessee Coal, Iron & Railroad Company

from Pratt and Big Seam coal in beehive ovens being still about 59 per cent. Yields lower than this are found on individual plants and are generally the result of inefficient supervision of the coke-oven operation, variations in the size of the charges, poor drafting and daubing, leaky oven doors, imperfect or slow sealing of the ovens after burning in, etc.

Systematic records so placed that they are available and intelligible to the foremen in charge generally result in noticeable improvement both in quality and yield.

The yield on byproduct plants is much higher, averaging around 70 per cent., though the screening operations which are necessary for preparing a suitable coke for blast-furnace use, by removal of a large amount of small coke, reduce this figure somewhat. Probably 66 per cent. would be a fair average for the yield of screened coke at the byproduct ovens of the state.

It is often erroneously assumed that the analysis of a coking coal will give exactly the yield which may be expected from it, by simply computing the total of ash and fixed carbon; a corollary to this fallacy is often worked out by which the ash of coke is computed by dividing the ash of coal by the known per cent. of yield. Such calculations neglect entirely the variable production of ashes and breeze at the ovens.

A test made at one of the Alabama coke plants shows a very peculiar condition, as well as the danger of making such assumptions as those mentioned. At this plant a very regular coke product was being made and analyses of the coke over a long period showed an average of 14.50 per cent. ash, and a yield of about 60 per cent. The coal used was Big seam washed and ran regularly 12 per cent. ash. This coal theoretically would produce coke running 20 per cent. ash instead of 14.50 per cent. It was decided to investigate this, so two ovens were selected for the test and a tight floor built in front of them so as to retain all ashes and breeze. The coal charged into the ovens was weighed and analyzed and everything from the oven after a 72-hr. coking period was also weighed and analyzed.

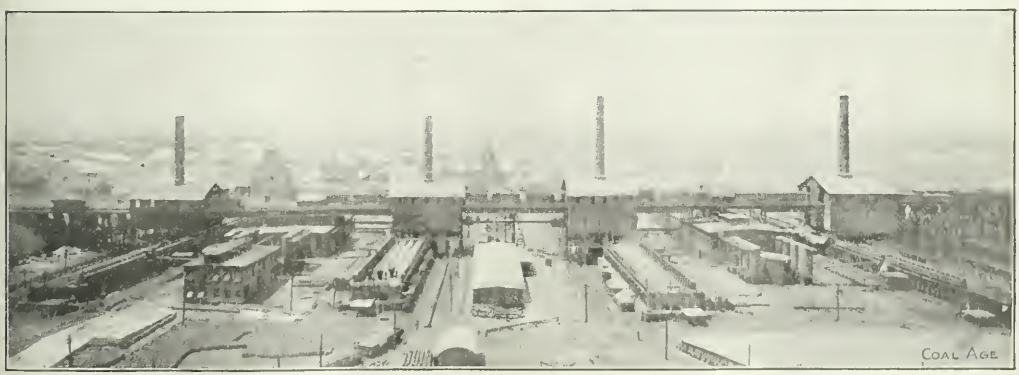
Ash Content of the Coke

The following results were obtained (per cent. of original dry coal):

60.6 per cent. screened coke, ash contents	14.56 per cent.
2.6 per cent. dry breeze, ash contents	31.56 per cent.
4.1 per cent. dry ashes, ash contents	49.34 per cent.

The amount of ash represented by these products was then calculated to be 11.72 per cent. of the original weight of coal (dry basis), while the analysis of the coal before charging showed 11.90 per cent. ash.

The explanation of this is that with this particular coal, the ash-forming impurities are to a great extent noncoking, and in some peculiar way are segregated from the coke during the coking operation and appear in the

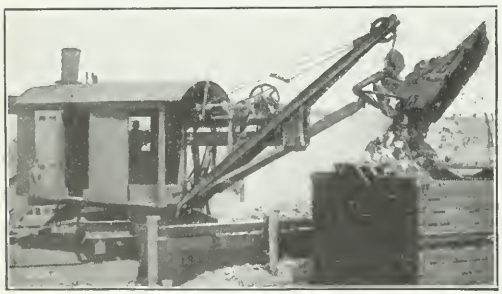


Semet-Solvay Byproduct Coke-Oven Plant, Ensley, Jefferson County, Ala.

910 Beehive Coke Ovens at Thomas, Ala., Largest Group of Ovens in the South. Owned by the Republic Iron & Steel Co.

form of an unusual amount of ashes at the oven instead of going into the body of the coke. This action probably takes place to a greater or less extent with all coking coals, and, unfortunately, makes it impossible to determine in advance of actual trial to what extent reduction of ash by improved coal washing would be reflected in the reduction of ash in the coke.

For instance, in this case improvements in the coal-washing plant were contemplated, amounting to about $60,000, by which it was expected to reduce the ash of this coal to about 8.5 per cent., but in view of the results shown by the test it was concluded that no lowering of the ash of coke would be effected thereby, but only a diminution of the amount of ashes made at the coke-



Steam Shovel Loading Coke

oven plant, and the only saving would be the saving in expense of disposing of the ashes.

Many analyses and physical tests of Alabama coke have been published from time to time, some of these were of special samples, some others from locations not typical of the district. The writers believe that the following analyses and physical tests represent a fair average of the quality of the coke produced by the principal operations on the Pratt and Big Seam:

(Dry basis)	Pratt Coke	Big Seam Coke
Volatile matter	0 96	1.27
Fixed carbon	91 34	84 64
Ash	7 70	14.09
Sulphur	1 33	0.73
Physical tests:		
Apparent specific gravity	1.30	1 00
True specific gravity	1.92	1 63
Per cent. of cells by Vol.	36.0	43.0
Ultimate strength per sq.in.	1600	1400
Load strength (factor of safety 4)	450	425

The above are representative figures from the records of operating companies and are averages of many separate results. All are on coke produced from washed coal in beehive ovens. Byproduct coke is usually superior to beehive in density, but does not have the silvery bright appearance characteristic of good beehive coke.

The products obtained from the byproduct ovens of the state with Pratt coal will run on an average about as follows:

Screened coke	66 to 70 per cent.
Breeze and small coke	6 to 4 per cent.
Ammonium sulphate	20 to 25 lb. per ton of dry coal
	7 to 9 gal. per ton of dry coal
Gas	9000 to 10,000 cu.ft. per ton dry coal

About one-half of the gas is needed for heating the ovens and the balance is either wasted or used outside of

Thomas Type of Coke Ovens at Coalburg, Ala. Probably First Mechanically Drawn Ovens in United States

the coke plant. The saving, which can be accomplished by coking in the byproduct oven in this state, depends very largely upon the use which can be made of the surplus gas.

Erratum

On p. 766 of our issue of May 17, in the first paragraph of the article entitled "An Effective Slate Picker," the following statement is made: "The accompanying photograph shows a Mason & Allen flat slate picker handling material containing 20 to 32 per cent. flat slate, etc." This should read "handling material containing 20 to 22 per cent. flat slate, and rejecting 18 to 21 per cent. in the process."

Improving Coke from Beehive Ovens

By Newell G. Alford*

SYNOPSIS—An article suggesting lines for the practical investigation of the causes for the variation in the quality of the product produced in beehive coke ovens, and the means for maintaining a uniform product.

To standardize operating methods about a beehive coke-oven plant is a problem which superintendents and managers find themselves periodically facing. Of course, this applies best to operations where a "coke inspector" is not overseeing the work and consulting with the coke boss. This overhauling of operating methods is apt to involve the personal supervision of an engineer or one higher up, and offers material for a lengthy article. Therefore, only the more common difficulties are dealt with in this short article.

To begin with, the distress is likely to start with some sultry letter addressed to the general superintendent in somewhat this tone.

Dear Sir:

We beg to advise that the last two consignments of coke received from your ovens are far from satisfactory. Our laboratory analyses show that the fixed carbon for the past week has been averaging 78% instead of the 84%, which you guaranteed in our contract. Unless your coke is brought up to this latter figure at once, we shall be forced to make other arrangements for our furnaces.

The general superintendent, of course, gets the gist of the letter in one reading and summary action follows. Needless to say, an interesting bit of dialogue ensues between the superintendent and the coke boss. For the sake of discussion let it be assumed that the letter to the superintendent was a true statement of facts.

Inspection reveals that the moisture in the coke may be noticed in touching it, an inch or more of "black butts" marking the ends of the lower sections, while the color is a dirty gray and the cell structure spongy.

If the coal used in charging the ovens analyzes the same as it did when better coke was produced, it is safe to lay the cause of the trouble to the oven operation. Under these conditions the coke described above is usually the result of cool ovens, together with insufficient combustion. The analysis of the coke will, therefore, show high moisture and volatile matter with a low fixed carbon.

It is understood that a cool oven will produce a slow ignition and feeble combustion of the coal with which it is charged, and that it will require a longer time to complete the burning than an oven which was hotter at the start.

Overquenching the coke not only injures the coke but destroys a certain amount of the heat that would be available in the bottom tile of the oven, in order to start the combustion of the next charge of coal. The heat destroyed varies with the temperature of the bottom tile before the coke is quenched and the amount of excess quenching.

Increasing Heat of Oven

After the coke has been drawn the first step is to raise the heat in the oven preparatory to charging the coal. Radiation and reflection of heat from the dome and floor are contributary elements for regaining heat. Following the drawing of coke from an oven, pieces of coke varying in size from chunks to breeze may be seen on the oven floor where they have been left by the puller. Good practice has shown that sweeping the oven floor clean with a steel broom will aid in the radiation and increase of heat.

To increase the heat the oven must be closed by placing a sheet of iron snugly in the oven doorway and the lid on the trunnel head. This not only excludes the outside air but hastens the rise in temperature, so that after standing an hour and a half or two hours in this state before charging, the inner temperature will have risen from approximately 150 deg. F. to 600 deg. or thereabouts.

With the oven ready for charging, further features of interest are brought to notice. When the sheet iron and lid are removed, the dazzling of heat can be seen within, while, perhaps, the bricks in the dome may be tinged with an orange glow. If dry coal is charged, gas may be generated so readily that a slight explosion may take place, and a streak of flame be emitted from the top of the oven door. This is a good indication, as it signifies quick combustion, the very result desired.

However, if washed coal is being used in the ovens, another difficulty is likely to arise. The benefits derived from sealing an oven and letting it stand over between charges can be entirely effaced by charging coal which is too wet. Unless dried after washing, coal is scarcely ever fit for charging into the ovens the same day that it comes from the washer. If there is more water present in the coal than the heat of the oven will evaporate before the coal ignites, the same result will be obtained as in the case where the oven was too cool before charging.

Size of Charges

Another feature well worth considering is the size of the charges. There are two or three gauging devices for sale which measure the discharge from the slack bin into the larry, which insure a standard charge for all ovens burning the same length of time. One of these devices, known as the Hughes Patent Charge Cutter, can be set to gage correctly for any charge varying from 48 to 96 hours per oven. This charge-measuring machine is in successful operation at the plants of the Wise Coal & Coke Co. and the Colonial Coal & Coke Co., both of Dorchester, Va.

Tests should be made upon the ovens to determine the exact size of the charge which burns off best in a given period, the determination to be governed by analyses. By coupling the results of such tests with the use of a charge gager, underburning and overburning of the coal may be avoided.

Underburning, on the one hand, produces coke such as that described in the hypothetical case at the beginning of this article. Overburning, on the other hand, results in the waste of fixed carbon, and yields as well a brittle coke.

*Assistant chief engineer, St. Bernard Mining Co., Earlington, Ky.

Quenching the Coke

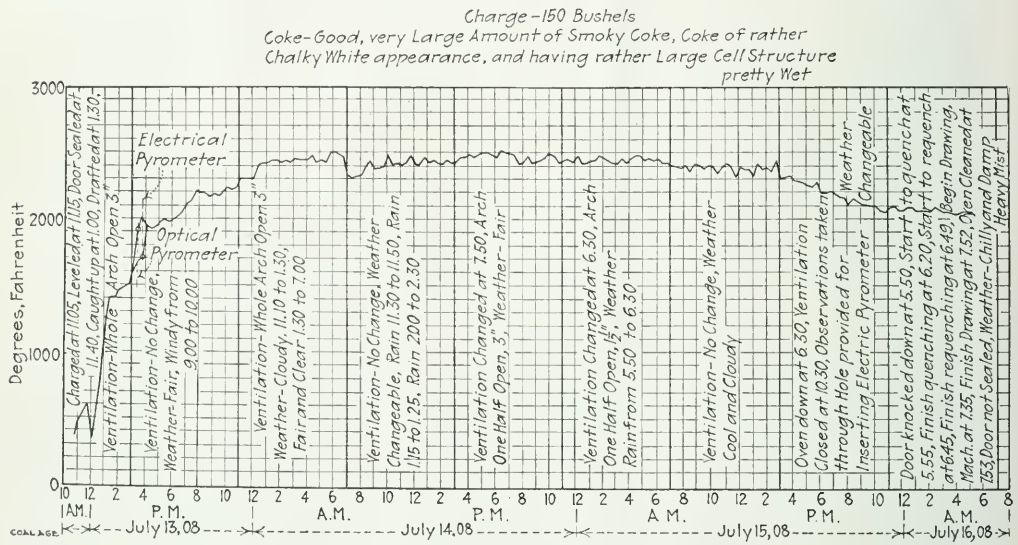
The quenching of coke is an important department of the process. Where coke is drawn with electric-pulling machines, quenching is usually done by one or two men. But where this is not the practice, the watering is done by the pullers, and, consequently, a variety of quenching methods are apt to be in vogue.

Coke otherwise perfect may be spoiled by watering it after it has been drawn from the oven. The man quenching the oven should make a careful distribution of the water over the incandescent coke, and the quenching should only go to the point of extinguishing the fire, when the pipe should be pulled from the oven. If the water is thrown on the coke for a longer period than this, saturation will follow with the consequent cooling of the oven.

If the fire in the coke is not put out with the first application of water, the coke should be requenched while air must enter at the door of the oven to permit a brisk combustion until the active generation of gases has subsided. Following this the air space at the top of the door is to be gradually decreased until the flaming on the surface of the incandescent coke ceases. The oven door should then be tightly sealed with the lid placed on the trunnel head until the coke is quenched.

Failing to put the lid on the trunnel head, neglecting to repair chinks that occur between the jamb bricks, or not sealing the oven door thoroughly, result in the burning and consequent waste of fixed carbon.

Coke, which shows upon analysis a high per cent. of volatile matter, may also be the result of uneven leveling of the coal. The process of fusing and coking begins with the surface of the coal and continues downward through the mass to the bottom. If the charge of coal has been unevenly leveled, the vertical sections of the charge being of varying thicknesses, will not all burn off


Charge-150 Bushels
Coke-Good, very Large Amount of Smoky Coke, Coke of rather
Chalky White appearance, and having rather Large Cell Structure
pretty Wet
Degrees, Fahrenheit
3000
2000
1000
0
Electrical Pyrometer
Optical Pyrometer
Charged at 11.05, Leveled at 11.15, Door Sealed at 11.40, Caught up at 1.00, Drafted at 1.30, Ventilation-Whole Arch Open 3"
Ventilation-No Change, Weather-Fair, Windy from 9.00 to 10.00
Ventilation-Whole Arch Open 3" Weather-Cloudy, 11.10 to 1.30, Fair and Clear 1.30 to 7.00
Ventilation-No Change, Weather Changeable, Rain 11.30 to 11.50, Rain 11.15 to 1.25, Rain 2.00 to 2.30
Ventilation Changed at 7.50, Arch One Half Open, 3" Weather-Fair
Ventilation Changed at 6.30, Arch One Half Open, 1/4" Weather Rain from 5.50 to 6.30
Ventilation-No Change, Weather-Cool and Cloudy
Oven down at 6.30, Ventilation Closed at 10.30, Observations taken through Hole provided for Inserting Electric Pyrometer
Weather Changeable
Door knocked down at 5.50, Start to quench at 5.55, Finish quenching at 6.20, Start to requench at 6.45, Finish requenching at 6.49, Begin Drawing, Mach. at 1.35, Finish Drawing at 7.52, Oven Cleaned at 1.53, Door not Sealed, Weather-Chilly and Damp Heavy Mist
10 12 2 4 6 8 10 12 2 4 6 8 10 12 2 4 6 8 10 12 2 4 6 8 10 12 2 4 6 8
1 A.M. P.M. A.M. P.M. A.M. P.M. A.M.
COALAGE July 13,08 July 14,08 July 15,08 July 16,08

Temperature Curve of an Oven

inside the oven. If watered on the ground after being drawn from the oven, the moisture does not evaporate from the coke. An analysis of such coke may show the moisture varying from 2 to 5 per cent., or, perhaps, even more.

In the very nature of things, air is necessary in the beehive process to furnish the requisite heat for the coking of the coal by the combustion of the volatile matter. Air is, therefore, admitted through the door of the oven to supply the necessary oxygen to secure complete combustion of the gases thrown off by the coal while coking.

Experience has proved that the key to the ventilating problem is this: The supply of air entering the oven must be adjusted so as to give a complete combustion or as nearly so as is possible in practical work. Observation shows that the largest volumes of gas are liberated by the coal in the early stages of the process, varying with the amount of volatile matter in the coal. Enough in the same length of time. Thus there will be patches in the oven, which will be underburned coke, with "black butts" and dark-colored masses running high in volatile matter.

A good grade of coke may be readily identified by the presence of silvery globules on the upper half of the section, which, when held in the sunlight, often have a tendency toward iridescence. The silvery globules are the deposits formed by the gases from the volatile hydrocarbons in the coal during their upward passage through the fissures of the incandescent mass which has been already coked.

A high per cent. of ash in coke may be caused by a poor interior condition of the oven. The intense heat sometimes breaks the silica brick in the crown of the oven, bits of brick and brick dust falling upon the coke. The very best grade of silica brick should always be used in oven crowns, as these will stand the amount of heat with which they are likely to come in contact.

Variation in Coke

The records of two differing conditions, under which the same coal was coked, follow, the marked contrast in the coke produced being shown in each case by the analyses.

Test No. 1

Conditions: Oven was not sealed and was allowed to stand over prior to charging. The bottom was not swept out. An hour elapsed before the coal ignited. There was insufficient ventilation at top of door in the beginning, which was not altered throughout the process. The charge was burned off long before door was sealed. The lid was not used at all. The coke was overquenched. Brick dust was present on the top of the coke. Black Butts occurred on the coke near the door jamb. The coke was too dark in color and the cell structure spongy.

ANALYSIS

	Per cent.
Moisture	2.71
Volatile matter	3.91
Fixed carbon	78.62
Ash	14.76
	100.00

Test No. 2

Conditions: Oven was in good repair. Hot ovens were on both sides. The bottom of the oven was cleaned out. Oven was sealed, standing idle 2½ hours prior to charging. Oven dazzling hot. Leveling very even. Coal ignited 4 min. after charging. Whole arch of door given 3 in. draft in the beginning. Combustion decidedly more brisk than in test No. 1. Draft was diminished gradually until charge ceased flaming. Carefully quenched. No black butts. Color-metallic gray with luster. Coke bore silvery globular deposits on upper half of section.

ANALYSIS

	Per cent.
Moisture	0.61
Volatile matter	1.92
Fixed carbon	85.17
Ash	12.30
	100.00

With the preceding data in mind, the following nine questions will give the investigator a clue to his beehive-oven trouble, if the cause lies in the operation of the oven:

1. Are the ovens sufficiently hot when charged?
2. Are proper steps taken to regain heat between charges?
3. Are charges of uniform size?
4. Are charges too large or too small for the length of time that the ovens burn?
5. Does the ventilator attend to his duties?
6. Is the proper amount of air admitted to the ovens?
7. Is the coke properly quenched?
8. Are the ovens in good repair?
9. Are the charges evenly leveled?

A few years ago one of the large West Virginia coke-producing companies made a thorough investigation of the conditions which tend to produce the best coke, the research including pyrometer readings on the temperatures of the ovens, readings being taken every half hour and the temperatures plotted to show the variations graphically.

From the accompanying figure, an idea can be had of the rise and fall in temperatures throughout the coking process. The electrical pyrometer was used until the heat became strong enough to effect the optical pyrometer. The readings were taken by three men, each working an eight-hour shift.

The maximum temperature in the curve shown is 2520 deg., while in some instances where ovens are hotter before charging they frequently reach 2800 degrees.

Machinery for Beehive Coke Ovens

By E. C. Ricks*

SYNOPSIS—The three coke-drawing machines at present on the market are briefly described and their principal advantages and shortcomings set forth. A few short paragraphs are also devoted to a successful leveling machine.

The purpose of this article is not to enumerate the various machines (almost a score of them) which have been designed for drawing coke from beehive ovens, but to outline briefly the operation of the three types at present in everyday operation.

The Hebb machine is one of the "over-drawing" type, operated by electricity, and pulls the coke from the oven onto a chain and slat conveyor, which deposits it in railroad cars. The machine is a very heavy affair, but performs its work fairly well although it has attained comparatively no commercial success. This has been due partly to "squabbling" among the stockholders, but mainly on account of the cost of the machine, which is necessarily much greater than that of the other machines mentioned below, while it, seemingly, has no advantages worth mentioning, to offset the additional expenditure. To the best of the writer's knowledge, there are five of these machines in use today; one at Jones & Laughlin's plant in Pittsburgh, and four at the plants of the Thompson Connellsville Coke Co., at Republic, Penn.

The Stauft machine—At present, there is only one of these in operation, it being located at the plant of the Taylor Coal & Coke Co., near Uniontown, Penn., of which plant, the inventor, D. B. Stauft, is general superintendent. This is also of the "over-drawing" type, similar to the Hebb machine. The conveyor part of this apparatus works on the same principle as the Hebb and Covington machines and is operated by electricity; however, air is used on the extractor part, not only to draw the coke, but to propel the device along the track in front of the ovens.

The Stauft machine, while yet in its infancy, is doing good work and attracting some attention. As to how well this machine will continue to stand up to everyday work, drawing its capacity of ovens, remains to be

*Uniontown, Penn.

seen; however, the machine at Taylor works has been drawing 46 ovens per working day, for the past several months. The supreme test of time and operation under varied conditions, through which this machine will have to pass, before it can be considered a commercial success will be watched closely, and with interest by all coke operators.

The Pioneer Machine Has Attained Success

The Covington was the pioneer machine to attain commercial success and is, today, the only one for drawing and loading coke from bee-hive ovens, which has been extensively adopted, there being approximately two hundred of them in operation throughout various sections of the United States and Canada, representing an investment of more than a million dollars.

From the crude machine operated by steam, shown in Fig. 1, the Covington has had its ups and downs, working under all imaginable conditions; being redesigned

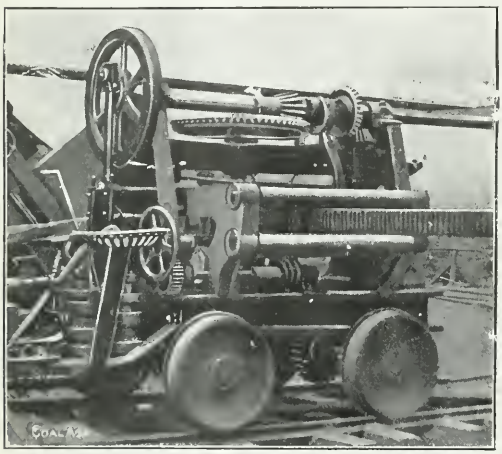


Fig. 1. The First Successful Covington Coke-Drawing Machine

from time to time, better material being used in its construction, whenever experience proved a change necessary for its betterment. So well have coke operators taken to this machine, that it has been necessary for the makers to build large additions to their plant twice within the past few years. Now they have a capacity of one coke machine every two days.

The Covington Machine Co., of Covington, Va., are the manufacturers of the Covington machine. This company reports that its entire output has been sold from three to four months ahead, for the past year. Although there are about fifty concerns using these machines, one of the best evidences of their utility is the fact that the H. C. Frick Coke Co. has given repeat orders five or six times. At present their total investment in these machines is close to a half-million of dollars.

The Covington machines are of the "under-drawing" type and are operated by electricity; every mechanical movement of the latest model being power driven.

The capacity of all three makes of machines above mentioned is from four to six ovens per hour. The coke being drawn, screened and loaded into cars, including shifting of the machine, etc., within the period mentioned.

The total labor cost for drawing an oven in the Connellsville region, where most of these machines are in use, is 31c. per oven as against $1.10 to $1.15 per oven, for the same work done by hand. Adding to the labor cost, repairs to machine and ovens, power, oil, waste, interest on investment, etc., the machines effect a net saving of from 50 to 60c. per oven drawn, to say nothing of the increased production from the ovens, due to the short time required for drawing by machinery, allowing a longer burning period, which permits heavier charges of coal.

Fig. 2 shows one of the later model Covington drawers, a number of which have been installed in Pennsylvania and West Virginia, within the past four months. Twenty more of these machines are now on order for the same section, and will be installed within the next 60 to 90 days.

The Covington Leveler

In Fig. 2 is also shown a Covington leveler, a number of which are in operation in the Connellsville region.

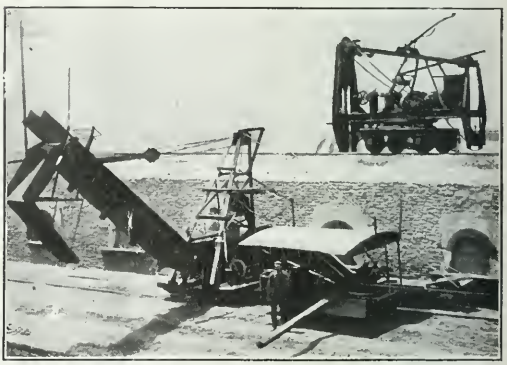


Fig. 2. A Modern Machine, also a Leveler on Larry Track

The machine shown in the picture was put in service at the Continental No. 1 works, of the H. C. Frick Coke Co., Uniontown, Penn., June 4, 1909, and so far has leveled more than 150,000 ovens. At this plant there are 400 ovens, comprising two blocks and one bank, and this one leveling machine takes care of the entire installation, keeping ahead of three larries charging. The machine levels from 30 to 40 ovens per hour, including shifting, and requires only one man for its operation.

Where this leveling machine is used, as soon as the coke is drawn, the door is immediately bricked completely, and daubed, regardless of when the oven is to be re-charged. This, of course, conserves heat and makes the new charge ignite much sooner than is the case where it is necessary to leave the door partly open until the leveling is done by hand.

This machine, also, makes it possible to burn heavier charges, besides, being a great labor-saver. It has been conservatively estimated that 5 per cent. additional coal can be coked, in a given time, where the machine is used, owing to the conservation of heat, above mentioned, and the good leveling done.

EDITORIALS

Evolution in Coking Practcie

Coke manufacturers have been slow to give up the old beehive type of oven. There has probably never been an example of more tenacious adhering to acknowledged uneconomical methods than is exemplified in this case That a change must eventually take place is obvious, but it is equally clear that it will not be an abrupt change such as is frequently witnessed in metallurgical engineering. In this latter profession, when new and more effective methods of ore treatment are devised, the engineers are prompt to take advantage of them and there are innumerable examples of elaborate and expensive plants being dismantled before they were scarcely in operation.

The evolution of the beehive oven, while less rapid, and along more conservative lines is, however, none the less sure. Thus we find that a radical modification of it is now being generally accepted in the Connellsville region, the Mitchell type of rectangular oven having definately superseded it there. It is estimated that less than two per cent. of the ovens constructed in that district during the last year have been of the beehive type. In its present accepted form the Mitchell is not a byproduct oven, but the inventors have devised certain alterations by which they expect to be able to effect a saving of these, and without any depreciation in the quality of the product.

The principal advantage of the Mitchell oven lies in the rapidity with which it can be discharged. To "pull" the old beehive type requires from 3½ to 4 hr., while the mechanical pusher and loader used with the Mitchell oven reduces this time to as many minutes. By the former method the oven becomes cooled to such an extent during the time the coke is being extracted that there is also a loss of about two hours more before the coal starts burning properly, so that the total time lost amounts to between 5½ and 6 hr. In addition to this the charging capacity of the Mitchell type is between 8 and 9 tons per oven, or from 35 to 50 per cent. greater than the standard Connellsville beehive oven.

Mother Jones

Mother Jones came to New York and addressed a meeting of 1500 enthusiasts and left the following morning for Washington. The yellow journals gave her three inches of insignificant type with a one-column headline. So despite the cheering and waving of banners, Mother Jones did not score any marked triumph.

She had been brought to the city for the purpose of setting a new monthly periodical on its feet and perhaps she was successful in this endeavor, but she did not bring the sober elements of society to a decision favoring her cause, for her supporters on the platform were Socialists and Industrial Workers of the World, and in Carnegie Hall were few if any labor unionists and none of the philanthropic multitude who frequently make labor troubles their hobby.

Mrs. Jones is a venerable old woman, 81 years of age. For the most part, one is disposed to believe she does not purposely palter with the truth. Perhaps she knew well the temper of her audience, knew that it was not ill-disposed toward violence, for she did not hesitate to admit that the large following she took to Charleston to demand the dismissal of the guards provided themselves with guns before their return to their homes.

She detailed the evidence against her at the court martial and related that a mine superintendent and a bookkeeper complained that she had incited them to violence by calling them individually, and we may add not very brilliantly, "two by fours." A major in uniform complained that he had been incited by being told that, one of these days, his epaulets would be removed and swords would be transformed into pruning hooks.

These are mild ways of creating a disturbance, but Mother Jones showed that she is not a child at the art, and has not served her apprenticeship for nothing, for at the hall she declared that Morgan's fingers had dripped with the blood of women and children and that a certain senator had murdered 700 men in his mine by an explosion. We could not help wondering whether Mother Jones had not uttered in the hill country of West Virginia, language at least as inciting as she used in Carnegie Hall.

She had nothing to say about wages or company-store prices. It is true that she did open her discourse by saying that the Cabin Creek miners had never had a good meal and that their toes protruded from their worn-out shoes. But she made it clear that the fight was primarily for the establishment of a union in some places and for its effectual recognition in others.

We are not sure that unions can ever greatly benefit the working classes but nevertheless we cannot feel that the operator does well to attempt in any way to prevent their formation, unreasonably harassing though they often are. Interference with the liberty of the individual does but exasperate him and breed violence such as West Virginia has just seen and will see again shortly if the signs do not fail.

The Industrial Workers of the World think they note in West Virginia a fit place for their lawless attacks on society and though now they are cumbered with the barbers' strike, and the frenzied attempt to wipe Paterson, N. J., from the map, they may at any time descend on the coal fields of West Virginia.

They frankly confess that they have no ultimate program. The present evil to be overborne, they declare, is capitalism; that being overthrown, the work of reconstruction will be commenced. But the manner of structure to be selected, they do not know. They in very truth "don't know where they are going but they're on their way."

The impression is abroad that the Industrial Workers of the World are the very off-scouring of the people.

Those who have such an idea would be disabused by a visit to their well attended meetings. They are fanatics of the type of the English suffragettes. The frenzy of modern life is in their veins, a wild craving for excitement, to leave the beaten path, to plunge headlong with their fellows, whether friendly or resisting. This spirit of unrest has seized all the overstrung, brilliant and weak-willed alike, and among their leaders are many men of ability and character.

The only way to meet the evil propaganda which have created them is by mending what is now unjust and by commencing a campaign of education which will sweep away the tissue of lies that magazines and newspapers prepare for the pleasure of their subscribers. What object can there be to a publisher to tell the truth when the sale of a newspaper depends on the number of readers? Most of these are not wealthy and the journalist must condemn the "haves" and commiserate the "have-nots," right or wrong.

If every government bureau must publish bulletins, engage press agents, and send trained speakers, north, south, east and west, how are the coal operators going to succeed if they sit passively through it all and do not defend their positions? The world is very equal, very human; the high places and the low are filled with men, good and evil. They who would maintain those economic principles which they believe will promote human happiness, must urge them at some expense of time and money on their less enlightened fellows and give the world a glimpse, we think it will be a gladdening glimpse, of the real brotherhood and true socialism of our modern coal operators.

Coal Storage under Water

Some of the larger industrial companies, as well as many of the railroads, habitually store coal in the open air upon vacant property. This method is, however, open to two serious objections. Soft coal, when subjected to the action of the atmosphere, is certain to oxidize to a greater or less extent, and thus depreciate in heat value. Furthermore, the action of frost tends to disintegrate the individual pieces of coal, thus increasing the losses in burning. Second, particularly if the coal contains a large percentage of sulphur and is stored to considerable depth, there exists a strong liability to spontaneous combustion, and considerable losses occur annually from this cause.

To overcome both of these difficulties, coal is sometimes stored under water in concrete tanks or vats of considerable size and capacity. It is claimed by those who employ this method of storage that the practically negligible loss in heat qualities vastly more than offsets the increased amount of moisture in the coal as it goes to the boiler furnaces. Furthermore, the subaqueous storage of the fuel renders spontaneous combustion impossible, and there is therefore no danger of loss from this source. This result, too, is accomplished regardless of the size or quality of the coal stored.

A large Chicago manufacturing firm is at present employing this method at one of its suburban plants, with results which are averred to be entirely satisfactory. The fuel handled is No. 1 screenings, Illinois coal, which ranges in size from dust up to approximately 1¼-in. lumps. This fuel, after being loaded out from storage, is allowed to drain for a few hours before passing to the chain-grate stokers with which the boiler furnaces are fed.

Although the expense of building a storage plant of this kind is great, it would appear that in many instances at least the advantages gained, namely, small loss from oxidation, immunity from spontaneous ignition, and the fact that the smallest sizes and poorest grades of coal may be thus safely stored throughout indefinite periods, are commensurate with the expense. The cost of handling coal in a storage scheme of this kind should not be higher and may be decidedly less than when it is piled upon the ground in the usual manner.

John Fulton

A number such as this would be incomplete did it not reflect some opinions and views of the leading spirits in the coke industry. Fulton and coke are two such entirely synonymous words that each immediately recalls the other. John Fulton occupied a unique position in the coke industry of the past—a position which no one may ever attain to in the history to come. He stood preëminently at the head of the profession in all its ramifications, whether of the beehive oven, the retort oven or any of the intricate regenerative or byproduct recovery processes. As he now frankly concedes, the industry has become too complicated for one brain to grasp in its entirety; in common with other engineering professions, new branches and subdivisions have developed, each requiring the attention of a specialist so that it is quite probable no one man will ever again predominate the profession as John Fulton has in the past.

Mr. Fulton thinks the country is facing a great problem when the Connellsville region is exhausted. The life of these fields is quite definitely defined now, and when the end comes, the retort oven must be resorted to. This he thinks will also witness the final demise of the beehive oven. But so long as there is a supply of these coals, he predicts that the old-fashioned beehive will continue to thrive, as no retort oven has yet been devised that will displace them with the world's two standard coking coals—the Connellsville and the Durham, England. And it is incidentally interesting to note that Mr. Fulton puts the Connellsville product ahead of Great Britain's, the slightly higher ash content of the former producing somewhat better slag in the blast furnace.

Conservation is also a favorite topic with Mr. Fulton. While both coal and iron are being exhausted at an alarming rate, he thinks that the real conservation will be effected by greater economies in the methods of using, particularly in the case of coal. He also views the growing scarcity of water with some alarm.

Of the foreign coal-mining methods, Mr. Fulton has the greatest disdain. He spoke of one German installation he visited which was constructed along the most elaborate and permanent lines. Steel and concrete were used throughout and the whole represented an almost awe-inspiring edifice. The cages had many compartments for cars, but these were only of a quarter-ton capacity, while the production of the plant was only between 200 and 300 tons per day. The local superintendent also explained that they were most careful to ship only sufficient coal to just meet the market requirements. Evidently a Sherman anti-trust law is unknown in Germany.

A Model Coal-Preparation Plant

By Milton J. Williams*

During the past few years, although much has been written about the subject of coal mining and coke manufacture in both beehive and byproduct ovens, only a comparatively meager amount has appeared concerning the pulverization or other preparation which the coal should receive if a fine grained and superior grade of coke is to be anticipated.

In this matter of preparation before coking, the plant of the Byproduct Coke Corporation at Solvay, Ill., just south of South Chicago, may be well considered as an example of the best practice in this country. Unfortunately, it is impossible to show photographs illustrating the various machines and processes.

The preparation plant consists of three distinct sets of units, each consisting of a Bradford breaker, a coal hopper, a magnetic separator and feeding belt, and a No. 6 Williams crusher. The coal handled is smokeless and Boomer West Virginia bituminous. It is first passed through a Bradford breaker provided with perforations 1½ in. square. Here a large percentage of the foreign matter is removed and no coal passes on until it has been reduced to the size of the perforations above mentioned.

Of this 1½-in. product and smaller, 80 to 85 per cent. is ½ in. and under. When the moisture content of the coal reaches 3½ to 5 per cent., the material becomes difficult to handle in hoppers and chutes, as it is an inert or slow-moving body; consequently, special chutes are employed to handle this coal.

The Bradford Breakers

The Bradford breakers above mentioned are of Heyl and Patterson design and are regulation size. Each has a capacity of 125 to 150 tons per hour, and the succeeding machinery over or through which the coal travels is arranged for a similar capacity. From the breakers the material falls into large steel bins or hoppers, from whence it passes to magnetic separators in the form of short belt conveyors. These are approximately 5 ft. wide, and 8 or 10 ft. long.

The coal upon these belts varies from 3 to 3½ in. deep throughout the full width of the conveyor. The head or driving pulley is magnetized and consequently catches and discharges into a special chute a considerable percentage of the iron or foreign metallic material which has found its way from one source or other into the coal. These separators also furnish an automatic, uniform feed to the crushers.

From these belts the coal passes directly to No. 6 Williams Jumbo crushers and is pulverized or ground to a product ranging from 80 to 90 per cent. through a ⅛-in. opening. These machines are direct connected to 150-hp. alternating-current motors by means of a Muir friction clutch. Such clutches are employed to pick up the load gradually in starting the crushers as the hammer type of pulverizer requires more power to start than to operate empty at full speed. In many similar installations flexible couplings are used to direct-connect crushers to motors, but in such cases it is advisable to have special motors with high starting torque.

These particular crushers are 48 in. in diameter and 36 in. wide. They weigh approximately 25,000 lb. each, and operate at 750 r.p.m. Their durability, accessibility, and efficiency are too well known to require further comment.

After being crushed and pulverized, the coal is carried by an inclined belt conveyor to a storage bin, from which it may be drawn off from time to time and carried to the ovens as the operation of the latter may require.

From the foregoing it will be seen that the preparation of the coal for coking at this plant is continuous and entirely mechanical, and can therefore be accomplished with a minimum of labor and superintendence. A failure or breakdown of any one piece of the apparatus can only decrease the output of the preparation plant by one-third, for should the failure of the particular unit be sufficiently serious to stop operations in that part of the equipment, there are, as mentioned above, three separate and distinct routes by which the coal travels from the original dumping or storage point to the bins serving the coke ovens.

*Old Colony Building, Chicago, Ill.

A New Method of Boiler Cleaning

A new type of boiler-tube cleaner, or, more strictly speaking, a new method of boiler-scale removal, has been recently invented and placed upon the market in England

The Oxyacetylene Scale-Removing Apparatus after a Trial Test

by Adolph Schror. This method is radically different from those common in this country, which are strictly mechanical in their action.

The principle of the new apparatus is simple. It consists in the employment of an oxyacetylene flame of high temperature but of moderate pressure, which is rapidly played upon the scale. The effect is to disintegrate and break down the deposits, and, notwithstanding the high temperature of the flame, the makers claim that there is no cause for anxiety on the score of undue heating in the boiler tubes, and that the apparatus may be used to remove the thinnest scale.

Contracts under this system are undertaken on the "no cure, no pay" principle, by the Pyro Boiler Cleaning Co., of London, and we understand that thus far, at least, the results obtained have been entirely satisfactory.

Coke Works of the Entire Connellsville Region

Revised and Corrected to Apr. 1, 1913. Published through Courtesy of "Connellsville Courier."

CONNELLSVILLE REGION

No. Ovens	Name of Works	Names of Operators	Postoffice	Nearest Railroad Station
200	Acme	W. J. Rainey	New York, N. Y.	Mt. Pleasant, P. R. R.
80	Acme	Penn Coke Co.	Uniontown, Pa.	Smithfield, B. & O.
300	Adelaide	H. C. Frick Coke Co.	Pittsburgh, Pa.	Adelaide, P. & L. E.
356	Alverton	H. C. Frick Coke Co.	Pittsburgh, Pa.	Alverton, P. R. R.
397	Baggaley	H. C. Frick Coke Co.	Pittsburgh, Pa.	Baggaley, P. R. R.
182	Beatty	Mt. Pleasant Coke Co.	Greensburg, Pa.	Beatty, P. R. R.
50	Bethany	Majestic Coke Co.	Uniontown, Pa.	Ruffsdale, P. R. R.
300	Bitner	H. C. Frick Coke Co.	Pittsburgh, Pa.	Bitner, B. & O.-P. R. R.
120	Boyer	Mt. Pleasant Coke Co.	Greensburg, Pa.	Udell, P. R. R.
240	Brinkerton	H. C. Frick Coke Co.	Pittsburgh, Pa.	Brinkerton, P. R. R.
299	Buckeye	H. C. Frick Coke Co.	Pittsburgh, Pa.	Star, P. R. R.-Mullen, B. & O.
30	Brush Run	Brush Run Coal & Coke Co.	Mt. Pleasant, Pa.	Mt. Pleasant, P. R. R.-B. & O.
260	Calumet	H. C. Frick Coke Co.	Pittsburgh, Pa.	Calumet, P. R. R.
32	Carolyn	Peerless-Connellsville Coke Co.	Uniontown, Pa.	Alverton, P. R. R.
303	Central	H. C. Frick Coke Co.	Pittsburgh, Pa.	Tarr, P. R. R.
54	Chester	Sunshine Coal & Coke Co.	Uniontown, Pa.	Vance Mills, P. V. & C.
150	Clare	Clare Coke Co.	Greensburg, Pa.	Trauger, P. R. R.
120	Coalbrook	H. C. Frick Coke Co.	Pittsburgh, Pa.	Ruth, P. R. R.
400	Collier	H. C. Frick Coke Co.	Pittsburgh, Pa.	Collier, B. & O.
400	Continental No. 1	H. C. Frick Coke Co.	Pittsburgh, Pa.	Uniontown, P. R. R.-B. & O.
326	Continental No. 2	H. C. Frick Coke Co.	Pittsburgh, Pa.	Walnut Hill, P. R. R.
300	Continental No. 3	H. C. Frick Coke Co.	Pittsburgh, Pa.	Newcomer, P. R. R.
129	Crossland	H. C. Frick Coke Co.	Pittsburgh, Pa.	Crossland, B. & O.
333	Davidson	H. C. Frick Coke Co.	Pittsburgh, Pa.	Davidson, P. R. R.-Connellsville, B. & O.
40	Dexter	Connellsville Coke Co.	Connellsville, Pa	West Overton, B. & O.
230	Dorothy	H. C. Frick Coke Co.	Pittsburgh, Pa.	Latrobe, P. R. R.
40	Ellen No. 1	Whyel Coke Co.	Uniontown, Pa.	Whitney, P. R. R.
50	Ellen No. 2	Whyel Coke Co.	Uniontown, Pa.	Whitney, P. R. R.
100	Elizabeth	Unity-Connellsville Coke Co.	Greensburg, Pa.	Dorothy, P. R. R.
218	Elm Grove	W. J. Rainey	New York, N. Y.	Elm Siding, B. & O.
135	Fort Hill	W. J. Rainey	New York, N. Y.	Dickerson Run, P. & L. E.
101	Gilmore	Gilmore Coke Co.	Uniontown, Pa.	Smithfield, B. & O.
124	Grace	W. J. Rainey	New York, N. Y.	Moyer, P. R. R.
272	Heela No. 1	H. C. Frick Coke Co.	Pittsburgh, Pa.	Heela, P. R. R.
300	Heela No. 2	H. C. Frick Coke Co.	Pittsburgh, Pa.	Trauger, P. R. R.
300	Heela No. 3	H. C. Frick Coke Co.	Pittsburgh, Pa.	Heela, P. R. R.
120	Henry Clay	H. C. Frick Coke Co.	Pittsburgh, Pa.	Broad Ford, B. & O.
355	Hostetter	Hostetter-Connellsville Coke Co.	Pittsburgh, Pa.	Hostetter, P. R. R.
100	Humphreys	Bessemer Coke Co.	Pittsburgh, Pa.	Trauger, P. R. R.
250	Juniata	H. C. Frick Coke Co.	Pittsburgh, Pa.	Juniata, B. & O.
20	Junction	Marietta-Ganier Coke Co.	Connellsville, Pa.	Dickerson Run, P. & L. E.
306	Kyle	H. C. Frick Coke Co.	Pittsburgh, Pa.	Fairchance, P. R. R.-B. & O.
499	Leisenring No. 1	H. C. Frick Coke Co.	Pittsburgh, Pa.	Leisenring, P. R. R.-B. & O.
196	Leisenring No. 2	H. C. Frick Coke Co.	Pittsburgh, Pa.	Bute, P. R. R.
502	Leisenring No. 3	H. C. Frick Coke Co.	Pittsburgh, Pa.	Monarch, P. R. R.
304	Leith	H. C. Frick Coke Co.	Pittsburgh, Pa.	Leith, P. R. R.-B. & O.
227	Lemont No. 1	H. C. Frick Coke Co.	Pittsburgh, Pa.	Darent, P. R. R.-Lemont, B. & O.
350	Lemont No. 2	H. C. Frick Coke Co.	Pittsburgh, Pa.	Lemont, B. & O.
20	Little Sunshine	King Coke Co.	Uniontown, Pa.	Humphries, P. R. R.
32	Love	C'ville Mutual Coal & Coke Co.	Scottdale, Pa.	Mutual, P. R.R.
40	Magee	Magee Coke Co	Uniontown, Pa.	Clare, P. R. R.
60	Mahoning	Mahoning Coal & Coke Co.	Connellsville, Pa.	Dunbar, P. R. R.
510	Mammoth	H. C. Frick Coke Co.	Pittsburgh, Pa.	Mammoth, P. R. R.
400	Marguerite	H. C. Frick Coke Co.	Pittsburgh, Pa.	Marguerite, P. R. R.
25	Marion	Marion Coke Co.	Udell, Pa.	Udell, P. R. R.
165	Morgan	H. C. Frick Coke Co.	Pittsburgh, Pa.	Morgan, B. & O.
360	Mt. Braddock	W. J. Rainey	New York, N. Y.	Mt. Braddock, B. & O.-Gist, P. R. R.
310	Mt. Pleasant	Mt. Pleasant Coke Co.	Greensburg, Pa.	Heela, P. R. R.
195	Mutual	H. C. Frick Coke Co.	Pittsburgh, Pa	Mutual, P. R. R.
32	Myers	Brownfield-C'ville Coke Co.	Uniontown, Pa.	Tarr, P. R. R.
329	Nellie	Brown & Cochran	Dawson, Pa.	Dickerson Run, P. & L. E.
252	Oliphant	H. C. Frick Coke Co.	Pittsburgh, Pa.	Oliphant Furnace, P. R. R.
328	Oliver No. 1	Oliver & Snyder Steel Co.	Pittsburgh, Pa.	Redstone Jct., P. R. R.-Oliver, B. & O.
480	Oliver No. 2	Oliver & Snyder Steel Co.	Pittsburgh, Pa.	Redstone Jct., P. R. R.-Oliver, B. & O.
300	Oliver No. 3	Oliver & Snyder Steel Co.	Pittsburgh, Pa.	Thaw Station, P. V. & C.
221	Painter	H. C. Frick Coke Co.	Pittsburgh, Pa.	McClure, B. & O.
200	Paul	W. J. Rainey	New York, N. Y.	Dickerson Run, P. & L. E.
25	Pennsville	Pennsville Coke Co.	Pennsville, Pa.	Pennsville, P. R. R.
15	Percy	Marietta & Stillwagoo	Connellsville, Pa.	Perry, B. & O.
400	Phillips	H. C. Frick Coke Co.	Pittsburgh, Pa.	Phillips Mine, P. R. R.
95	Rainey	W. J. Rainey	New York, N. Y.	Dawson, B. & O.
446	Redstone	H. C. Frick Coke Co.	Pittsburgh, Pa.	Brownfield, P. R. R.-B. & O.
550	Revere	W. J. Rainey	New York, N. Y.	Revere Works, P. R. R.
26	Sapper	Sapper Coke Co.	Uniontown, Pa	Leckrone, B. & O.-M. R. R.
110	Semet-Solvay	Semet-Solvay Co.	Dunbar, Pa.	Dunbar, P. R. R.-B. & O.
42	Shannon	Shannon Coal & Coke Co.	Uniontown, Pa.	Jnntown, B. & O.
36	Shirey	South Fayette Coke Co.	Uniontown, Pa.	Baggaley, P. R. R.
448	Sloaf	H. C. Frick Coke Co.	Pittsburgh, Pa	Sloaf, B. & O.
625	Southwest No. 1	H. C. Frick Coke Co.	Pittsburgh, Pa	Morewood, P. R. R.
220	Southwest No. 2	H. C. Frick Coke Co.	Pittsburgh, Pa	Alice Mines, P. R. R.
205	Southwest No. 3	H. C. Frick Coke Co.	Pittsburgh, Pa	Tarr, P. R. R.
61	Spring Grove	Cochran Bros.	Dawson, Pa.	Dawson, B. & O.
903	Standard	H. C. Frick Coke Co.	Pittsburgh, Pa	Mt. Pleasant, P. R. R.-B. & O.
155	Stewart	Stewart Iron Co., Lim.	Uniontown, Pa	Uniontown, P. R. R.-B. & O.
135	Summit	H. C. Frick Coke Co.	Pittsburgh, Pa.	Summit, B. & O.; Summit Ter. P. & L. E.
40	Thomas	Whyel Coke Co.	Uniontown, Pa.	Smiley, B. & O.
464	Trotter	H. C. Frick Coke Co.	Pittsburgh, Pa.	Trotter, P. R. R.-B. & O.
50	Union	W. J. Rainey	New York, N. Y.	Alverton, P. R. R.
350	United	H. C. Frick Coke Co.	Pittsburgh, Pa.	United, P. R. R.
245	Valley	H. C. Frick Coke Co.	Pittsburgh, Pa	Valley Wks. P. R. R. Valley Mines, B. & O.
80	Veteran	Mt. Pleasant Coke Co.	Greensburg, Pa.	Udell, P. R. R.
150	White	H. C. Frick Coke Co.	Pittsburgh, Pa.	Sherrick, R. & O.
352	Whitney	Hostetter-Connellsville Coke Co.	Pittsburgh, Pa.	Whitney, P. R. R.
300	Wynn	H. C. Frick Coke Co.	Pittsburgh, Pa.	Wynn Works, P. R. R.
500	Yorkrun	H. C. Frick Coke Co.	Pittsburgh, Pa	Yorkrun, M. R. R.-B. & O.
241	Youngstown	H. C. Frick Coke Co.	Pittsburgh, Pa	Stambaugh, B. & O.-P. R. R.
22,319				

LOWER CONNELLSVILLE REGION

40	Adah	Adah Coke Company	Uniontown, Pa.	Cheat Haven, B. & O.
400	Alicia	W. Harry Brown	Alicia, Pa.	South Brownsville, M. R. R.
200	Allison No. 1	W. J. Rainey	New York, N. Y.	Allison, M. R. R.
40	Anica	Wilkey & Feather Coke Co.	Uniontown, Pa.	Whitsett Junction, P. & L. E.
128	Atcheson	Republic Iron & Steel Co.	Youngstown, O.	Gans, B. & O.
20	Baxter Ridge	Baxter Ridge Coal & Coke Co.	Uniontown, Pa.	Outerop, B. & O.
100	Bridgeport	H. C. Frick Coke Co.	Pittsburgh, Pa.	South Brownsville, M. R. R.
470	Brier Hill	Brier Hill Coke Co.	Brier Hill, Pa	Brier Hill, M. R. R.
20	Browning	Browning Coke Co	Uniontown, Pa.	Vance Mill Jct., P. R. R.
50	Brownsville	Brownsville Coke Co.	Uniontown, Pa.	Brownsville, P. R. R.-P. & L. E.-M. R. R.

LOWER CONNELLSVILLE REGION (Continued)

No. Ovens	Name of Works	Names of Operators	Postoffice	Nearest Railroad Station
426	Buffington	H. C. Frick Coke Co.	Pittsburgh, Pa.	New Salem, M. R. R.
34	Burebinal	Smithfield Coal & Coke Co.	Smithfield, Pa.	Smithfield, B. & O.
205	Century	Century Coke Co.	Brownsville, Pa.	Brownsville, M. R. R.
40	Champion	Champion Connellsville Coke Co	Brownsville, Pa	Brownsville, P. R. R.-M. R. R.-P. & L. E.
24	Coffman	South Fayette Coke Co.	Uniontown, Pa.	New Salem, M. R. R.
500	Colonial No. 1	H. C. Frick Coke Co.	Pittsburgh, Pa.	Smock, P. V. & C.
156	Colonial No. 3	H. C. Frick Coke Co.	Pittsburgh, Pa.	Grindstone, P. V. & C.
300	Colonial No. 4	H. C. Frick Coke Co.	Pittsburgh, Pa.	Grindstone, P. V. & C.
142	Cyrilla	Sunshine Coal & Coke Co.	Uniontown, Pa	Linn, P. V. & C.
120	Crystal	United Connellsville Coke Co.	Pittsburgh, Pa	Gans, B. & O.
250	Dearth	H. C. Frick Coke Co.	Pittsburgh, Pa.	Low Phos, M. R. R.
402	Donald Nos. 1 and 2	Consolidated C'ville Coke Co.	Uniontown, Pa.	Grays Landing, M. R. R.
160	Donald No. 3	Consolidated C'ville Coke Co.	Uniontown, Pa.	Grays Landing, M. R. R.
50	Dunn	The Bixler Coal & Coke Co.	Pittsburgh, Pa.	Edna, B. & O.
500	Edenborn	H. C. Frick Coke Co.	Pittsburgh, Pa.	Edenborn, M. R. R.
149	Edna	Waltersburg Coke Co.	Uniontown, Pa	Waltersburg, P. R. R.
32	Emery	South Fayette Coke Co.	Uniontown, Pa.	Leekrone, B. & O.-M. R. R.
132	Eleanor	Sunshine Coal & Coke Co.	Uniontown, Pa.	Low Phos, M. R. R.
200	Fairbank	Struthers Coal & Coke Co.	Cleveland, O.	Fairbanks, M. R. R.
32	Finley	Jas. Byrne & Co.	Uniontown, Pa.	New Salem, M. R. R.
400	Footedale	H. C. Frick Coke Co.	Pittsburgh, Pa.	Footedale, M. R. R.
220	Francis No. 1	Sunshine Coal & Coke Co.	Uniontown, Pa.	Martin, M. R. R.
50	Francis No. 2	Sunshine Coal & Coke Co.	Uniontown, Pa.	Newcomer, P. R. R.
80	Fretts	South Fayette Coke Co.	Uniontown, Pa.	Messmore, P. R. R.
119	Garwood	Etna-C'ville Coke Co.	Connellsville, Pa.	Simpson, M. R. R.
58	Genuine	Genuine Connellsville Coke Co	Waltersburg, Pa	Waltersburg, P. R. R.
400	Griffin Nos. 1 and 2	Bessemer Coke Co.	Pittsburgh, Pa.	Masontown, M. R. R.
52	Hill Top	Sunshine Coal & Coke Co.	Uniontown, Pa.	Newcomer, P. R. R.
210	Herbert	Connellsville Central Coke Co.	Pittsburgh, Pa.	Low Phos, M. R. R.
38	Hope	Hope Coke Co.	Uniontown, Pa.	Shoaf, B. & O.
74	Hoover	James H. Hoover	M'Clellandt'wn, Pa.	Ache Junction, M. R. R.-P. R. R.
100	Hustead	Hustead-Semans Coal & C. Co.	Uniontown, Pa.	East Millsboro, M. R. R.
260	Isabella No. 1	Isabella-Connellsville Coke Co.	Pittsburgh, Pa.	Isabella Sta., M. R. R.
140	Katherine	Union-Connellsville Coke Co.	Uniontown, Pa	Simpson, M. R. R.
200	LaBelle	LaBelle Coke Co.	LaBelle, Pa.	LaBelle, M. R. R.
220	Lafayette	Atlas Coke Co.	Helen, Pa.	Helen, P. R. R.
462	Lambert	H. C. Frick Coke Co.	Pittsburgh, Pa.	Lambert, M. R. R.
516	Leckrone	H. C. Frick Coke Co.	Pittsburgh, Pa.	Leckrone, B. & O.-M. R. R.
30	Leon	Franklin Coke Co.	Uniontown, Pa.	Tippecanoe, P. R. R.
400	Lincoln	Lincoln Coal & Coke Co.	Scottdale, Pa.	Waltersburg, P. R. R.
250	Low Phos	Connellsville Central Coke Co.	Pittsburgh, Pa.	Low Phos, M. R. R.
45	Madison	United Connellsville Coke Co.	Pittsburgh, Pa.	Madison, P. R. R.
64	Marion	Southern Connellsville Coke Co.	Uniontown, Pa	Cheat Haven, B. & O.
244	Martin	Republic Iron & Steel Co.	Youngstown, O	Martin, M. R. R.
202	McKeefrey	McKeefrey Coal Co.	Leetonia, Ohio	Martin, M. R. R.
257	Millsboro	Bessemer Coke Co.	Pittsburgh, Pa.	Besco, P. R. R.
150	Mt. Hope	Mt. Hope Coke Co.	Uniontown, Pa.	Linn, P. V. & C.
60	Murphy	Echard Coal & Coke Co.	Connellsville, Pa	Star Junction, P. & L. E.
30	Newcomer	Newcomer Coke Co.	Uniontown, Pa.	Newcomer, P. R. R.
100	Old Home	W. J. Parshall	Uniontown, Pa.	Parshall, M. R. R.
480	Orient	Orient Coke Co.	Uniontown, Pa.	Orient, M. R. R.
34	Parhsall No. 1	Puritan Coke Co.	Uniontown, Pa.	Parhsall, M. R. R.
168	Parshall No. 2	Puritan Coke Co.	Uniontown, Pa.	Parshall, M. R. R.
30	Perry	Perry Coke Co.	Pittsburgh, Pa.	Perryopolis, P. & L. E.
72	Plumer	Plumer Coke Co.	Uniontown, Pa.	Leekrone, M. R. R.-B. & O.
400	Republic	Republic Iron & Steel Co.	Youngstown, O.	Republic, M. R. R.
120	Rich Hill	Rich Hill Coke Co.	Outerop, Pa.	Outerop, B. & O.
350	Ronco	H. C. Frick Coke Co.	Pittsburgh, Pa.	Ronco, M. R. R.
86	Rose	Sunshine Coal & Coke Co.	Uniontown, Pa.	Bourne, B. & O.
373	Royal	W. J. Rainey	New York, N. Y.	Royal Works, P. R. R.
30	Sackett	H. R. Sacket Coal & Coke Co.	Smithfield, Pa.	Outerop, B. & O.
378	Searight	Taylor Coal & Coke Co.	Uniontown, Pa.	Low Phos, M. R. R.
260	Shamrock	Fayette Coke Co.	New Salem, Pa.	New Salem, M. R. R.
100	Solon	Prospect Coal & Coke Co.	Uniontown, Pa.	New Salem, M. R. R.
310	Sterling	Consolidated C'ville Coke Co.	Uniontown, Pa.	Masontown, M. R. R.
400	Thompson No. 1	Thompson-C'ville Coke Co.	Pittsburgh, Pa.	Republic, M. R. R.
400	Thompson No. 2	Thompson-C'ville Coke Co.	Pittsburgh, Pa.	Republic, M. R. R.
305	Tower Hill No. 1	Tower Hill-C'ville Coke Co.	Uniontown, Pa.	Republic, M. R. R.
394	Tower Hill No. 2	Tower Hill-C'ville Coke Co.	Uniontown, Pa.	Republic, M. R. R.
500	Washington No. 1	Washington Coal & Coke Co.	Dawson, Pa.	Star Junction, B. & O.-P. & L. E.
500	Wasbington No. 2	Washington Coal & Coke Co.	Dawson, Pa.	Star Junction, B. & O.-P. & L. E.
76	Wineland	Banning Connellsville Coke Co.	Uniontown, Pa.	Fanning, B. & O.
70	Yukon	Whyel Coke Co.	Uniontown, Pa.	Yukon, P. R. R.
16,599				

UPPER CONNELLSVILLE REGION

120	Atlantic No. 2	Atlantic Crushed Coke Co.	Greensburg, Pa.	Bradenville, P. R. R
60	Atlantic No. 3	Atlantic Crushed Coke Co.	Greensburg, Pa.	Bradenville, P. R. R.
50	Chester No. 2	E. A. Humphries Coal & Coke Co.	Scottdale, Pa.	Bradenville, P. R. R
208	Connellsville	Latrobe-Connellsville Coke Co.	Latrobe, Pa.	Bradenville, P. R. R
293	Derry No. 1	Latrobe-Connellsville Coke Co.	Latrobe, Pa.	Bradenville, P. R. R
50	Derry No. 2	Latrobe-Connellsville Coke Co.	Latrobe, Pa.	Bradenville, P. R. R
244	Duquesne	Bessemer Coke Co.	Pittsburgh, Pa.	Bradenville, P. R. R.
80	Fort Palmer	Westm'd-C'ville Coal & Coke Co.	Pittsburgh, Pa.	Fort Palmer, L. V. R. R.-P. R. R
202	Graceton	Graceton Coke Co.	Graceton, Pa.	Graceton, P. R. R.
136	Latrobe No. 1	Latrobe Coal Co.	Altoona, Pa.	Latrobe, P. R. R.
50	Ligonier No. 2	Ligonier Coal Co.	Latrobe, Pa.	Derry, P. R. R.
53	Lockport	Bolivar Coal & Coke Co.	Pittsburgh, Pa	Lockport, P. R. R.
136	Loyalhanna	Loyalhanna Coal & Coke Co.	Philadelphia, Pa	Loyalhanna, P. R. R
40	Marietta	Marietta-Connellsville Coke Co	Connellsville, Pa.	Wilpen, L. V. R. R.-P. R. R.
160	Monastery	H. C. Frick Coke Co.	Pittsburgh, Pa.	Latrobe, P. R. R.
200	Old Colony	Greensb'g-C'ville Coal & Coke Co.	Pittsburgh, Pa.	Ligonier, L. V. R. R.-P. R. R.
80	Saxman	Latrobe-Connellsville Coke Co.	Latrobe, Pa.	Latrobe, P. R. R.
77	Superior No. 1	Latrobe-Connellsville Coke Co.	Latrobe, Pa.	Latrobe, P. R. R.
167	Wilpen	The Shenango Furnace Co.	Pittsburgh, Pa.	Wilpen, L. V. R. R.-P. R. R.
300	Wharton	Wharton Coal & Coke Co.	Coral, Pa.	Coral Station, P. R. R.
2700				

GREENSBURG-CONNELLSVILLE REGION

57	Carbon	Keystone Coal & Coke Co.	Greensburg, Pa.	County Home Jct., P. R. R.
193	Donohoe	Donohoe Coke Co.	Greensburg, Pa.	Greenwald Station, P. R. R.
100	Huron	Keystone Coal & Coke Co.	Greensburg, Pa.	Dundale, P. R. R.
400	Jamison No. 1	Jamison Coal & Coke Co.	Greensburg, Pa.	Luxor, P. R. R.
516	Jamison No. 2	Jamison Coal & Coke Co.	Greensburg, Pa.	Hannastown, P. R. R.
491	Jamison No. 4	Jamison Coal & Coke Co.	Greensburg, Pa.	Crabtree, P. R. R.
40	Marthabel	Northern Connellsville Coke Co.	Connellsville, Pa.	County Home, P. R. R.
283	Salem	Keystone Coal & Coke Co.	Greensburg, Pa.	Allsworth, P. R. R.
2080				

DISCUSSION BY READERS

Carbon Monoxide a Supporter of Combustion

In the present June issue of a contemporary, in answer to the question as to the correctness of two contradictory statements in reference to carbon monoxide supporting combustion, the editor states:

The statement quoted from the I. C. S. Instruction Paper that carbon monoxide does not support combustion is correct.

The contradictory statement was made in the first 1000 copies of "Examination Questions and Answers," but was corrected in all subsequent issues. A similar incorrect statement was made in some editions of "The Coal and Metal Miners' Pocketbook." Previous editions of the pocketbook stated that carbon monoxide is not a supporter of combustion. The statements that it is a supporter of combustion were made by a writer formerly in the employ of the publishers of "The Colliery Engineer," who, while an able mining writer, and as a rule accurate, in this instance expressed an opinion of his own, which is in direct opposition to the actual experience of chemical authorities whose works are regarded as standards all over the world.—EDITOR.

It is clear the above statement refers to me as being the author of the offending statement, viz., "carbon monoxide will support combustion," and the reference justifies a reply.

The quotations referred to are as follows:

It (carbon monoxide) is combustible, burning with a pale blue flame; but, by itself, does not support combustion.

I. C. S. Reference Library, Vol. 145, § 6, p. 2.

It (carbon monoxide) is also a supporter of combustion, being the only mine gas that burns and also supports combustion.

Coal and Metal Miners' Pocket Book, Tenth edition (1911), p. 350.

It (carbon monoxide) is combustible, burning with a pale-blue flame. This gas also supports combustion . . . .

Examination Questions and Answers, First edition (1907), Ques. 312, p. 53.

The statement is not one of "opinion," but on the contrary one of *fact;* although it were better that, for mining students, it should be further explained. While carbon monoxide has no available oxygen and therefore cannot support the combustion of carbon, the gas (CO) will support an oxygen flame, which will burn in an atmosphere of pure carbon monoxide, although it would not burn in air. The statement, although correct, was modified later, at my own suggestion, in the I. C. S. coal-mining textbooks.

As I have often explained, the reason mine lamps burn even more brightly when in the presence of carbon monoxide (CO) is because the gas adds to the combustion going on in the flame of the lamp by adding a gaseous fuel to the hydrocarbons of the flame. The air, and not the gas, in that case, supports the combustion.

Any gas or substance that, through its own agency by virtue of its composition, renders the combustion of other matter possible is a "supporter" of that combustion. By combustion we understand any destructive chemical reaction between the constituent elements of two substances, and resulting in the formation of new products or compounds.

J. T. BEARD.

New York City.

A Valuable Suggestion to Buyers of Mining Machinery

I was much interested in the Foreword of Feb. 15. I believe that the writer of that article had, unquestionably, the right idea. From the manufacturer's standpoint, all the plans and estimates made and engineering work done for various prospective customers, as well as for those who make inquiries from curiosity, must be charged to some account. In some factories, this becomes a serious consideration in the matter of costs, which must be added proportionately to the price of machinery. Considering now that six or seven manufacturers have all prepared plans and specifications for one inquiry, and, out of all these, only one can receive the contract, the balance must figure to recover on future sales what they have spent on these estimates.

Another matter of great difficulty is, as suggested in the article, that no competent engineer is employed by the purchaser of machinery, in a vast number of cases, the purchaser considering that by requesting bids and specifications for machinery he gets his engineering done for nothing. The variation in specifications on machinery by different manufacturers for the same installation is often startling. Equipment that will not stand long enough to warrant its being considered even a fair investment, is very frequently sold at a much higher price than high-class machinery that someone else has offered at a comparatively low figure.

Most purchasers will say that they want a plant to give lasting, uniform service, and, when the specifications arrive, they are incapable of judging what machinery will give them such service. They usually form their judgment largely by the little item at the end of the proposal, which states the price, and they purchase on this basis frequently to their own detriment.

Our universities are every year turning out young engineers in large numbers. The majority of these young men have a natural leaning and aptitude for this line of work, but, as the Foreword suggests, they become timekeepers, clerks or hold other similar positions in which their knowledge of engineering is not properly broadened, nor is their opinion, from an engineering standpoint, often requested by their employers. Many of these young men would have been as well off if they had taken a business course for $60, instead of having spent several thousand dollars and four years of their time training for engineering and never having an opportunity to use the knowledge acquired. These young men should be given positions in which they can prepare drawings and specifications, after having investigated the conditions and ascertaining the requirements. In this manner, it would be possible to receive from manufacturers a uniform line of bids, and then prices would become a true comparison as to the quality of the machinery offered.

I believe it is the custom in Europe that when a buyer asks a manufacturer to prepare plans and specifications,

he agrees to pay for these on a basis of 2½ per cent. of the total estimate, irrespective of whether the bid is accepted or rejected. This places the various bids received on a more equal basis of comparison. In this country, the purchaser does not pay the 2½ per cent. for the plans and specifications submitted; but, in reality, he unconsciously pays six or seven times that amount.

I believe that if some system of this kind were adopted in this country, both the manufacturer and the buyer of machinery would be saved many thousands of dollars a year; and it would certainly eliminate the person who sends in inquiries merely as a matter of curiosity or for the purpose of ascertaining if he has been duped in some recent purchase of machinery. I would like to see this matter further discussed by those who are interested, and I believe much good would result from such a discussion.

O. H. Bohm.
American Contractor Co.

Joplin, Mo.

Systematic Timbering

Systematic timbering may be practicable where the conditions with respect to the roof and floor are regular; but, in many coal seams, the roof is fractured and there are fault lines and cross-slips in the roof that make it seem more advisable to set a post where it is needed, regardless of the regular distance apart. In this locality, the heavy pitching seams have been fractured by the very forces that disturbed the strata. The system of timbering employed here is irregular, being adapted to the varying conditions of the roof. In some cases, posts are set to prevent the bottom from sliding as much as to secure the roof.

The care of mine timber is a question of growing importance. Statistics show that three times as much timber is being consumed as is being produced by the forest growth. According to the U. S. Forest Service Bulletin No. 78, 1909, there are approximately 500,000,000 cu.ft. of mine timber in use in the United States, about 40 per cent., or 200,000,000 cu.ft. of which, it is claimed, can be advantageously treated, which would reduce this portion of the timber in use, to one-thirteenth of the quantity required, or say, 15,000,000 cu.ft. These figures are based on the estimated life of an untreated mine prop as being approximately three years; while, with proper treatment, it is claimed the life of mine timber may be increased to 13 years. The cost of mine timber per ton of coal mined makes the question of the preservation of timber an important factor. This cost, in 1905, in the anthracite region of Pennsylvania, was 8c. per ton of coal mined.

Coalmont, B. C., Canada. J. W. Powell.

Study Course in Coal Mining

By J. T. Beard

The Coal Age Pocket Book

Height Due to Any Given Velocity—Reversing the conditions of falling bodies and assuming a body is projected vertically upward with a given initial velocity (v), it will rise to the same height (h) from which it must fall to gain the given velocity. The same formulas are used in each case.

This is well illustrated by a simple experiment. The small tank of water shown in Fig. 1 is placed under a bell jar from which the air is then exhausted. The water was previously boiled to drive out the air, which otherwise would escape into the vacuum formed in the jar and destroy the accuracy of the experiment. As shown in the figure, there is provided at the bottom of the tank a spout turned vertically upward. When every provision is made to reduce the friction, the column of water that spouts from the tank will rise to practically the level of the water in the tank. As shown by the dotted lines, the height to which the water spouts decreases as the level of the water falls in the tank.

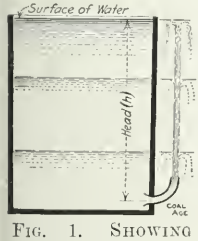


Fig. 1. Showing Height of Rise Equal to Fall

Velocity of Efflux—By means of the above experiment or a similar one, it is found that water or any fluid flows out through an opening in a tank (Fig. 2) with the same theoretical velocity that a body would attain falling through a height equal to the distance of the point of discharge below the free surface of the water in the vessel or tank. This is called the "velocity of efflux" or the "velocity of discharge."

Head-Producing Velocity—The vertical distance of the point of discharge below the free surface of the liquid is the "head" producing the velocity of the discharge. Hence, the theoretical velocity of discharge for any given head is the same as the velocity due to an equal height, in the case of a body falling in a vacuum. This is one of the most important principles in the study of hydraulics.

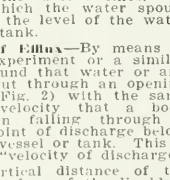


Fig. 2. Head (h) Produces Velocity (v)

Pressure Head—The pressure at the point of discharge is caused by the weight of water above that point. It is this pressure that produces the velocity of discharge. The head corresponding to a given pressure is called the "pressure head."

1.0 ft. water column = 0.434 lb. per sq.in. pressure;
2.3 ft. water column = 1.000 lb. per sq.in. pressure.

The Coal Age Pocket Book

Flow of Air and Water Compared—Air and water are both fluids and as such the flow (theoretical velocity) in each case, is calculated from the head, by the law of falling bodies. The same head will produce the same velocity in air as in water, but the pressures are very different.

Water, at maximum density is about 815 times as heavy as the same volume of air, at normal temperature and pressure (60° F., 30-in. bar.). A given head of water column, therefore, weighs about 815 times as heavy as the same head of air column, and produces a pressure as many times as great.

Disregarding friction, the pressure required to produce any given velocity in a flow of water is practically 815 times as great as that necessary to produce an equal velocity in air. For example, a head of 400 ft. gives a velocity of $v = 8\sqrt{400} = 160$ ft. per sec., which is the same for air as for water. The corresponding pressures, in each case, are

Water pressure, $400 \times 0.434 = 173.6$ *lb. per sq.in.*

Air pressure, $\frac{400 \times 0.434}{815} = 0.213$ *lb. per sq.in.*

It is important to note that the head must always be estimated as of the same density as that of the flowing medium.

EXAMPLES TO ILLUSTRATE

1. To what height will a stone rise if thrown vertically upward with an initial velocity of 90 ft. a second, disregarding the resistance of the air; and what time will elapse before it again reaches the ground?

Solution—The height to which the stone will rise is the height due to its initial velocity, which is

$$h = \frac{v^2}{2g} = \frac{90 \times 90}{2 \times 32.16} = \frac{8100}{64.32} = \text{say } 126 \text{ ft.}$$

The total time of flight is double the time required to fall from this height, the time of rise and the time of fall being equal; therefore,

$$t = 2\sqrt{\frac{2h}{g}} = 2\sqrt{\frac{2 \times 126}{32.16}} = 5.6 \text{ sec., nearly}$$

Or, the time can be calculated from the initial velocity; thus

$$t = 2\left(\frac{v}{g}\right) = \frac{2 \times 90}{32.16} = 5.6 \text{ sec., nearly}$$

2. With what theoretical velocity will water be discharged from a hole in the side of a tank, at a depth of 10 ft. below the surface?

Solution—The velocity of discharge disregarding friction, is the same as the theoretical velocity due to that height; and is

$$v = \sqrt{2gh} = \sqrt{2 \times 32.16 \times 10} = 25.3 \text{ ft per sec.}$$

INQUIRIES OF GENERAL INTEREST

Foundation for New Headframe

A shaft 225 ft. deep is lined for the first 75 ft. from the surface with timber. The present headframe or derrick rests on sills above this timber lining. It is desired to erect a new steel headframe. The timber lining is not durable or substantial enough to support the new construction: neither would it support the surrounding ground, should the new headframe be built on foundations on either side of the shaft. It has been suggested that the new headframe must rest on concrete foundations set a considerable distance back from the shaft to afford a firm bearing. The size of the shaft is 8x18 ft., in the clear. The ground is soft and inclined to slip.

SUPERINTENDENT.

Steubenville, Ohio.

In reply to this inquiry, we cannot do better than to refer our correspondent to two articles, recently published in COAL AGE, one entitled "Steel in Mine-Construction Work," May 17, p. 757; the other "Modern Steel-Tipple Design," May 24, p. 786. Both of these articles explain in detail the great advance made in tipple construction since the introduction of steel for this purpose.

In the most recent designs in steel-tipple construction, the vertical columns have been replaced by inclined or spreading legs, forming a very substantial frame and making it possible to set the foundations at a considerable distance back from the shaft, so that the vibrations incident to the handling of the coal on the tipple are not transmitted to the shaft lining. This form of construction is known as the "A-frame" and very much reduces the vibration in the structure, which formerly interfered with the weighing of the coal on the tipple. This special form of construction is the result of a careful study and investigation of the requirements in coal-tipple design, by the manufacturers. Since its introduction, in the Middle West, this type of tipple has attracted considerable attention and, it is stated, continues to give satisfaction.

⁂

Tension of Water Vapor

Referring to the answer to the first question, under the heading "Air and Mine Gases," COAL AGE, Feb. 15, p. 275, I want to ask what is meant by the "tension of water vapor." Also, in the answer to this question, what does the number 0.3765, represent; and, in answer to the third question on the same page, what do the numbers, 0.6235 and 0.37 represent?

H. E. URSHINE.

Monongahela, Penn.

By the tension of water vapor is meant its elasticity; or, in other words, the effort exerted by the water vapor to expand. This expansive effort of a vapor or gas is always equal to the pressure that it supports. Some authorities use the word "pressure," instead of tension; but, correctly speaking, the tension of a gas or vapor is the effort it exerts to resist the pressure it supports.

In the calculation of the weight of 1 cu.ft. of saturated air, it is necessary to calculate, first, the weight of 1 cu.ft. of dry air, under a pressure diminished by the tension of the vapor, and add to this the weight of moisture in 1 cu.ft. of the air when saturated. In making this calculation for saturated air, the weight of the air, disregarding the moisture it contains, depends on the atmospheric pressure (p) minus the tension (t) of the water vapor; while the weight of the water vapor depends on the tension (t) of the vapor, multiplied by its specific gravity (0.6235). The combined weight (w) of the air and the water vapor it contains, therefore, is proportional to the expression $(p - t) + (0.6235\ t)$, which can be written $p - (1 - 0.6235)t$, or $p - 0.3765\ t$.

As just explained, the number 0.6235 is the specific gravity of water vapor, referred to air of the same temperature and pressure, as unity.

The number, 0.37, is the reciprocal of the weight of 1 cu.ft. of dry air at absolute zero (460° F.) and a pressure of 1 lb. per sq.in. This number corresponds to the number, 1.3273, which is the weight of 1 cu.ft. of dry air at absolute zero and a pressure corresponding to 1 in. of mercury. The weight of 1 cu.in. of mercury (32 deg. F.) is 0.4911 lb., and $0.4911 \div 1.3273 = 0.37$, which shows that these two constants correspond and will give the same result in calculation.

⁂

Calculation of the Specific Gravity of Gases

Kindly explain the method of calculating the specific gravity of gas, and why this does not correspond exactly with the actual specific gravity.

ROBERT SMITH.

Federal, Penn.

The specific gravity of any gas, referred to air of the same temperature and pressure, as unity, is calculated by first finding the molecular weight of the gas, which is the sum of the atomic weights of its elements. Thus, for marsh gas (CH_4), $C = 12$; $H_4 = 4 \times 1 = 4$; and the molecular weight of this gas is $12 + 4 = 16$. Then, since the molecule of a gas is assumed to have twice the volume of an atom of hydrogen, at the same temperature and pressure, the density of the gas referred to hydrogen is one-half its molecular weight; or, in this case, the density of marsh gas is 8.

Air is 14.4 times as heavy as hydrogen, at the same temperature and pressure, and the specific gravity of a gas referred to air as unity, may, therefore, be calculated from its density referred to hydrogen, by dividing the density by 14.4. Thus, for marsh gas, $8 \div 14.4 = 0.556$, nearly.

The actual specific gravity of a gas, as determined by experiment, varies more or less from the calculated specific gravity, owing to inaccuracies of determination and impurities in the gas, but the difference is slight.

EXAMINATION QUESTIONS

Bituminous Firebosses' Examination in Pennsylvania, May 8, 1913

Ques.—If, while making an examination, you discovered explosive gas in the intake current of one of the splits in which 60 persons are at work, explain your method of proceedure to protect the men.

Ans.—Assuming that the intake current contains a dangerous percentage of gas and that it is impossible to restrict the inflow of gas into the current, and, further, that to short-circuit the air current in an endeavor to prevent the gas from reaching the working face would create a dangerous condition where the men were at work, the only means left to prevent disaster would be to increase the circulation of air in the section affected, if this is possible. In the meantime, prompt notice should be sent in for the men to extinguish their lights and withdraw from that section of the mine. By sufficiently increasing the volume of the air current in that section of the mine, the percentage of gas would be reduced below the danger point.

Ques.—What provision does the act of June 9, 1911, make in regard to firebosses who neglect to comply with their duties, or who shall make false reports?

Ans.—The law specifies (Art. 5, Sec. 6) that for such neglect of duty or false report, the fireboss "shall be deemed guilty of a misdemeanor and shall be suspended by the mine foreman, and his name shall be given to the inspector for prosecution. If found guilty, he shall return his certificate of qualification as fireboss to the Department of Mines; provided, however, that he may again be an applicant for a certificate as fireboss, at any regular examination, after the expiration of six months; but if found guilty of a second offense, he shall return his certificate to the Department of Mines and cannot then be an applicant for reëxamination."

Ques.—If a feeder of gas fills a large cavity in the roof of a heading, how would you keep the cavity clear?

Ans.—A special brattice should be erected so as to deflect the air current into the cavity in the roof. Such a brattice is generally arranged by stretching a piece of canvas across the heading a sufficient distance above the floor and inclined at a suitable angle to carry a portion of the air up into the cavity of the roof, so that it will sweep out the gas.

Ques.—If, while making an examination on a fall, your lamp became extinguished, how would you determine what gas or gases were present?

Ans.—It is difficult to answer this question without more exact information. The gas above the fall may be a body of pure marsh gas, the gas being given off in the roof and accumulating in the cavity as fast as it is carried off by the air current. In this case, the action of the flame in the lamp should betray the fact that it is undiluted marsh gas. On the other hand, this body of gas may be a mixture of carbon dioxide and marsh gas, formed under conditions that permitted these gases to mix together without the addition of air. Such a mixture will extinguish the flame of a lamp, in a brief time. The mixture has been styled "flashdamp," because, when the lamp is first introduced into the gas, a cap is formed on the flame but almost immediately disappears, owing to the fresh air in the combustion chamber of the lamp being exhausted. The flame then dims and is extinguished by the gas, which enters and fills the combustion chamber of the lamp. The mixture of carbon dioxide and marsh gas is lighter than air and collects at the roof.

Ques.—How would you proceed to enter and examine a place supposed to contain firedamp?

Ans.—Proceed with caution, moving quietly and making frequent tests for gas at the roof. Care should be taken not to allow a thin layer of gas at the roof to escape notice. The gas should be slightly disturbed by blowing the breath against the roof, so that the gas will come down and reach the lamp. Every precaution should be taken to avoid walking into a body of gas, or passing under a layer of gas at the roof, without this being observed, until it is too late to retreat safely.

Ques.—Where are the gases that are generated in bituminous coal mines generally found?

Ans.—Gas is found, in all mines, in greatest quantity, either where it accumulates or in poorly ventilated places where it is generated. The accumulation of gas depends on the character of the gas and the strength of the air current circulating through the place. The tendency of marsh gas (CH_4) is to accumulate at the face of rise headings, or at the roof, or on the "falls." The tendency of carbon dioxide (CO_2) is to accumulate in swamps, or at the foot of dip workings, or at the floor or other low places and in poorly ventilated abandoned workings.

Ques.—Under what conditions would it be unsafe to fire shots in bituminous coal mines?

Ans.—It is always unsafe to fire a shot in a working place generating gas before carefully testing that and the adjoining places for gas. If the mine is dusty, the working face and the road, ribs and gob should be sprinkled thoroughly before a shot is fired. It is unsafe to fire a shot when the brattice has not been properly arranged or there is any derangement of the circulation by which an unusual condition is produced. It is generally unsafe to fire more than a single shot in a close working place of contracted area, since the heat, gas and dust generated by the first shot may be ignited by the flame of the second shot. It is always dangerous to fire shots facing each other, or to fire a shot depending on another shot that is expected to explode first. An entry shot, in blowing roof or bottom, should never be laid to face a strong air current.

Ques.—What is meant by the "head" in reference to air, water, or other fluids?

Ans.—The term head, as then used, is the vertical distance between the surface of the fluid and any given point below the surface. Whether the fluid is air, water or other liquid, the pressure, at any point below the surface, is equal to the weight of a column of that fluid extending from the given point to the surface.

COAL AND COKE NEWS

Washington D. C.

A revised form of the resolution for the investigation of the coal controversy in the West Virginia fields has been reported in the Senate within the past few days as follows:

Resolved, that the Senate Committee on Education and Labor is hereby authorized and directed to make a thorough and complete investigation of the conditions existing in the Paint Creek coal fields of West Virginia for the purpose of ascertaining:

First. Whether or not any system of peonage has been or is maintained in said coal fields.

Second. Whether or not postal services and facilities have been or are interfered with or obstructed in said coal fields; and if so, by whom.

Third. Whether or not the immigration laws of this country have been or are being violated in said coal fields; and if so, by whom; and whether or not there have been discriminations against said coal fields in the administration of the immigration laws at ports of entry.

Fourth. Investigate and report all facts and circumstances relating to the charge that citizens of the United States have been arrested, tried, and convicted contrary to or in violation of the Constitution or the laws of the United States.

Fifth. Investigate and report to what extent the conditions existing in said coal fields in West Virginia have been caused by agreements and combinations entered into contrary to the laws of the United States for the purpose of controlling the production, sale, and transportation of the coal of these fields.

Sixth. Investigate and report whether or not firearms, ammunition and explosives have been shipped into the said coal fields with the purpose to exclude the products of said coal fields from competitive markets in interstate trade; and if so, by whom, and by whom paid for.

Seventh. If any or all of these conditions exist, the causes leading up to such conditions.

Said committee, or any subcommittee thereof, is hereby empowered to sit and act during the session or recess of Congress, or of either house thereof, at such time and place as it may deem necessary; to require by subpœna or otherwise the attendance of witnesses and the production of papers, books, and documents; to employ stenographers, at a cost not exceeding $1 per printed page, to take and make a record of all evidence taken and received by the committee and keep a record of its proceedings; to have such evidence, record, and other matter required by the committee printed; and to employ such other clerical assistance as may be necessary. The chairman of the committee or any member thereof may administer oaths to witnesses.

Subpœnas for witnesses shall be issued under the signature of the chairman of the committee or subcommittee thereof. Every person who, having been summoned as a witness by authority of said committee or any subcommittee thereof, willfully makes default, or who having appeared refuses to answer any questions pertinent to the investigation herein authorized, shall be held to the penalties provided by section one hundred and two of the Revised Statutes of the United States.

The expenses thereof shall be paid from the contingent fund of the Senate on vouchers ordered by said committee, signed by the chairman thereof, and approved by the committee on contingent expenses.

Divergent Opinions of the Supreme Court of Appeals

In the furtherance of its study of the West Virginia coal situation, the Senate has had printed two recent decisions by the Supreme Court of Appeals of West Virginia in the cases of State ex rel. Mays vs. Brown and others, in which careful attention is given to the action taken by the governor of West Virginia in establishing martial law in that state. According to the majority opinion in these cases:

As a result of these principles, views and conclusions, we have two areas or sections in the state, by virtue of the declaration of a state of war in the district, in which the powers of government and the rights of citizens differ most radically. The tremendous power of the governor in the military district does not extend beyond the limits thereof. Nevertheless, he is the governor of the peaceable territory of the state, and has such powers as are normally vested in him by the constitution and the laws, and any additional authority the legislature may have conferred upon him in pacific territory in the event of such exigencies, not violative of constitutional provisions. In the language of John Adams, the state has a peace power and a war power, both of which are now active.

We construe the returns of the respondents as asserting, for the purposes of this case, the power of detention of the petitioners, not a right to try them by a military commission. Having shown the existence of a state of war in the area covered by the governor's proclamation, and the steps taken to suppress the insurrection and lawlessness in that territory, the returns say the petitioners have been largely instrumental in causing and encouraging the lawlessness, riot and insurrection, and that their detention is, in the judgment of the executive, necessary in order to effectually suppress the same.

This sufficiently charges them with having willfully given aid, support, and information to the insurgents, the enemy, in a time of war, insurrection, and public danger, and Section 6 of Chapter 14 of the code confers upon the governor power to apprehend and imprison all such persons.

Such acts may be done either inside or outside of the military district. Nothing in the terms of the statute limits the exercise of this executive power of apprehension and imprisonment to persons within the military district, and it is obvious that persons outside of such district may do as much or more than persons inside of it to defeat executive action looking to the suppression of the insurrection or rebellion. Hence there is no reason for such a limitation. On the contrary, there is good reason against it, wherefore we must say the legislature intended no such a limitation, and the statute contemplates such arrests and imprisonment of persons committing these acts outside of the military district.

The minority opinion in the same case as now issued by the Senate takes practically the reverse point of view, saying:

A clash between mine owners and miners cannot be considered public war, and the participants dealt with as enemies of the state. True, it is that in war the enemy, whether a foreign one or a rebel to whom the status of belligerent has been given, has no legal rights which those opposed to him must respect. But have either the mine owners and their guards on the one side, or the miners on the other assumed the status of belligerency against the state?

Because of warfare between themselves and violations of the law in relation thereto, has neither side any constitutional rights which the state is bound to respect? Nothing in the record justifies the conclusion that either the mine owners and their guards on the one hand, or the miners on the other, have lost their allegiance of the state by the unfortunate clash between them or by any other act.

Neither faction has made war against the state. Each time the militia has been sent to the district, all has remained quiet. Chief Justice Marshall early defined what it is to make war:

To constitute a levying of war, there must be an assemblage of persons for the purpose of effecting by force a treasonable purpose. (Ex parte Bollman, 4 Cranch, 75.)

Nothing even reminding one of treasonable purpose is involved in these cases. Yet the majority opinion deals with the citizens of the district as rebels. It deals with a part of Kanawha County as enemy's country. In this it cannot be sustained by reason of authority. Cabin Creek district has not seceded! The residents of that district are citizens of the state under its civil protection, though they may have violated the law. Because one violates the law, does he lose his legal rights? The guiltiest man, if he is not an enemy in public warfare directly against the state, is entitled to all rights as a citizen.

PENNSYLVANIA

Anthracite

Philadelphia—G. C. Todd, special assistant to Attorney-General McReynolds, has presented to Judges Gray, Buffington and McPherson, in the Federal District Court, a decree to enforce the mandate of the highest court, cancelling the so called 65 per cent. contracts under which the large coal-carrying railroads purchase the product of small companies. This decree will not prevent coal companies, individually, from entering into the 65 per cent. contract arrangement with railroads, so long as they are not the result of a concerted plan or plot or in restraint of trade.

Wilkes-Barre—About 700 employees at the Westmoreland Colliery of the Lehigh Valley Coal Co. and 1000 employees at the Taylor Colliery of the Lackawanna Coal Co. are on strike because of the failure of some of their number to wear the union working button. It is reported that agents of the I. W. W. have been at work at Westmoreland, influencing the men to drop their allegiance to the United Mine Workers and ally themselves with the Industrial Workers of the World.

The 1500 employees in the coal-stripping operations of Contractor David Benjamin, in the Hazleton section, have been granted a substantial increase in wages under a three-year agreement, secured by the officers of the United Mine Workers of the Seventh District.

Scranton—The climax of this city's fight for surface protection comes with the march of citizens on the State Capitol in Harrisburg, to demand that the Senate pass the Davis Mine Cave bill and the Roney coal tonnage tax measure. Special rates have been obtained, and it is expected that more than 200 men will form the delegation. This demonstration promises to surpass any that has ever been made in this section of the state.

Bituminous

Monongahela—Over 600 men employed at the Gallatin and Manown mines of the River Coal Co. struck, May 26, because the company officials demanded that they work in entries with white powder and safety lamps. It is reported that the men have stated that they would not work with safety lamps and white powder in any entry as long as electricity is used in the mines. They claim that electricity is as dangerous as open lights.

WEST VIRGINIA

Charleston—Governor Hatfield, of West Virginia, is exonerated on a number of charges circulated against him in connection with the West Virginia coal strike, in a report to the national commiteee of the Socialist party made June 3 by Victor L. Berger, Adolph Germer and Eugene V. Debs, who conducted a personal investigation.

Sagamore—The large and costly plant of the Buffalo & Susquehanna Coal Co., at Sagamore, was put out of commission and a loss of about $15,000 was entailed by an accident, May 30, that has all of the earmarks of being the handiwork of vandals.

The coal train that visits the town daily had taken out all but eight loaded coal cars and put 30 "empties" in on the grade above the tipple. About two hours after the train had left there was a heavy crash of girders, and every one of the 38 cars was smashed up badly and piled under and about the tipple. The bottom pans, girders and much other skeleton work of the tipple being torn out.

Investigation showed that the cars had had their brakes properly set when they were put in. It is evident that some one opened the brakes and the cars started by their own weight. There is no clue as to the perpetrators of the deed. A wrecking crew from Galeton was called and has been at work clearing the tracks, but it will be some time before the tipple is put into shape to permit the resumption of work at the big operation.

Wheeling—Five hundred miners went on strike May 24 at the Loraine Coal & Dock Co.'s mine at Crescent, Ohio. In addition to this 400 workmen employed at the Enterprise Enamel Works, at Bellaire, Ohio, are also on strike.

Morgantown—The summer meeting of the West Virginia Coal Mining Institute will be held in Morgantown, June 24, 25 and 26. There is a desire on the part of the officials of the Institute that the coal men of the state get acquainted with the State University. It is believed that when the interests become aware of the excellent equipment of the school, so far as the college of mines is concerned, that they will take more interest in it and will begin the ground work of an important school of the state.

OHIO

Columbus—The Ohio representative of the annual mining congress to be held at Karlsbad, Bohemia in July will ask for a six-hour day and a five-day week for all work connected with coal-mining industries. He will also ask for a uniform inside day wage scale, and proportionate advances for machine mining and also for a substantial advance on pick-mined coal.

It is said that Ohio coal operators will be drawn into the investigation to be made by the United States Senate Committee on Education by the labor people in West Virginia fields. Allegations have been made by the members of the committee that the operators in Ohio are interested in fomenting trouble in the West Virginia field.

Governor Cox, of Ohio, will soon take up the matter of naming the commission provided for in the Thomas resolution adopted by the Ohio General Assembly. This commission is to investigate the rate of wages being paid for coal mining in Ohio. The resolution was adopted to sidetrack the Green antiscreen bill, which had passed the Ohio Senate and was pending in the House of Representatives. Judge M. N. Donahue, of the Ohio Supreme Court, who was offered a place on the commission, refused to serve.

INDIANA

Indianapolis—The Indiana wide entry law of 1907 is held to be constitutional by the Supreme Court of the United States. It provides that there shall be at least 2 ft. of space between track and wall, either on one or both sides, as a means of escape for miners in case of threatened collision or other accident to the cars. Veins 3 and 4 in the block field are exempt from the law. The penalty for violation is a fine not to exceed $200, to which imprisonment may be added. The Vandalia Coal Co., in a test case, which it carried through the courts of the state, took it in final appeal to the highest court of the land, the judges of which decided unanimously that the law is constitutional. The company alleged it was discriminative and class legislation.

ILLINOIS

Springfield—If the mine inspectors' bill, which is now in the State Legislature, becomes a law, the miners of Illinois will soon vote on each inspector by districts. Notices are to be posted at each mine, giving the date of the proposed convention to which each mine shall send a delegate. The delegate has a vote for every miner represented, so that two or three large mines in a district may by combination agree on a choice and force it on the others.

Jacksonville—A fire which started from spontaneous combustion of coal dust recently destroyed $125,000 worth of property of the Royal Colliery Co., 1½ miles west of Virden. The upper works of the mine, with the exception of a one-story brick engine house, and the tipple and washery containing 100,000 tons of coal were consumed. Machinery in the tipple valued at $17,000 was ruined. The fire started in the upper part of the washer building and had gained considerable headway before employees of the company on their way to start the night shift had discovered the blaze. None of the company's men were in the mine at the time. The upper works were recently improved at a cost of $20,000, and the tipple, when constructed a few years ago, was valued at $15,000. The cost of the washery was placed at $50,000, and this spring new shaker screens were installed at a cost of $10,000. The loss is covered by insurance. Six hundred men will be thrown out of work temporarily.

Herrin—One life was lost and another saved only by the use of an oxygen machine as the result of a fire which broke out May 22 in the mine of the Illinois Hocking Valley Washed Coal Co. The fire is still raging and the state rescue car has been called from Benton to aid in fighting the flames. The fire is believed to have started in the mule stable, where 17 animals were burned to death.

COLORADO

Denver—The new coal mine inspection bill of Colorado has now become a law. Each coal operator is compelled to pay the coal mine inspection department ½c. for every ton mined. It is expected that this will bring in a revenue of approximately $24,000 a year. The expenses of the department will be in the neighborhood of $15,000 to $18,000, and the balance will go into the general fund of the state.

IDAHO

Kellogg—The miners employed on Big Creek, at the Sidney Shonts lease went on strike May 19, demanding $4 per day. They claim this is a scale that should be paid at all properties located on isolated spots such as the one at which they are working.

MONTANA

Lewistown—Judge R. E. Ayers has named the following men to constitute the Board of Coal Mine Inspectors for Fergus County: P. H. Gilkerson, mine operator; A. H. Brew, coal miner; J. B. McDermott, state inspector.

PERSONALS

R. M. Waugh, of Calvert, Tex., has been appointed general superintendent of the Southwestern Fuel Co.'s mines, located three miles north of that city. Mr. Waugh succeeds T. M. Reaverly.

J. W. Bishoff, chief engineer of the Davis Colliery Co., has been appointed acting general superintendent, in the place of J. F. Healy, general manager of mines, who has resigned. This appointment was to take effect June 2.

Martin Garvey, superintendent of the operations of the Davis Coal & Coke Co., at Thomas, Tucker County, W. Va., has resigned his position, to take affect June 1. It is expected that he will travel for eight months. After that time has elapsed, he will have charge of the coal properties in the state of Kentucky.

OBITUARY

James E. Reese, foreman of Mine No. 6, at Albia, Iowa, was instantly killed while on duty May 28. Mr. Reese was using the telephone at the foot of a hill, when the tailrope on the ingoing trip broke, letting the cars run wild. Mr. Reese was struck and sustained a broken neck. He is survived by a wife and child.

T. S. Elwell, general manager of the Pittsburgh Coal Co., of Wisconsin, died May 21 at St. Mary's Hospital, in Duluth, following an operation for acute appendicitis. Mr. Elwell is a graduate of the University of Wisconsin Law School, and, for a number of years practiced that profession. The body has been taken to Minneapolis. Mr. Elwell is survived by a widow, a daughter and a sister.

PUBLICATIONS RECEIVED

Department of the Interior. Bureau of Mines: Rules and Regulations to Govern the Coal Mines at Gebo, Wyo. Leased to the Owl Creek Coal Co. Thirteen pages 5¾x9 in.

Construction of Railroads in Alaska. Hearings before the Committee on Territories, United States Senate, Sixty-third Congress, First Session Part 7, dated May 12, 1913, pages 267-288, 5¾x9 in.

TRADE CATALOGS

The B. F. Goodrich Co., Akron, Ohio. Pamphlet. "Longlife" conveyor belt. Ill., 5½x8½ in.

The Watt Mining Car Wheel Co., Steel Mine Cars, Catalog "F", Second Edition May 1913. Nineteen pages 5½x7¾ in. illustrated. Also Catalog "B" Steel Ore Cars.

The Star Electric Fuze Works, Wilkes-Barre, Penn. Eight pages, 7½x9 in. describing and illustrating "Red Spitters" for blasting in Coal Mines. Also matter describing the "Liliput" shot firers battery.

The Trimont Manufacturing Co., 55-71 Amory St., Roxbury (Boston), Mass. Catalog No. 77. 12 pp.; 5¼x6¾ in.; illus.

The above is a neat little catalog containing advance prices upon all goods (Trimo wrenches, etc.) put out by the Trimont company. It will be sent upon request.

RECENT COAL AND COKE PATENTS

Coal Drill—J. G. Huntley, Pittston, Penn., 1,055,464, March 11, 1913. Filed Sept. 3, 1912. Serial No. 718,303.

Coal Separator—S. T. Pratt, Nanticoke, Penn. 1,058,259, Apr. 8, 1913. Filed Aug. 21, 1912. Serial No. 716,265.

Improvements in Charging Gas Retorts—Riter-Conley Mfg. Co., 15 Exchange Pl., Jersey City. Filed in London. 6898 of 1912.

Crusher Roller for Coal Breakers—E. L. Clark, Scranton, Penn. 1,058,948, Apr. 15, 1913. Filed Aug. 5, 1912. Serial No. 713,210.

Dump Car Device—C. H. Doty, W. L. Burner and J. M. Wilcox, assignors to Kilbourne & Jacobs Mfg. Co., Columbus, Ohio. 1,057,413, Apr. 1, 1913. Filed Apr. 14, 1910. Serial No. 555,541.

CONSTRUCTION NEWS

Red Lodge, Mont.—It is reported that the Northern Pacific R.R. is securing right of way for lines from Bridger to the Bear Creek coalfield.

Seattle, Wash.—The new coking plant, which is to be established at Seattle, is to cost in the neighborhood of $3,000,000. The plant will employ from 300 to 600 men and will be a large consumer of Alaska coal.

Catasauqua, Penn.—The Lehigh Coal & Navigation Co. contemplates the erection of coal docks near Catasauqua for emergency use during flood periods. At present, anthracite is handled by docks at Mauch Chunk.

Hazard, Ky.—The Hazard Coal Co., has just contracted with the Roberts & Schaefer Co. to design and build a coal mining plant at Hazard, Ky. The new Marcus combination screen and picking conveyor equipment will be used.

Birmingham, Ala.—George B. McCormack and Erskine Ramsey and associates are planning to construct a byproduct coke-oven plant with a daily capacity of 1000 tons. It is estimated that the cost will be in the neighborhood of $1,500,000.

Astoria, Ore.—J. C. Brooks, representing a large coal company in the Middle West, is investigating local conditions relative to establishing a large coal dock at this place. The purpose is to provide coal for steamships coming to the Columbia River.

Birmingham, Ala.—The Sloss-Sheffield Steel & Iron Co. has awarded contracts for the construction of large concrete and steel coal washers at Flat Top and one at Brookside. The company will also build two washers at Russellville and four coal openings in the Brookside district. Altogether, about $750,000 will be spent in the improvements.

Wilkes-Barre, Penn.—The Wilkes-Barre Colliery Co. has just begun operations at its electrically driven plant at Hudson. This is the only complete colliery so driven in the anthracite region. The apparatus was furnished by the Westinghouse Electric & Mfg. Co. Power is purchased from the Lackawanna & Wyoming Valley R.R. Co.

Hazleton, Penn.—The C. M. Dodson Coal Co. is installing at the Beaver Brook Colliery an electric hoist driven by a 300-hp. Westinghouse slip ring motor with magnetic control. The source of current supply is the Harwood Electric Co.'s plant at Harwood, Penn.

The Lehigh Valley Coal Co. is changing the Spring Brook Slope hoist from steam to electric drive. A 250-hp. Westinghouse alternating-current motor with liquid conroller is being used to replace the hoisting engine.

Whitesburg, Ky.—A location for one of the many mining plants to be constructed by the Elkhorn Fuel Co., recently organized at Baltimore, has been selected at Kona, on the main line of the Lexington & Eastern R.R., at the mouth of Boone's Fork. Engineers are now starting on the preliminary surveys. Actual construction work will be started within a few days. Two other industrial cities will be built in the immediate vicinity. This development is expected to eclipse the large operations and developments of the Consolidation Coal Co.

Portland, Ore.—The Portland Council this week granted a franchise to the Northwestern Electric Co. to install a steam heating plant in the city and according to an announcement of General Manager W. E. Coman the pipes will have been laid and the steam turned on in the business district of the city by the end of the present summer. The company will use fuel oil in its furnaces and hence the installation of the plant will probably to some extent affect the local coal consumption, although a good many of the buildings that are counted on as customers are now using this fuel.

Chattanooga, Tenn.—The Cumberland Land Syndicate is planning the erection of a 60-oven byproduct coking plant in Chattanooga, at a cost of $1,500,000. This plant will produce approximately 275,000 tons of coke annually, besides an immense quantity of gas for industrial, domestic and illuminating purposes. As yet no site has been decided upon, but it is rumored that the Cumberland Syndicate expects to use the 22,000 acres of coal land near Tracey City, recently purchased, for this purpose. Construction work will require approximately 15 months, and it is said that it will be at least 60 days before this can be started.

NEW INCORPORATIONS

Birmingham, Ala.—The White Cross Coal Co.; capital stock, $5000. Incorporators: John Kerr, T. H. Kerr, Lee Stone.

Peoria, Ill.—The Logan Coal Co.; capital stock, $2500; to mine coal. Incorporators: J. M. Tyson, R. W. Peters, J. H. Kingsbury.

Chicago, Ill.—The American Fuel Co.; capital stock, $10,000; mining coal. Incorporators: Frank Hajek, Frank Radons and Walter Baldwin.

Chicago, Ill.—The Eastman Coal Co.; capital stock, $20,000; coal, coke, kindling wood, etc. Incorporators: C. W. Mogg Freda Spears, T. H. Miller.

Buffalo, N. Y.—The Stickney-Price Coal Co.; capital stock, $30,000; to deal in coal, wood, etc. Incorporators: S. W. Stickney, R. S. Price, G. A. Hughes.

Scottdale, Penn.—The Round Bottom Coal Co.; capital stock, $200,000; to purchase and operate 2000 areas of coal land in Marshall County, W. Va. J. W. Wiley, president.

Louisville, Ky.—The Big Four Magnolia Coal Co.; capital stock, $20,000; to deal in coal and land. Incorporators: R. F. Harrison, E. J. Harrison and Paul Blackwood.

Lex, W. Va.—The Lex-Pocahontas Coal Co.; capital stock, $2500; sale of coal and merchandise. Incorporators: J. H. Norman, Russell Mott, W. C. Haight, Paul Cortell and E. Landstrom.

Logansport, Ind.—The Citizens Coal & Gas Co. has been incorporated here, with $10,000 capital stock, to deal in coal. The directors are, G. A. Linton, H. G. Williamson and W. L. Morris.

Newton, Penn.—The Saron Coal & Coke Co.; capital stock, $100,000; to engage in the mining of coal and manufacture of coke. Incorporators: D. T. Vinton, W. R. Thompson, T. J. Bryant, E. Watts and A. E. Bush. Chief works to be located at White County, Ky.

Buffalo, N. Y.—The Commercial Coal & Supply Co., capital $2500; directors, William A. Adolf, Henry C. Stone, a former coal dealer, and Peter Englehardt. The coal business of the late James Ash is incorporated under the name of James Ash, Inc., the directors being John G. Cloak and Charles F. Houck, executors of the estate, and Daniel C. Shearer.

INDUSTRIAL NEWS

Wellsburg, W. Va.—T. C. Bane, of Short Creek, has sold half of his farm, 175 acres, to the McKinley Coal Co.

Punxsutawney, Penn.—W. J. McAninch, Joseph Knabb and others, have secured options on a large tract of land fronting the Sandy Lick, where they have secured siding privileges. They are now test drilling and expect to develop a deep seam of coal which has been found constant throughout the numerous drillings for gas.

Connellsville, Penn.—A seam of coal has been discovered at Rockwood recently, and preparations are being made to develop it and erect coke ovens.

Pottsville, Penn.—The actual work of stripping Broad Mountain for coal by the P. & R. has been started by Dick and Co., contractors of Hazleton.

Shady Side, Ohio—The shaft at the new Webb mine, of the Jones Coal Co., has been completed, and work on the inside of the mine is to be started at once.

Minot, N. D.—The site for a briquetting plant has been bought for some time and the machinery has recently been arranged for. This makes the plant practically an assured reality.

Spokane, Wash.—The International Coal & Coke Co., whose mines and offices are located at Coleman, Alberta, will distribute $30,000 in profits, among its stockholders who were registered on May 20.

Albia, Iowa—The Harris Bros. are arranging to open their new mine on the Spencer farm, south of Hilton. They have a large tract of land to work and the enterprise will represent an investment of $300,000.

Connellsville, Penn.—The Pittsburgh Coal Co. has purchased 300 acres of the Caldwell tract in Washington County. The consideration was $82,500. The tract of land in question lies in Mt. Pleasant Township.

Waynesburg, Penn.—W. H. Brown, who recently bought 1344 acres of Greene County coal at Grays Landing, is expecting to develop his property during the fall. His Alida plant of 400 ovens, on the river near Brownsdale, is in active operation.

Detroit, Mich.—The Solvay Process Co., of Detroit has bought the Spring Coal Co.'s property in the Pocahontas smokeless district of West Virginia, as an addition to its list of ten mines. The output is to be increased to 500,000 tons annually.

Wichita, Kan.—It is rumored that S. B. McClaren, a coal and lumber dealer, will establish two coal yards in Wichita this fall. Men are now at work erecting the sheds, the first of which is to be 14x130 ft., and the second, 20x58 ft. The buildings will be finished early in June.

Coffeyville, Kan.—A 6-ft. bed of coal is said to have been found at a depth of 292 ft. on the Sullivan farm, four miles south of Parsons. The coal was so finely ground that it is impossible to determine its quality, but there is talk of organizing a company to make a thorough test.

Columbus, Ohio—The Hocking Valley R.R. Co. has placed an order with the Ralston Steel Car Co., of Columbus, for 1000 gondola steel coal cars, to be delivered some time in the fall. These cars are to take the place of the 3000 30-ton cars sold by the road to a Northwestern railroad company.

Windber, Penn.—It is reported that the first coal has been extracted from the Loyalhanna new mine at Cairnbrook. This coal is being taken out through the tunnels put in for taking in empty mine cars when the mine is in complete operation. Scheesley & Sons, contractors, finished their work and left the job May 30.

Hickman, Ky.—Saad Salaamy, who has been in the coal business in this region for the past two years, has gone into business with J. T. Dillon. The firm will be known as the Independent Coal Co. They will install a large electric crane, with two 100-ft. towers, for conveying coal from barges on the river to their yards.

Pittsburgh, Penn.—The new coke-drawing machinery has been delivered at the Marianna plant of the Pittsburgh-Buffalo Co., on the Elisworth branch of the Monongahela division of the Pennsylvania R.R. One thousand men are employed at present, but additional miners are being employed each day, and 200 more men can be given work.

Coshocton, Ohio—Members of the Ohio Coal Co., whose mines are located in the Tunnel Hill neighborhood on the C., A. & G. lines, held a business meeting in Coshocton recently. Extensive improvements have been made about the mines the last several months. The shipping facilities and output have been increased, houses built and other improvements made.

Moundsville, W. Va.—Attorney I. N. Kuhn, of Waynesburg, and J. W. Iams, of East Waynesburg, have just closed a deal by which Mr. Kuhn secures from Mr. Iams 521 acres of coal land located in Marshall County, W. Va. The coal is in two tracts, one lying near Limestone, and the other near the Panama mines on the B. & O. R.R. In partial payment, Mr. Kuhn has given a business property in Washington.

Eldora, Ill.—Mr. Reece, of Gillespie, Ill., has been in Eldora for considerable time investigating the coal fields in that region. His object was to become acquainted with owners of property where coal prospects exist. Later he will return and endeavor to secure option on the coal-bearing lands for the purpose of drilling. If successful, he will install machinery and at once begin mining operations.

Los Angeles, Calif.—It is rumored that the Standard Oil Co. of California is behind individual land seekers who are buying or leasing extensive properties in the Kern River district. It is pointed out that the company is already in the fuel, oil and asphalt business on an extensive scale, and the heavy variety of petroleum found in the Kern River field is needed by the concern's refinery in that section.

Birmingham, Ala.—Contracts have been closed with the Central Coal Co. to supply electric power for the production of coal at Kimberly No. 3, and Kimberly No. 1, which are located about 19 miles north of Birmingham, on the Louisville & Nashville R.R. The power will be furnished by the Birmingham Railway Light & Power Co., at a cost of $50,000, approximately half of what it will cost the coal company to manufacture it itself.

Battle Creek, Mich.—For nearly six weeks the Grand Trunk R.R. has been unable to get coal from the mines in Indiana, and it has been necessary to use the largest part in the reserve dock in the Nichols yards. In view of the fact that the flooded mines are now dried out, the road intends to replenish this reserve coal supply which it has drawn upon. For this purpose 50 men are at work in the local yards unloading coal, and it is expected that several hundred tons will be required to refill the bins.

Cleveland, Ohio—The Kirk-Dunn Coal Co., with $300,000 capital stock, contemplates developing 2000 acres of Ohio coal land on the Youngstown & Ohio River R.R., according to an announcement made recently. Interested in the new company are F. M. Kirk, Cleveland coal man, and W. H. Dunn, Salem coal man. The land lies in the neighborhood of East Liverpool and Lisbon, Ohio. The company expects to be operating extensively by autumn of this year. Its Cleveland office will be in the Williamson Building.

Philadelphia, Penn.—At a meeting of the directors of the George B. Newton Coal Co., the report of the president for the first six months showed earnings in excess of the amount necessary to pay a dividend on the first and second preferred stock, as well as a sufficient amount to take care of the sinking fund. In view of betterments and improvements to be made this summer, it was felt that the consideration of the dividend on the second preferred stock should be postponed until the end of the company's first year, in November.

Colon, Panama—The discovery of a high-grade anthracite coal has been made within 18 miles of deep-water transportation, in the Colon region. The discovery was made on the Rio Indio, which flows into the Caribbean, not far from the mouth of the canal. An area of 25 miles was surveyed and was found to be underlaid uniformly by a seam of coal from 2 to 4 ft. thick, running 85 per cent. carbon. Surveys, preliminary to the construction of a railroad, 80 miles in length, are to be started at once. This will bring the coal region into direct communication with the canal, where it can be loaded aboard ship.

COAL TRADE REVIEWS

GENERAL REVIEW

The demand for hard coal keeps up in all sections of the country, and the current month is expected to be an active one in the anthracite business. The loading out of New York harbor is notably slow, and stove still continues to be the shortest in supply. Naturally some of the sizes are beginning to drag with the approach of midsummer but as compared with previous years the situation is satisfactory in every respect.

The coastwise bituminous trade is showing an increase in strength as the season advances. Most agencies seem to be liberally supplied with orders, and the small buyers have now definitely abandoned hopes of lower prices. The market is firm all along the line, and in much better condition than ordinarily at this period of the year. The labor supply in the mining regions is short, and a slight curtailment in production on the part of a large number of operators would create an interesting situation to say the least. Loose tonnages are becoming more infrequent, due to a broadening in the market and a restriction in production, and this is, of course, creating a freer buying movement in the spot market.

In the Pittsburgh district indications point to a record-breaking business in the lake trade, while the market still continues strong in all branches; in the spot market most operators are demanding a premium over the season's circular for whatever free coal they have. Most shipments on contracts are being well kept up but there are occasional reports of an insufficient labor supply; were this condition remedied the movement would immediately become so heavy that a car shortage would develop. In adjacent territories practically no one is filling orders promptly, because there is insufficient coal to go around; reports are current that a number of large wholesalers have contracted for some tonnages that they are now unable to deliver.

There is an increasing demand for domestic grades in Ohio, which, together with the good steam trade, and a heavy lake business, has stiffened the market in every respect; every effort is being made to rush as large a tonnage as possible into the Northwest, and prices are being well maintained. Dumping at the Hampton Roads piers during the week has not been as heavy as was expected; producers, however, are holding their surpluses in a number of instances to apply on contracts which shortly become operative. The Southern market is as active as could be expected at this time, with a car shortage in some districts, as a result of which a number of mines are falling behind on their contracts.

Buyers generally in the Middle Western market still appear to be holding off in anticipation of a uniform break in prices, but indications in most districts are that the coming winter will see some new high records in quotations. The heavy shipments in the lake trade are reducing consignments on certain grades, with the result that a scarcity is developing in some few districts. The strong position of the Eastern fuels continues to be the main feature in the market.

BOSTON, MASS.

Bituminous—Very little new business is heard from. All the agencies appear to be comfortably supplied with orders, especially on Pocahontas and New River. The smaller buyers are falling into line from week to week, having practically abandoned any hope of lower prices. The market is very firm and there is an entire absence of "cut" rumors. The first of June finds the situation in decidedly better shape than for many years at this season. Receipts at Hampton Roads are rather smaller than a month or two ago. The accumulation has all been moved and on account of short labor supply the daily output is somewhat diminished.

Georges Creek is slowing up on deliveries. Some of the transportation operated by Georges Creek interests has been diverted to loading other coals, in only a small way, to be sure, but yet it seems to signify a reduced output. A small decrease in each of a large number of operations will be sufficient to make things interesting again this fall and winter. Even at the high prices ruling it is no effort to place all the Georges Creek that comes down. The same is true of the better known grades from Pennsylvania districts. All-rail and up the line from the tidewater distributing points there is no perceptible change from a week ago.

Current quotations on bituminous at wholesale are about as follows:

	Clearfields	Cambrias Somersets	Georges Creek	Pocahontas New River
Mines*	$1 05@1 40	$1 25@1.50	$1.67@1.77	
Philadelphia*	2 30@2 65	2 50@2 75	2 92@3.02	
New York*	2 60@2 95	2 80@3.00	3.22@3.32	
Baltimore*			2 85@2.95	
Hampton Roads*				$2.85
Providence†				$3.73@3.78
Boston†				3.78@3.90

*F.o.b. †On cars.

Anthracite is coming forward steadily on spring orders. The demand keeps up from all sections and June is expected to be an active month for hard coal. Stove is the size most in request although the demand for other grades is really more even than was expected. It is understood that a liberal share of the anthracite mined is being sent to other markets and if that condition holds for a few weeks the demand will continue to be somewhat ahead of the supply. Loading with most of the New York companies is notably slow, except on pea and buckwheat.

NEW YORK

Anthracite—The hard coal business during May was just about equal to that of 1911, and, of course, far ahead of the trade during the same month in 1912, conditions then, being abnormal, due to the suspension in mining. The outlook for the summer is doubtful. Some companies are inclined to regard the situation rather optimistically, while others anticipate an abnormally dull market over the midsummer period. In general it appears that the trade is easing off slightly, although not more than what is normally expected at this time of the year.

Stove coal continues to be the shortest in supply, with Lehigh egg a close second; in fact most companies report all the prepared sizes to be in good demand. Pea and buckwheat in the steam grades are still the heaviest, some operators reporting that they are now putting these into storage, although others state that they have not yet found this necessary. While labor is short in the mining districts, the effects are not apparent on the shipments coming in, which are fully up to the usual amount for this time of the year. Car supply is excellent.

A further increase in the standard anthracite circular of 10c. per ton is now in effect, and we quote the New York market on hard coal as follows:

		Individual	
	Circular	Lehigh	Scranton
Broken	$4.70	$4.45@4.65	$4.50@4 70
Egg	4.95	4.90	4 95
Stove	4.95	4 90	4 95
Chestnut	5.15	5 15	5.20
Pea	3.50	3 30@3.45	3.35@3.50
Buckwheat	2 75	2 15@2 45	2 50@2 75
Rice	2.25	1 70@1.95	2 25
Barley	1.75	1.35@1.70	1.60@1 75

Bituminous—A strong insistent demand for soft coal still continues at tidewater. There are no large stocks on hand, and requisitions on contracts are much heavier than usual at this period, with the result that there is a large tonnage moving.

The feature of the local market is the exceedingly heavy demand for gas coal. This is so far in excess of the supply that considerable of the business has been diverted to other grades, resulting in a material stiffening in the market all along the line. Another unusual condition is the lack of any reasonable explanation for the unusually large demand at this period of the year. It is obvious that there is a heavy consumption, but it is equally clear that this is not confined to any one particular industry, and seems to be entirely due to general industrial activity.

Companies are refusing to take any further new business, except at fancy prices, and spot business in the line trade is also much improved. Some contract buyers, accustomed to holding out for low prices, are beginning to find out that they are in a difficult position now. We continue last week's quotations with prices firm, and tonnages rather difficult to obtain on the following basis: West Virginia steam, $2.55@2.60; fair grades, Pennsylvania, $2.65@2.70; good grades of Pennsylvanias, $2.75@2.80; best Miller, Pennsylvania, $3.05@3.15; Georges Creek, $3.25@3.30.

PITTSBURGH, PENN.

Bituminous—The market continues strong throughout, but as operators are well able to ship there is not much prompt business being placed. There is no uniform prompt market, some producers being willing to sell such free coal as they have at regular circular prices, while others demand a premium, and occasionally secure it. We note a sale today of 1500 tons of prompt at 10c. above circular prices. The supply of labor is somewhat scant, according to the opinion of some, but it remains a fact that necessary shipments are being made. The car supply is short only occasionally, but with a larger labor supply operators would probably try to get out more coal than they could secure cars for, and then the situation would be definitely called one of car shortage.

Lake shipments are heavy with all signs pointing to a record breaking tonnage this year. This does not mean that the Pittsburgh district is doing more than its share, but that there is general pressure for heavy Lake shipments. The slack market is quite irregular, as usual at this time, many operators selling for what they can secure, while others hold to the circular price of 90c. and store what cannot be sold. The lowest price done on slack this season is understood to have been 55c., and in extreme cases in the past week 60c. has been done, though 75c. would probably represent the average market for prompt slack. Operators are now quoting two prices on 1¼-in. screened coal, $1.55, the regular circular price put out months ago, for 1¼-in. domestic, and $1.50 for 1¼-in. steam coal. Noting that prompt coal, except slack, frequently commands a premium of 5@10c., we quote regular circular prices as follows: Slack, 90c.; nut and slack, $1.05; nut, $1.25; mine-run, $1.30; ¾-in., $1.40; 1¼-in. steam, $1.50; 1¼-in. domestic, $1.55, per ton at mine, Pittsburgh district.

Connellsville Coke—The market remains quite strong in the face of a very decided lack of activity as regards new business, and it is quite evident that the operators are holding together on prices through faith, stimulated by the strong influence of banking interests, rather than through actual market conditions. Shipments against contracts are heavy, but have undergone a slight decrease in the past fortnight, due to the blowing out of a few blast furnaces. Prompt demand is extremely light, and is generally filled at concessions of 5@10c. from the usual asking price of $2.25 for furnace coke. Negotiations for contracts for furnace coke are light, and some inquiries recently out have been withdrawn. Demand for foundry coke is only moderate, but prices continue to be held at a good premium over furnace coke, on account of the shortage of labor, which particularly affects the forking of cars. We quote prices unchanged: Prompt furnace, $2.15@2.25; contract furnace (nominal asking) $2.50; prompt foundry $2.85@3.25; contract foundry, $3@3.25, per ton at ovens.

BALTIMORE, MD.

The improved condition in the local market was maintained during the week, the demand for all grades continuing brisk and the price list firm; spot business was the feature of the market, especially in the line trade. Consumers depending on prompt delivery are buying more freely, while loose tonnages are becoming more infrequent, due to a broadening of the market and some restrictions in production at the mines.

The movement under contract continues large, with prices unchanged. In fact, a good healthy tone pervades the coal industry in this vicinity due to an unusual industrial activity, and operators are having difficulty in meeting the increased demand because of the labor shortage.

Shipments of gas coal to the Lakes have reached the highest point of the year, and this has tended to create a shortage of railroad equipment in the Eastern markets. As yet, this has not seriously interfered with operations, but indications are that it will gradually become worse and be even more acute than usual the coming fall.

PHILADELPHIA, PENN.

The anthracite trade is now past the first week in June, and comparing with the business during this month last year, which was the first full month that the mines worked after the suspension, the situation is said to look fairly good. Of course, some of the sizes are beginning to drag, notably the small ones, and egg and chestnut, but stove coal will carry the others along. All orders for this last size must be accompanied by some for the other sizes as well.

The market so far has shown almost a reversal of conditions, as regards the demand for stove and chestnut. It was the unprecedented call for the latter size some two years ago, which doubtless impelled the operators to advance the price to 25c. over stove, and the effect has been to drive some of the business that formerly was on chestnut, back to the stove size. At any rate, the market is hungry for stove, and the proportion of the orders is entirely at variance with the percentage of this size mined.

Tidewater business from this port seems to be the strongest feature of the market. The local trade is still going along at a jog trot, with nothing to boast of in either the demand, or the outlook for future business. As a matter of fact, the market is gradually approaching the season when conditions are generally sluggish. Of course, a comparison with last year during the summer months, cannot be considered, but as general rule curtailed work at the mines, and a stagnant condition of the market, usually prevails during the season now approaching.

The bituminous market has still to redeem itself. While there seems to be a slightly better feeling, its growth is slow, and action feeble, although the feeling seems to be general that, taking all in all, it is gradually growing better.

BUFFALO, N. Y.

The bituminous market is as strong as ever and bear members of the trade now content themselves by predicting that it will all go flat next fall. At present they need most of their time for hunting up coal enough to meet their demand. Practically nobody is filling orders promptly, for the reason that there is not bituminous enough to go around. There were long faces when the Decoration Day reports came in with notice of next to nothing done in the mines. Every effort was made to keep the miners at work, but with only partial success.

There are still a good many minor contracts making, all of which are quite satisfactory to the seller; one operator claims to be getting fully 15c. more than a year ago. There is much report of jobbers eastward who have taken big selling contracts without fortifying themselves at the mines and now they are begging for coal. One of them who used to buy all he could sell, and getting it at his own prices, is now paying as much for slack as he contracted to furnish mine-run for.

There is, therefore, no slackness in prices. Pittsburg select lump is quoted at $2.80, three-quarter at $2.65, mine-run at $2.55 and slack at $2.15. Coke is less firm than coal and is quotable on the basis of $4.75 for best Connellsville furnace.

The anthracite trade is steady, but consumers are well enough supplied to keep them quiet for sometime yet. Report has it that the Eastern coast trade is good enough to make it undesirable to crowd coal Westward just now except for storage against winter. Shipments of anthracite by lake for May, were 628,650 tons and for the season, 1,133,364 tons. For the same time last season the shipments were only 40,250 tons, owing to mining suspension.

COLUMBUS, OHIO

Activity still characterizes the coal trade in all the mining districts of Ohio. There is a slightly increasing demand for domestic grades, which coupled with a good steam trade and a heavy Lake business has the effect of making the market stiff in every particular. The tone is good and practically every one connected with the trade anticipates a good year. Prices are well maintained at the same level which has prevailed for the past few weeks.

The lake trade is still active, every effort being made to rush a large tonnage to the Northwest. The docks are taking care of the shipments in good shape and the congestion among the lake vessels is about over. Dock prices are well maintained and shippers in both the Hocking Valley and eastern Ohio fields are working as fast as possible. Some trouble over a car shortage is reported from eastern Ohio and as a result production in that district has been curtailed.

Railroads are taking a large tonnage, because of the increasing freight movement; many of the railroad contracts have been renewed although a few are still hanging fire. Steam contracts have been mostly renewed at higher figures than prevailed in 1912.

Quotations in the Ohio fields are as follows:

	Hocking	Pittsburgh	Pomeroy	Kanawha
Domestic lump	$1 50	.....	$1.50	$1.50
½-inch	1 35	$1 25	1.35	1.30
Nut	1 20	.....	1.25	....
Mine-run	1 15	1.10	1.15	1 10
Nut, pea and slack	0 70	....	0.70	0.70
Coarse slack	0 60	0.70	0 60	0.60

Practically no labor troubles are reported from any of the Ohio fields; most of the strikes have been unimportant although a few have lasted for some time. As a result production has held up well with the exception of districts where the car shortage has affected the output. In Eastern Ohio it is reported at about 75 per cent. because of the car shortage. In the Hocking Valley it is about 90 per cent. and in the Pomeroy Bend field it is 60 per cent. of capacity.

HAMPTON ROADS, VA.

While dumpings at the tidewater piers have been good they have not been as heavy as was expected at the beginning of the week when there was a large fleet at all piers. Buyers have been offering $2.85 to $2.90 for spot or prompt coal during the week and while there have been some few sales, suppliers are not negotiating, preferring to hold coal now at tidewater for contract vessels about due. One of the large shippers over Lamberts Point has 19 vessels due during the month of June for foreign cargoes in addition to Coastwise contract business and it now looks as though the coal shortage will continue on into June unless the unrest at the mines is straightened out and the collieries worked to their full capacity.

Total dumpings for the month of May are not yet in but at Sewalls Point it will be around 280,000 tons, at Newport News about 295,000 tons, while Lamberts Point figures should run considerably over 330,000.

LOUISVILLE, KY.

The abnormal supplies of slack which have been offered during the past few weeks appear to have been absorbed, and the market for this grade is again in an approximately normal condition. As noted in a previous issue, this condition was due to a large railroad consumption, particularly in the Southern market. It now seems that these roads have acquired good surpluses, with the result that their demand has been materially reduced, and the supply of fine coal is again approximately normal. As a result of the excessive demand for the small grades, there was naturally an overproduction of lump coal, and a consequent falling off in prices. This, however, tended to stimulate the stocking-up so that no unusual surpluses accumulated.

As a result of the falling off in domestic consumption, due to the arrival of summer, eastern Kentucky producers generally find it difficult to obtain orders, and the trade is dull. Operators are now looking forward to the time when consumers will begin to stock up, with which business they will have to be content until the real winter demand opens up in the fall. It is not unlikely also that the labor situation in West Virginia may have a stimulating effect upon the local market; car supply in those fields is also reported as inadequate, and the combination of these conditions may prove to the advantage of the local market. There is some inquiry from Chicago and the Northwest, but this has not as yet resulted in a sufficient volume of business to materially affect the field as a whole.

The second-grade eastern Kentucky screenings are in light demand at 50 to 60c. f.o.b. mines, with the better qualities at 75 to 85c., and little moving. Western Kentucky fuels range about the same as the second-grade eastern Kentucky products, with 30c. being a fair average on pea and slack. Eastern Kentucky block is $1.60 to $1.70, block and lump $1.50 to $1.55, and round $1.25 to $1.35.

DETROIT, MICH.

Bituminous—The market generally is slightly duller than last week, due probably to the firm stand which the operators are taking in the matter of prices. Some buyers are undoubtedly holding off in anticipation of a decided slump before very long, while on the other hand one of the largest local wholesalers is credited with the statement that he expects to see the highest price level the coming winter this district has ever witnessed. It is generally conceded that many of the Ohio operators are already sold up to December and are now refusing to accept any further business at the prevailing circular.

The following is approximately the local market on soft coal:

	W. Va. Splint	Gas	Hocking	Cambridge	No. 8 Ohio	Pocahontas	Jackson Hill
Domestic lump	$1 50		$1 50			$1 90	$1 90
Egg	1 50		1 50			1 90	1 90
1½-in. lump	1 25						
¾-in. lump	1 15	$1 15	1 15	$1 15	$1 15		
Mine-run	1 05	1 05	1 05	1 05	1 05	1 25	
Slack	0 80	0 85		0 50	0 85		

Anthracite—The demand for hard coal in the local market is holding up well, and jobbers seem to have a better volume of business than they had anticipated. There has been no difficulty in disposing of all the coal coming in, and a number of orders for May delivery have been carried over into the current month.

BIRMINGHAM, ALA.

A canvass of the local situation shows that most of the producers consider the general coal market as active as could be expected for this season of the year. It is only in rare cases that orders are seriously needed and in almost every instance the mine that is short on orders has a poor grade of coal to offer. Where the coal is properly prepared there is not much worry about disposition at a remunerative figure. In many instances, on the railroads where the car shortage is most acute, the mines are not keeping up with their contracts.

Regardless of how favorable other conditions may be, it is not believed that the outputs in Alabama can be largely increased until the labor situation is materialy improved. Prices seem to have struck a level properly justified by consumption and production as there is little variation from week to week.

INDIANAPOLIS

The coal trade continues in about normal condition, with little to change the situation from week to week. There is a fair amount of the steam grades moving, all the factories continuing on a steady, if somewhat limited schedule. The delivery of domestic coal from the retail yards increased as the month of May advanced, consumers apparently having the idea that prices may increase. If no lift is given prices for June, that month is likely to see more than the average quantity of coal put in house cellars.

The following prices prevail:

Anthracite, chestnut	$8 00	Hocking Valley lump	$4 50
Anthracite, stove and egg	7 75	Luhrig lump	4 55
Anthracite, grate	7 50	Luhrig washed egg	4 75
Pocahontas, forked lump	5 50	Cannel	6 55
Pocahontas, shoveled lump	5 00	Linton No. 4 lump	3 20
Pocahontas, mine run	4 00	Linton No. 4 egg	3 20
Pocahontas, nut and sack	3 50	Indiana washed egg	3 50
Blossburg	5 50	Brazil block	4 00
Jackson (Ohio)	5 25	Indianapolis lump coke	6 00
Kanawha lump	4 50	Indianapolis crushed coke	6 00
Kanawha egg, nut	4 50	Connellsville lump	7 00
Pittsburg lump	4 50	Citizens' egg coke	6 00
Raymond lump	4 50	Citizens' nut coke	6 00
Winifrede lump	4 50		

CHICAGO

There is an exceptionally strong demand for smokeless coal in the Chicago market. A number of the larger buyers who have not obtained a sufficient supply on contract are buying freely in the spot market. A large amount of tonnage is being absorbed by the lake trade and, as a result, rail shipments to Chicago are light. A large supply of eastern Kentucky coal is being shipped here and sales are brisk. Hocking Valley prices continue to be strong, but comparatively little of this coal is being received here.

Dullness prevails in the spot market for Western domestic fuel. In anticipation of the harvesting season, a few orders have been sent for Brazil block and southern Illinois coal. A substantial increase in the number of orders for anthracite has been noted, although the general volume of business is far from heavy. As a result of the small production of lump, there is a strong demand for Western screenings. Low grade screenings command 80 to 85c., while the price for the high grades ranges from 85 to 90c.

Prevailing prices in Chicago are:

	Springfield	Franklin Co.	Clinton	W. Va.
Domestic lump	$1.97@2.07	$2.30@2.40	$2.27	
Egg		2.30@2.40		$3.75
Steam lump	$1 82@1 87		2.07	
Mine-run	1.77@1 82	2.20@2.30	1 97	3 30
Screenings	1 62@1 67	1 95	1.57@1 62	

Coke—Connellsville and Wise County, $5.25@5.50; byproduct, egg, stove and nut, $4.55@4.75; gas house, $4.65@4.75.

MINNEAPOLIS-ST. PAUL

The coal business continues on the same slow and steady basis as heretofore this coal year. May was a sample of two extremes in weather. The forepart of the month was cold and rainy, and the retail trade was stimulated by small ordering of coal with which to keep heating plants agoing. The last week was the other extreme, with the thermometer registering as high as 90 degrees. A smaller amount of hard coal was placed with the consumer at the spring prices than usual, and it seems the early summer storage has become almost a negligible quantity in the Twin Cities and the Northwest. Dock prices have been adhered to at circular very closely and the senseless cutting in vogue last year, has not been in evidence except in a few cases.

ST. LOUIS, MO.

The past week saw some new records for low prices made, in both high-grade and cheaper coals. Standard mine-run sold down to 72½c., 2-in. lump 77½c., and 6-in. lump 85c. It is generally conceded that the cost of producing Standard coal is above 85c., on a mine-run basis, so if they continue to produce large enough tonnages, it is only a matter of time. On Carterville and Franklin County the low market was 95c. for lump and egg. Even in anthracite, on a jobbing basis it is being handled in St. Louis on a 5c. margin.

There is a scarcity of smokeless and very little moving in; the strike in the New River field threatens to cut off the local

supply, as St. Louis draws largest from that particular district.

The prevailing circular is:

	Carterville and Franklin Co.	Big Muddy	Mt. Olive	Standard
2-in. lump				$0.90
3-in. lump			$1.20	
6-in. lump	$1.15 @ 1 20		1 25	1.05
Lump and egg		$2.25		
No. 1 nut	1.05 @ 1 15			
Screenings	0.90 @ 0 95			0.85
Mine-run	1.00 @ 1 10			0.80
No. 1 washed nut	1 35			
No. 2 washed nut	1 20			
No. 3 washed nut	1 25			
No. 4 washed nut	1 25			
No. 5 washed nut	1 00			

St. Louis prices on June anthracite are: Chestnut, $7.15; stove and egg $6.90; grate $6.65. Smokeless lump and egg is $4.45 and mine-run $4. Byproduct coke is $5 and gas house $4.75.

SPOKANE, WASH.

It is said that a big profit is made by the retailers in Spokane, and that the domestic trade could be served with Roslyn and Crows Nest Pass coals at about $6.75 to $7.25 a ton, according to the haul, and at about $8 to $8.25 for the Wyoming product, the difference in freight rates making the latter coal higher. There is said to be about $1 difference in the cost of slack and mine-run and there is 25c. more duty on lump coal for family use from Canada than on slack, or steam. Prices at which steam coal is sold to business blocks are: $5.25 for mine-run or $5.75 to $6.25 delivered. This coal costs at the mine in the Crows Nest district: Slack, $2; mine-run, $2.85@2.35 and lump, $3@3.25 a ton. The latter retails at $8.75@9.25 f.o.b. Spokane. The freight rate on coal from the Crows Nest Pass district ranges from $2.15 to $2.25 a ton and the duty is 15c. on slack and 40c. on mine-run and lump. On this basis the lump coal costs from $5.65 to $5.80 laid down in Spokane, and as it is claimed that this must be screened, and the screenings sold at a low rate, this loss is estimated at about 25c. a ton.

Taking the benefit of this, the highest rate for Canadian coal is $6.05 a ton. Owl Creek coal comes from the Northern Wyoming field and the freight rate is $4.25 a ton to Spokane, but the Carney and Roundup coals draw a lower rate, the latter coming from Montana. The cost of Owl Creek at the mine for lump is $2.75 and for nut $2.25. Taking the highest rate, it costs $7.20 laid down in Spokane. Southern Wyoming coal including the Rock Springs district costs $4.80 freight and the mine cost is the same as Owl Creek, making it cost $7.55 here.

PRODUCTION AND TRANSPORTATION STATISTICS

IMPORTS AND EXPORTS

The following is a comparative statement of imports and exports in the United States for March, 1912-13, and for the nine months ending March, 1911-12-13, in long tons:

	9 Months			March	
Imports from:	1911	1912	1913	1912	1913
United Kingdom	13,067	5,911	7,451	50	96
Canada	1,240,937	729,583	1,361,379	104,346	107,016
Japan	7,474	12,886	42,657	5,578	440
Australia & Tasmania	228,003	159,720	191,158	10,324	10,141
Other countries	4,717	1,501	3,289	57	32
Total	1,494,198	909,601	1,231,934	120,355	117,725
Exports:					
Anthracite	2,048,535	2,578,400	3,383,126	277,283	158,522
Bituminous,					
Canada	5,996,537	7,987,237	8,295,614	511,616	736,549
Panama	396,367	330,433	340,259	27,414	32,500
Mexico	491,490	235,493	264,537	24,119	57,629
Cuba	705,478	804,094	915,889	91,643	110,727
West Indies	385,708	503,769	456,013	63,075	53,308
Other countries	459,968	774,316	741,597	255,259	99,230
Total	8,435,548	10,637,342	11,013,909	973,126	1,089,943
Bunker coal	4,763,429	5,121,183	5,377,041	671,052	582,129

VIRGINIAN RAILWAY

Total shipments of coal over this road for April of the current year were 345,939 tons as compared with 280,995 tons for the same month last year. Shipments for the first four months of the year were: 1,578,283 tons for the current period and 1,195,600 tons in last year.

FOREIGN MARKETS

GREAT BRITAIN

May 23—Prices continue to show irregularity for prompt shipment. Smalls, particularly, are more abundant, with prices on the downgrade. Colliery owners are holding firmly for high figures for forward delivery, but buyers are unwilling to operate at the prices asked.

Quotations are approximately as follows:

Best Welsh steam	$5 28@5 42	Best Monmouthshires	$4.74@4.86
Best seconds	5 10@5 22	Seconds	4.56@4.68
Seconds	4 92@5.04	Best Cardiff smalls	3 48@3.54
Best dry coals	5 04@5 28	Seconds	3.36@3.42

The prices for Cardiff coals are f.o.b. Cardiff, Penarth or Barry, while those for Monmouthshire descriptions are f.o.b. Newport; both exclusive of wharfage, and for cash in 30 days—less 2½%.

British Exports—The following is a comparative statement of British exports for April, and the first four months of the last three years, in long tons:

	April		4 Months		
	1912	1913	1911	1912	1913
Anthracite	29,793	235,650	766,219	587,797	937,166
Steam	1,986,312	4,708,475	14,631,510	10,132,535	17,317,543
Gas	256,486	983,697	3,203,899	2,205,484	3,503,943
Household	45,654	146,273	474,255	344,888	581,727
Other sorts	66,326	276,774	973,356	696,939	1,159,199
Total	1,494,571	6,350,869	20,049,239	13,967,643	23,580,878
Coke	11,081	70,200	319,909	288,204	352,396
Manufactured fuel	21,856	184,145	548,697	395,188	492,541
Grand total	1,527,508	6,605,214	20,908,859	14,651,535	24,633,615

GERMANY

Germany's coal production, imports and exports, for March and first three months of the current year were as follows:

	March		Three Months	
	1912	1913	1912	1913
Coal	12,811,823	15,413,278	42,021,733	47,558,449
Lignite	7,041,990	6,706,221	20,413,947	20,917,977
Coke	2,159,905	2,744,350	6,742,553	7,991,860
Coal briquettes	356,336	462,014	1,222,190	1,436,225
Lignite briquettes	1,652,904	1,827,304	4,819,710	5,548,260

	Coal		Coke	
Three Months	1912	1913	1912	1913
Production	42,021,000	47,558,000	6,743,000	7,992,000
Imports	1,899,000	2,177,000	132,000	140,000
Exports	7,595,000	8,460,000	1,305,000	1,699,000
Consumption	36,325,000	41,276,000	5,570,000	6,433,000

COAL SECURITIES

The following table gives the range of various active coal securities and dividends paid during the week ending May 31.

Stocks	Week's Range High	Low	Last	Year's Range High	Low
American Coal Products	87	87	87	87	87
American Coal Products Pref.	109½	109½	109½	109½	109½
Colorado Fuel & Iron	31¼	30¾	31	41¼	30¾
Colorado Fuel & Iron Pref.			155	155	150
Consolidation Coal of Maryland	102¼	102¼	102¼	102¼	102¼
Lehigh Valley Coal Sales	225	210	215		
Island Creek Coal Com	52	51	51		
Island Creek Coal Pref.	85	84	84		
Pittsburgh Coal	18	17¾	17¾	24¾	17¾
Pittsburgh Coal Pref.	82½	80¾	80¾	95	79¾
Pond Creek	22¾	19¾	19¾	23¾	19¾
Reading	163	159¾	160¾	168¾	152¾
Reading 1st Pref			90	92¼	89¾
Reading 2nd Pref	89	89	89	95	87¼
Virginia Iron, Coal & Coke	41	40	40	54	43

Bonds	Closing Bid	Asked	Week's Range or Last Sale		Year's Range	
Colo. F. & I. gen. s f g. 5s	95	97	97	May '13	95	99¾
Colo. F. & I. gen. 6s			107¼	June '12		
Col. Ind. 1st & coll. 5s gu.	79	Sale	79	79¾	78¾	85
Cons. Ind. Coal Mc. 1st 5s	..	80	85	June '11	..	..
Cons. Coal 1st and ref. 5s	..	94	93	Oct '12	..	..
Gr. Riv. Coal & C. 1st g 6s	..	100	102¾	April '06	..	..
K. & H. C. & C. 1st s f g 5s	..	96	98	Jan. '13	98	98
Pocah. Con. Coll. 1st s f 5s	86	87¾	86¾	86¾	86¾	87¾
St. L. Rky. Mt. & Pac. 1st 5s	..	78	76	Mar '13	76	80
Teno. Coal gen. 5s	100	Sale	100	100	100	103
Birm. Div. 1st consol. 6s	101	103¾	101	April '13	101	103
Tenn. Div. 1st g 6s	..	102	102	Feb. '13	102	102
Utah Fuel 1st g 5s	..	104	110	Jan. '09	..	..
Utah Fuel 1st g 5s	..	..	..	..	..	..
Victor Fuel 1st s f 5s	..	80	80	May '13	79¾	80
Va. I. Coal & Coke 1st g 5s	93	95	93	May '13	93	98

DIVIDENDS

Lehigh & Wilkes-Barre Coal—Dividend of $3.25, payable June 17 to holders of record June 10.

FINANCIAL DEPARTMENT

Consolidation Coal Co.

President J. H. Wheelwright of this company reports under date of Mar. 19, for the fiscal year ended Dec. 31 as follows:

Bonds—The following 5% 1st Ms. have been released of record and bonds canceled. Consolidation Coal Co. Kentucky Div., $3,000,000; Somerset Coal Co., $4,000,000; Clarksburg Fuel Co., $2,500,000; Pittsburgh & Fairmont Fuel Co., $1,300,000.

Bonds in Sinking Funds and Pledged under First and Refunding Mortgage.

	Pledged	In S.F.
Consolida—4½% 1st M		$444,000
tion —4½% ref. M....	$322,000	446,000
Coal Co.—5% 1st and ref...	.....	95,000
Cumb. & Penn. RR. 1st 5%		x
Fairmont Coal Co. 1st 5%...	189,000	694,000
So. Coal & Trans. Co. 1st M. 5%..	486,000	14,000
Briar Hill Coal & Coke Co. 1st M. 5%.		. . .
Somerset Coal Co. 1st M. 5% of 1910...	3,585,000	. . .

x Sinking fund holds $678,000 bonds of other companies.

Of the auth. issue of $40,000,000 1st & ref. 5s, $10,495,000 are held to retire underlying bonds, $95,000 are in sinking fund, $14,956,000 are held for future additions, improvements, etc., $1,479,000 are in treasury and $12,975,000 are held by public. [Compare convertible bonds below].

Tonnage—The tonnage produced by all mines of the company from 1912 was 10,347,100 net tons, compared with 9,219,731 net tons in 1911.

	Maryland	*W. Va.*	*Penn.*	*Misc.Cr.*	*Elkhorn Tot.*	*Gross.*	*Tot. Net.*
1912	2,162,996	4,576,484	1,748,091	522,900	228,011	9,238,482	10,347,100
1911	2,178,391	3,925,329	1,671,639	456,544	.....	8,231,903	9,219,731

Elkhorn Field—The development work of the company in its 100,000-acre Elkhorn Field in Eastern Kentucky has progressed most satisfactorily. The town of Jenkins, on the eastern or Sandy Valley & Elkhorn Ry. side of the field now has a population of over 5000 people. The central power plant is now supplying all the power for the mines in the entire field, and these mines have been equipped with electrical haulage locomotives and electrical mining machines designed to cut this Elkhorn seam of coal.

Owing to the unusually high waters last spring, the construction of both railroads into this field was seriously delayed, and it was Oct. 1 before the Sandy Valley & Elkhorn Ry. was taken over for operation by the Baltimore & Ohio R.R. On the western side, the L. & N. R.R. was not completed until several months later, and the buildings are not so far advanced as at Jenkins, but some have been completed and a large number are under construction. The Louisville & Nashville R. R. Co. has ordered 3000 all-steel cars to take care of our output and they are now being delivered. The Baltimore & Ohio R.R. Co., for the Sandy Valley & Elkhorn Ry., has had built and delivered to that road 2000 all-steel cars, and we understand have an order for an additional 1000 all-steed cars in the process of being placed. Considering that the construction of neither railroad was commenced until April 1911, and the fact that their construction and equipment expenditures made and to be made are estimated at $10,000,000 shows the desire of the railroad companies to reach this field as quickly as possible and the value placed by them upon the traffic originating therefrom.

It is our belief that the production this year from the Elkhorn field will be at least 1,750,000 tons. During 1913 miners' houses and other necessary buildings will be constructed so as to provide homes for the miners required to produce the increasing output of these mines.

All the important steel producers have built, or are building, by-product plants, and have, therefore, adopted this method of making coke. Several hundred thousand tons of our Elkhorn Coal have been used in the largest by-product plants and gas works in this country, and the coal has been found to be uniform in quality and analyses show only ½ of 1% in sulphur, 3% or under in ash, with only a trace of phosphorus. This is run-of-mine coal as it reaches the consumer and not an analysis of picked samples. By practical use, therefore, it has been proven an ideal fuel for by-product purposes, yielding a pure metallurgical coke, a large and rich yield of illuminating gas, together with the other resultant by-products, tar, etc.

Outlook—The conditions show an improvement over last year and it is believed that the production of 1913 will greatly exceed the tonnage of 1912.

[The stockholders on Feb. 18, 1913 authorized the issuance of $6,500,000 6% 10-year bonds convertible into stock at 105 prior to Feb. 1, 1922, and also an increase of $6,190,500 stock, to take care of the convertible feature of the bonds. A public offering of the bonds was made in March. Pres. Wheelwright on Feb. 27, 1913, reported the company's total bonded debt as $28,613,000, including $11,645,000 "1st & ref. M" 5s, $10,468,000 underlying issues and the $6,500,000 new convertible bonds. He also reported the collateral for the new bonds as $1,800,000 Northwestern Fuel Co. com. stock; $500,000 Metropolitan Coal Co. stock, and $6,500,000 Consol. Coal Co 1st & ref. M. 5s, or their equivalent in cash, pending deposit of bonds. There are now listed on the N. Y. Stock Exch. $16,345,000 1st & ref. M. 5s, which amount, we learn, includes $4,605,000 of the $6,500,000 which are to be pledged for the convertible issue.]

RESULTS FOR YEAR ENDING DEC. 31, INCLUDING SUBSIDIARIES

Tonnage—	1912	1911	1910	1909
Coal mined	9,238,482	8,231,903	9,370,633	7,325,123
Coke manufactured	62,647	43,740	96,692	62,441
Coal mined by lessees	536,401	473,008	524,858	466,087
Gross earnings (coaling)	$13,708,564	$11,420,604	$12,712,256	$10,223,087
Operating expenses	9,896,157	*a*8,467,662	9,186,013	7,144,567
Deprec. mining plant	247,508	221,618	251,410	206,647
Deprec. misc. equipm't	95,284	78,999	59,607	68,491
Taxes	220,215	222,194	212,179	169,213
Interest and exchange	62,092	22,437	5,969	37,850
Insurance	39,424	41,803	29,306	25,140
Royalties	212,847	172,343	234,180	197,335
Total	$10,773,527	$9,227,056	$9,978,664	$7,849,243
Net earnings	$2,935,037	$2,193,638	$2,733,592	$2,373,844
Int. & divs. on sec. owned	$11,853	311,431	197,848	277,815
Total income	$3,746,890	$2,505,069	$2,931,440	$2,651,659
Deduct—				
Int. on Cons. Coal bds	$639,224	$517,084	$265,094	$263,529
Int. on sub. cos. bonds	334,858	355,926	650,376	650,610
Sink. fd. Cons. Coal bds	162,958	153,618	108,950	79,930
Sink. fd. sub. cos. bonds	106,492	94,605	194,444	165,631
Cash dividends (6%)	1,358,865	1,201,513	1,141,552	*b*1,009,883
Total deductions	$2,602,397	$2,322,746	$2,360,416	$2,169,583
Balance, surplus	$1,144,492	$182,323	$571,024	$482,076

a Cumberland & Pennsylvania RR. depreciation amounting to $108,230 in 1911, and insurance, $3,544, is charged to operating expenses in accordance with Inter-State Commerce Commission classification.

b Also 60% stock dividend calling for $6,150,000 paid March 1909 from accumulated surplus, the profit and loss surplus, including subsidiaries, on Dec. 31, 1909, after such payment being $6,406,421.

COMBINED GENERAL BALANCE SHEET DECEMBER 31.

Assets	1912	1911	Liabilities—	1912	1911
Property account *a*	47,918,32	45,255,105	Capital stock	25,000,000	25,000,000
Adv. payments on coal land purch	1,355,855	1,145,763	Bonded debt	24,410,000	23,234,000
Due from 1st&ref. mtge. trustee	*b*1,650,901	1,236,702	Car trust bonds—assumed by C. & P. RR.	456,000	532,000
Stocks of allied cos.	*c*3,636,888	2,846,688	Pur. money oblig's	31,429	58,229
Other investm'ts.	91,400	41,400	Briar Hill C. & C. bds. retired June 1 '11 and June 1 '12	60,000	30,000
Sinking funds	776,934	774,450	Bills payable	1,050,000	. . .
Coal and coke	260,785	345,553	Accounts payable	833,767	779,319
Materials, supp., etc	1,130,882	942,930	Pay rolls	308,805	282,250
Bills receivable	271,650	54,160	Royalties payable	205,953	186,044
Accts. receivable	4,643,426	4,606,158	Bd. int. and divs. due	61,921	62,223
Cash in banks, &c	971,401	1,231,856	Bond int. accrued	246,686	243,293
Cash for bond int. and divs. due	61,921	62,223	Sink. fds. accrued	136,340	135,629
Special deposits to cover royalties	205,128	185,110	Div. pay. Jan. 31	375,000	302,158
Special deposits for Elkhorn improv	. . . . .	358,371	Individuals and cos.	1,640,181	1,204,132
			Profit and loss	8,159,416	7,039,192
Total	62,975,498	59,086,469	Total	62,975,498	59,086,469

a Property account ($47,918,327) includes coal lands and other real estate, $34,192,275; less reserve for exhaustion, $2,507,086; balance, $31,685,189; mining plants and equipment, $14,333,781; less reserve for depreciation, $2,653,893; balance, $11,697,982; Cumberland & Penn. RR., $3,271,450; less sink. fund for redemption of bonds, $714,506, balance, $2,556,944; Cumberland & Penn. RR.; equipment, $1,832,626; less reserve for depreciation, $523,174; balance, $1,309,452; floating equipment, $1,141,730; less reserve for depreciation, $472,971; balance, $668,759.

b For 75% of cost of improvements, extensions, &c., $329,773; for expenditures on Northern Coal lands, $1,261,127, and for Briar Hill Coal & Coke bonds retired June 1, 1911 and June 1, 1912, $860,000; total, $1,650,901.

c Stocks of other companies owned include 18,900 shares Northwestern Fuel Co. common stock, 2,700 shares Northwestern Fuel Co. pref. stock and 7,513 shares Metropolitan Coal Co. common stock.

COAL AGE

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True Success

By Berton Braley

Written expressly for Coal Age

Though Dividends come rolling in
Beyond the dreams of avarice,
The measure of success you win
Is not determined just by this;
For it is Failure, not success,
(However great the golden spoil)
To profit by the harsh distress
Of those who serve you by their toil.

Your house of pride and lordly show
Is only proof of gold and greed
If in the miners' huts below
Are famine, misery and need;
If those who mine your good black coal
Have had no share in all your gain
But labor for a grudging dole,
Then your "Success" is false and vain.

If you are playing fair and square
And giving those who toil their due,
Taking for yours, your honest share
Of what the mine has yielded you,
If no man justly owes you hate
If you have kept your tenderness,
You may not gain a vast estate
But—you will find the true success!

Coking the Semibituminous Johnstown Coals

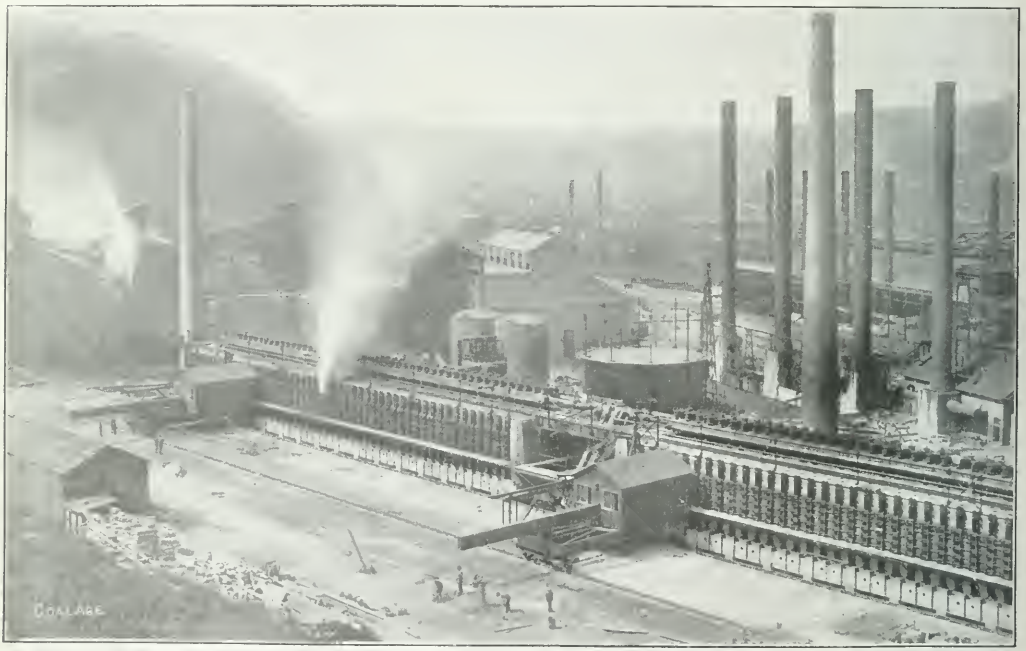
By John W. Gocher*

SYNOPSIS—The Johnstown coals will not coke in beehive ovens unless part of the fixed carbon is burned to make heat. They give much trouble because they swell so freely on coking. It has been noted that the coals which expand least are those which are highest above sea level. These also contain the highest volatile content but the indications do not afford sufficient basis for a conclusion as to the cause of the excessive expansion.

Although classed as a semibituminous fuel, the workable seams of coal in the Johnstown basin may be said to be among the dryest of the so called dry bituminous coals.

ning, or Cement, bed, with a few openings tapping the Upper Freeport, or Lemon seam. The topography of this region is so badly broken up that within a comparatively short radius from the center of the city, coal is mined from the same seam in openings varying 200 ft. or more in elevation, and this coal shows markedly different characteristics, with a more or less definite relation between the elevation of the coal and its proximate analysis.

A reference to the Johnstown folio of the Geological Survey will show that the bottom of the basin lies immediately north of the city and for convenience, in the table which is given later in this paper, the elevation of the various workings from which samples were taken is



Batteries 5 and 6, Otto-Hoffman Byproduct Ovens, Johnstown, Penn., Fifty Ovens to a Block

The Johnstown syncline crosses the lower end of the city in a northeasterly direction, and lies between the Laurel Ridge anticline on the northwest and the Ebensburg anticline on the southeast. In the hills surrounding the valley of the Stony Creek, on which the city is located, the workable seams of coal outcrop at numerous points.

Apparent Relation between Elevation and Coking Action

Most of the workings are to be found in two seams, the Lower Kittanning, or Miller, and the Upper Kittanning, or Cement, bed, with a few openings tapping the Upper Freeport, or Lemon seam. The topography of this region is so badly broken up that within a comparatively short radius from the center of the city, coal is mined from the same seam in openings varying 200 ft. or more in elevation, and this coal shows markedly different characteristics, with a more or less definite relation between the elevation of the coal and its proximate analysis.

A reference to the Johnstown folio of the Geological Survey will show that the bottom of the basin lies immediately north of the city and for convenience, in the table which is given later in this paper, the elevation of the various workings from which samples were taken is given as above sea level, the lower Kittanning bed in the bottom of the basin being approximately 950 ft. above that datum.

The Early Coking Methods

In the early days of the iron industry at Johnstown, the Upper Freeport coal was coked in heaps or mounds and the resulting product used in the local blast furnaces. The coke is said to have been of fair quality and well suited for use in the small blast furnaces of the time, which were used for smelting the local low-grade self-fluxing ore. More recently various attempts have been made to coke the local coals in ordinary beehive ovens, but with indifferent success, the coking time being 72

*Consulting engineer, Cambria Steel Co., Johnstown, Penn.

to 96 hr. and great difficulty being experienced in maintaining the oven heats.

At the present time, however, in West Virginia, similar coals are being coked in beehive ovens, but with low yield, a fair percentage of the carbon being used in addition to the volatile matter, to maintain the heat.

The method of coking in heaps at the Cambria plant was followed sometime in the seventies, by a plant of so called "Belgian" ovens, which were operated for several years and abandoned about 1880, when the company acquired coal lands and built beehive ovens in the Connellsville region. No definite records of these Belgium ovens are now in existance.

Coppee Nonrecovery Retort Ovens

The first retort ovens in which Johnstown coal was used were located at Conemaugh and worked in connection with the Cambria Iron Co.'s blast furnace at that point. The plant consisted of 60 Coppee nonrecovery retort ovens and was built in 1886-1887, and operated until the furnace plant was destroyed by the Johnstown flood in 1889, after which it was not rebuilt.

The coal used was the Upper Freeport, containing about 17½ per cent. of volatile matter, and it was crushed before charging, but was not washed. The ovens were 16 in. wide at one end and 20 in. at the other, 5 ft. high and 22 ft. long, and the coal charge weighed three tons. The coking time was 18 hr. and the coke yield 68.7 per cent.

At the outset the usual Coppee practice of working the ovens in pairs was followed, a fresh oven being charged alongside a partly coked one, in order to maintain the battery heat. This did not work satisfactorily and continual trouble was experienced in pushing the ovens.

Afterward the practice was changed, so that the ovens were charged and pushed in rotation, the oven heats probably being maintained by combustion of some of the carbon in the retort, the yield, as noted above, being 68.7 per cent. Efforts made from time to time to reduce the coking time below 18 hr. were unsuccessful, and were finally abandoned.

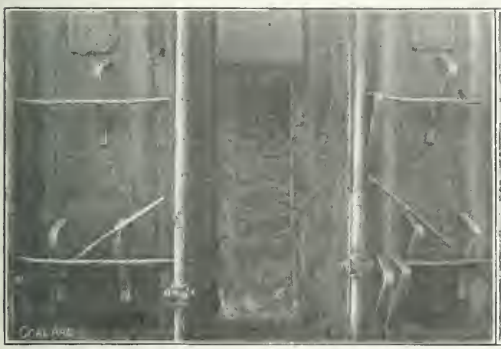
The operation of this plant gave constant trouble. The coal in coking swelled to such a degree that when the coke was pushed, unless extreme care was used, or the cake of coke had burned itself loose, damage to the oven walls resulted.

The Introduction of Otto Ovens

The gradual exhaustion of the Cambria Iron Co.'s holdings of first-class coking coal in the Connellsville region led, soon after the flood of 1889, to further investigation of possible methods for coking the local coal, and in 1893 and '94 representatives were sent to Germany to study the various systems of retort ovens. Coal was shipped to some of the German plants and coke made from it.

As a result, a contract was made with the Otto Coke & Chemical Co., the American representatives of Dr. C. Otto & Co., and 60 retort ovens with a plant for the recovery of tar and ammonia, were built at Johnstown in 1894.

This was the first byproduct-coke plant in this country to be built in conjunction with a steel plant and making its principal product for use in a blast furnace. This initial plant is still in service. Additions were made to it from time to time, until at present the installation consists of 372 ovens, all of them practically the same size, with a capacity of 4½ net tons of coke per charge.



Appearance of Red-Hot Coke in Retort before Pushing. Note How Tightly It Fills the Oven

Coke after Being Pushed from the Oven. It Is Not Large and Columnar like Beehive Coke

As compared with the large units now being constructed, these may seem small, but, until recently, the advisability of adopting larger ovens has been a matter of doubt. It has been questionable whether the "structure" of the coke would be sufficiently strong to withstand the pressures resulting from the swelling of the coal on coking, if that operation were conducted in larger ovens.

Small Variations in Analysis with Wide Variation in Expansion on Coking

The first plant was built with the intention of using mountain coal from points east of Johnstown, containing a higher percentage of volatile matter and for a time this coal was used.

The possibilities of the local coals were always kept in mind, however, and the practice gradually modified until, at present, only local coal is used, the mixture consisting of half from the Lower Kittanning and half from the Upper Kittanning seams.

This is true, however, of the coal from two openings

only, known locally as Franklin mines Nos. 1 and 2, efforts to use the coal from other mines in the same seams giving trouble.

This fact led, recently, to a systematic investigation of the characteristics of the coal as mined at different points, the results of which are given in Table I.

The results given are fair averages, and if any deduction can be made, it is that the highest volatile content is found in the coal at the highest level in the basin, and also that the degree to which the coal will swell in coking varies considerably with only slight differences in analysis.

An effort was made to trace some analogy between the average analysis of mixed coal, washed mixture and sludge. The average loss in crushing and washing is about 12 per cent. by weight.

After draining for an average period of 72 hr. the coal is removed, in successive layers of about 6 in. thick, from the top of the piles in the storage pits, by means of a traveling excavator which places it on belt conveyors, which, in turn, deliver it to the oven bins.

The average moisture content in the coal as delivered to the ovens is about 8.5 per cent. With fair oven heats the coking time is about 21 hr., and the coke yield about 80 per cent. of the coal charged, or the yield from coal as mined will average 68 to 70 per cent. of dry coke.

TABLE I. RELATION OF ELEVATION AND COMPOSITION TO EXPANSION OF COAL ON COKING

	Lower Kittanning—West Side of Stony Creek								Lower Kittanning—East Side of Stony Creek						Upper Kittanning			
	Mine No. 1		Mine No. 2		Mine No. 3		Mine No. 4		Mine No. 5		Mine No. 6		Mine No. 7		Mine No. 8		Mine No. 9	
Elevation above sea	1150 Ft.		1040 Ft.		1350 Ft.		1340 Ft.		1300 Ft.		1250 Ft.		1320 Ft.		1208 Ft.		1470 Ft.	
Coal	Raw	Washed	Raw	Washed	Raw	Washed	Raw	Washed	Raw	Washed	Raw	Washed	Raw	Washed	Raw	Washed	Raw	Washed
Volatile matter	15 40	16 34	15.54	15.12	17.37	17.65	17.90	17 73	17.66	17.80	17.53	17.14	18.55	18 15	16.20	16 23	17.30	17 10
Fixed carbon	76 48	77 53	75 46	79.11	73 58	76.81	72 95	75 79	72 04	76 07	73 35	76 66	71 09	73.32	70.35	74 36	71.53	74.59
Ash	8 12	6 13	9 00	5 77	9.05	5.54	9 75	6 48	10 30	6.13	9 12	6 20	10.36	8.53	13.45	9.41	11.17	8.31
Phosphorus	0 012	0 008	0.008	0 007	0.012	0 012	0.010	0 009	0.013	0.011	0.012	0 011	0 012	0.011	0 045	0.043	0.021	0.020
Sulphur	2 71	1 04	2 56	1 27	2 55	1 00	2 90	1 07	4 06	1 35	4 05	1 48	2 33	1 26	1.37	0.76	2.32	1 26
Silica	2 52	2 31	2 40	2 39	2.98	1 61	2 96	2 63	2 55	2 50	2 38	2 10	3 90	3 68	6.00	3.70	4 52	3.65
Lime	0 11	0 10	0.10	0 10	0.08	0 08	0.19	0 13	0 08	0 10	0 06	0 08	0.08	0 08	0 77	0 38	0.10	0 08
Magnesia	0.11	0 18	0 31	0 43	0 11	0 12	0.21	0 15	0 11	0 21	0 22	0 17	0 23	0 14	0 36	0 21	0.14	0 15
Alumina	2 10	2 06	3 02	1 35	2.58	2 38	2 40	1 85	1 80	1 98	2.24	2 04	3.18	2 82	4 10	3.68	3.35	2.58
Ferric Oxide	3 20	1 44	3.08	1 43	3 25	1.26	3.83	1 65	5 70	1 22	4.25	1 72	2 91	1.74	1 98	1.32	2.91	1.74

RESULTS OF COKING TESTS

Mine No. 1—Swelled badly—could not push when ovens were "down."
Mine No. 2—Swelled badly—could not push when ovens were "down."
Mine No. 3—Swelled considerably—pushed, but with difficulty.
Mine No. 4—Swelled somewhat less than No. 3—pushed hard.
Mine No. 5—Same conditions as No. 3.
Mine No. 6—Swelled badly—could not push.
Mine No. 7—Average working conditions.
Mine No. 8—Swelled considerably—pushed with difficulty.
Mine No. 9—Average working conditions.
Nos. 7 and 9 are the mines from which the coal is being coked.
Mine No. 8 is the famous Rolling Mill mine, from which 3000 tons of steam coal are taken daily.

behavior of the coal and its ultimate analysis, but the laboratory results varied so widely that no definite basis for such comparison could be fixed.

Present Practice in Preparation

The coal as mined from Mines 7 and 9, given above, is delivered in approximately equal quantities from the tipple bins onto a conveyor belt leading to Bradford breakers, where the lumps are broken and some of the bone, sulphur balls, etc., removed. The coal then passes to the crushing rolls, and is crushed to the following sizes:

Sizes	Percentage
On ½-inch mesh	3 78
Through ½-inch mesh	95 4
Through ¼-inch mesh	78 5
Through ½-inch mesh	66 2
Through ⅛-inch mesh	57.5

Leaving the crushing rolls, it is conveyed on belt conveyors to a storage bin in the highest part of the washery building. Thence it is delivered through spouts to the feed screws of two rows of improved Campbell washing tables.

From the tables the washed coal is sluiced, using the same water with which it was washed, into nine concrete drainage pits, each holding 1500 tons. The refuse is also sluiced into two smaller pits and allowed to drain, afterward being loaded onto cars for removal.

The water from the drainage pits finds its way into sewers under the pits, is collected in a sump and pumped back to an elevated tank for re-use. Table II shows an

TABLE II. AVERAGE ANALYSIS OF MIXED COAL, WASHED COAL AND REFUSE

	Mixed Coal	Washed Coal	Refuse
Volatile matter	17 09	18 00	13 30
Fixed carbon	69 50	73 95	20 56
Ash	13 20	8 05	66.14
Phosphorus	0 012	0.011	0.046
Sulphur	2 25	1 17	11 51
Silica	5 61	3 50	28 60
Lime	0 14	0 10	0.25
Magnesia	0 32	0 06	0 34
Alumina	3 52	2 73	16 42
Ferric Oxide	3 02	1 28	20 38

The product is regarded as a good metallurgical coke. It breaks with a good deal of cross fracture, into rather small rectangular blocks instead of fingers.

In appearance it is quite dense, with a large number of extremely small cells, and with the following physical characteristics: Apparent specific gravity, 1.005; true specific gravity, 1.847; porosity, 45.72 per cent.

After the shatter test of four drops from a height of 6 ft., 20.51 per cent. passes through a 2-in. mesh.

TABLE III. ANALYSIS OF COKE

Volatile matter	0.81%
Fixed carbon	89.28%
Ash	9.90%
Phosphorus	0.014%
Sulphur	0.94%
Silica	4.46%
Lime	0.13%
Magnesia	0.21%
Alumina	3.18%
Ferric Oxide	1.84%

Moisture in Coke High, Byproduct Yield 67 per Cent. of Normal Yield

The moisture in the coke varies. With the small-cell structure mentioned above, it is difficult, in the first place, to quench the coke properly, and when so quenched that danger of fire in the cars is eliminated, the small cells retain a large percentage of water, with not enough heat in the cell walls to drive it off. Since the coke is used in the company's furnaces and the charges are measured, not weighed, the variable moisture is not so serious a feature as it might be under other conditions.

The byproduct yield is a disappointing feature in coking this coal. It will be readily understood that constant use of a more or less swelling coal in a brick oven will inevitably result in the distortion of that structure, with resultant cracks and unavoidable leakage of the products of distillation. In consequence, the amount of ammonia and tar recovered is about two-thirds of the possible yield and the surplus gas is not enough to justify plans for its use elsewhere.

The average life of the coking chambers up to the time when the walls become so crooked as to prevent pushing the charge, is about two and one-half years. Renewal of individual retorts or of a group, with the remainder of the battery in service, is not good practice, as the local expansion of the new brickwork tends to increase any cracks which may exist in the working portions of the battery. It is now believed that the best procedure is to work the battery as a unit as long as practicable, allowing ovens which become too bad for service to remain banked. When the number of idle ovens becomes excessive, the battery should be rebuilt as a whole.

Effect of Moisture in the Coal

With oven chambers constructed altogether of silica brick, the question of what effect charging the wet coal into the hot chambers will have on the brickwork has repeatedly been asked. The face of the brickwork, after extended use, shows a slight checking or spawling, but in certain particularly good ovens, which have been in constant use six years, this checking is not enough to interfere with pushing the coke.

Coke Pusher Working at Battery No. 8

It is a question whether the moisture contained in the coal as charged may not be beneficial in coking a swelling coal. While wet coal weighs about 14 lb. per cu.ft. more than the crushed dry coal, the mixture as charged occupies considerably more space in the coking chamber than the same weight of dry fuel, due probably to the tendency of the moist particles of coal to stick together in irregular masses, thus forming interstices, which, when the coal later commences to swell in coking, provide room for a portion of the increased volume.

Tests have been made with dry coal and the coke apparently pushed about as easily as the usual charge. As the unwashed coal does not make satisfactory coke this practice could not be continued long enough to obtain definite information along this line.

The water vapor driven off during the process of coking, however, adds considerably to the volume of gases to be handled through certain parts of the byproduct apparatus.

From the foregoing it will be apparent that coking a lean semibituminous coal while practically impossible in beehive ovens, in retort ovens presents a variety of complex and interesting problems, such as do not fall to the lot of oven operators who can select their coal.

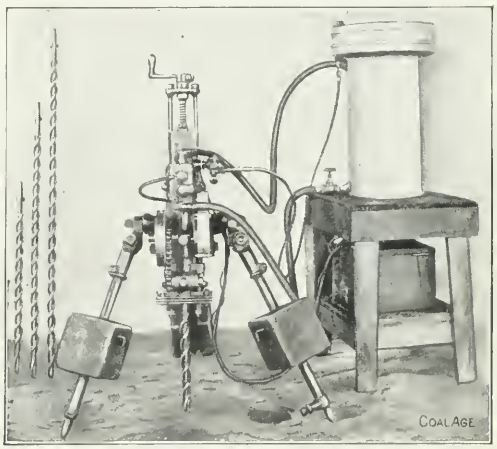
A Gasoline Rock Drill

A new and interesting gasoline rock drill has been recently developed in St. Louis, Mo. This has been built in four sizes, ranging from the hand drill weighing 35 lb. to the largest size which weighs 265 lb. and which will drill holes up to 20 ft. or more in depth.

The gasoline drilling engines are built to operate upon the two-cycle principle. They are free from gears, cams and pushrods. Backfiring is said to be impossible and speeds up to 3000 r.p.m. can be attained if desired.

The piston is moved rearwardly by energy stored in the flywheel and is picked up or cushioned on the return stroke by the compression of air. The drill steels are automatically rotated by means of a chain and sprocket which connects the crank to the rotator shaft.

Two types of drill steels may be used, one the common hollow steel through which water can be forced together



The Gasoline Rock Drill Upon Its Tripod

with a small amount of explosive pressure for the purpose of removing the rock cuttings from the drill holes. The other type is solid but is formed with a spiral conveyor which works the rock cuttings out of the hole, in the same manner as a wood augur does its chips. This type of steel does away with the water connections which sometimes cause trouble.

It is claimed that this machine is fool proof and simple and light for its capacity; that it will drill rock at the rate of from three to 15 in. per minute and the largest machine uses only two gallons of gasoline per ten-hour day.

The roller bearings with which this machine is supplied are packed with grease and require attention only about once a month. The exhaust may be either cooled by being piped into water, or led to the mouth of the shaft or tunnel through pipe lines. In either case, provided the ventilation is reasonably efficient, the exhaust does not vitiate the mine air to any extent.

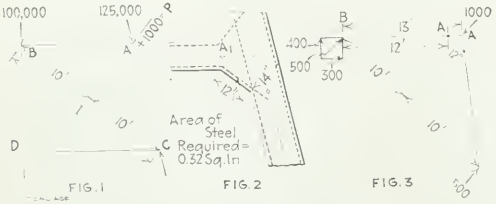
Experience has shown that with the most careful of packing the surface subsidence will equal from one-third to one-half the thickness of a seam. Even where hydraulic packing is used the subsidence may be anywhere from 0 to 10 per cent. Allowance should always be made for this shrinkage.

Colliery Practice in Concreting

By Elwyn E. Seelye* and A. T. Shurick

SYNOPSIS—This is the third installment on this subject. In this issue the advantages of concrete are discussed, together with costs and methods of designing a number of different types of structures. A number of construction details, and few remarks on forms are also given.

In our previous issues of Dec. 14 and 28, we have described the processes involved in concreting operations, the general rules which should be followed to safeguard the execution of the work, the commonest types of reinforcement in use, and proposed formulas for the design of reinforced-concrete beams, slabs and struts. It is proposed in this article to take up the practical design of some of the ordinary structures which may be built in reinforced concrete.



Figs. 1, 2 and 3. Stresses in Knee Bracing

Reinforced Concrete versus Other Materials—The first problem which will present itself will be the expediency of using reinforced concrete in place of steel or timber for a certain structure. Factors determining this are as follows: The occurrence of a suitable aggregate near the site, such as a gravel bed, slag or facilities for crushing rock, and availability of a suitable sand. Questions of life and durability of the structure will generally militate in favor of reinforced concrete.

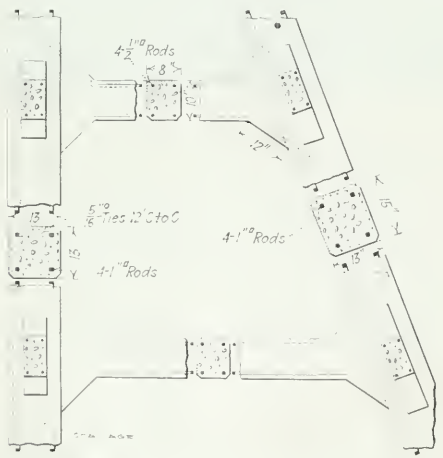


Fig. 4. Complete Details of Bent Panel

Cost of Reinforced-Concrete Structures

A rough idea of what a reinforced-concrete structure should cost may be obtained by using the figures given below. These price must be considered as basic inasmuch as they will vary greatly with location and conditions:

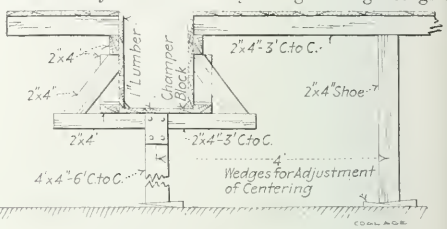


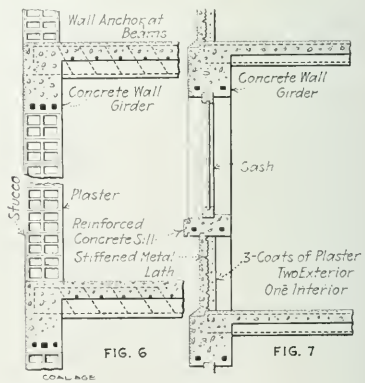
Fig. 5. Form Details

Column centering of concrete surface[1]	80.10
Centering for solid slabs[1]	0.11
Centering for tile and joist slabs including shoring for ordinary story heights[1]	0.10
Beam and slab centering and shoring[1]	0.08
Concrete in place[2]	6.00
Steel reinforcement in place[2,3]	0.025
Stiffened-wire lath in place[1]	0.06
Plastering three coats on stiffened wire lath[1]	0.07
Cement tile for roofs in place[1]	0.18

[1] Per square foot. [2] Per cubic yard. [3] Per pound.
[3] A rough idea of the weight of the reinforcement in a structure may be obtained by the formula weight of steel in pounds equals cubic feet of concrete times five.

Reinforced-Concrete Framing

The frames of such structures as headframes, tipples, breakers, washeries, buildings and trestles may be readily constructed of reinforced concrete. The main difference between the steel and reinforced-concrete frame is that in the concrete structure knee-bracing is generally resorted to in lieu of diagonal bracing. This is because diagonal-brace centering is uneconomical.



Figs. 6 and 7. Sidewall Construction

Let us assume a stress diagram for a unit of a frame and design the members and the knee bracing, see Fig. 1. The main stresses are assumed to be acting along the axis of the main members, but the wind load and vertical panel load will be resisted by the knee bracing and flexural

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strength of the main members. This knee-brace design will be taken up first.

This problem is really statically indeterminate and susceptible of solution only by an excursion into the complication of the elastic theory. But, if we assume that B and C are pin connections, we shall have a higher bending moment in the angular beams $B\ A\ C$ than if B and C are rigid joints, and hence, be on the side of safety. Accord-

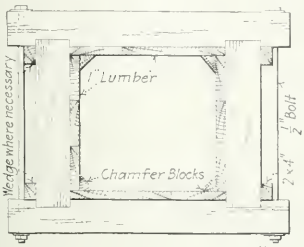
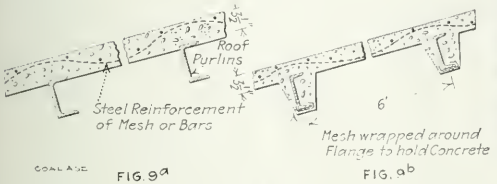


FIG. 8. COLUMN FORMS



FIGS. 9A AND B. STEEL AND CONCRETE ROOFS

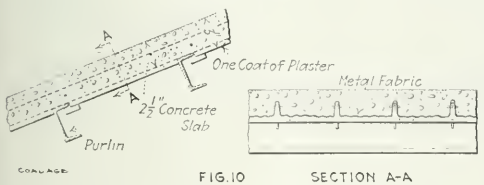


FIG. 10. THE APPLICATION OF STIFFENED-WIRE LATH

ing to this assumption, if the 1000-lb. wind load is normal to $B\ C$, we have a bending moment at A equal to

$$\tfrac{1}{4}\ Pl = \frac{1000 \times 20}{4} = 5000 = \text{ft.-lb.} = 60{,}000 \text{ in.-lb.}$$

Now recalling the flexural formula for reinforced concrete (see our previous issue of Dec. 28, 1912, p. 901), $M = 108\ bd^2$, where

M = Moment in inch-pounds
b = Width of strut
d = Effective depth of strut

We have $60{,}000 = 108\ bd^2$. Assuming effective depth of joint = 14, see Fig. 2, and we have:

$$b = \frac{60{,}000}{108 \times 14 \times 14} = 2.8$$

Area of steel = $0.008 \times 2.8 \times 14 = 0.32$ sq.in. in strut. Next the bending moment at A should be calculated. This is done by determining the resultant at B or C normal to AB. See Fig. 3. We then have $300 \times 12 \times 12 = 43{,}200$ in.-lb., and by the formula for reinforced concrete in flexure gives us:

$$bd^2 = \frac{43{,}200}{108} = 400$$

Assume d = 8 then w $= \frac{400}{64} = 6\tfrac{1}{4}$ in.

Steel = $8 \times 6\tfrac{1}{4} \times 0.008 = 0.42$ sq.in.

Hence, we will make the horizontal strut 8 × 10 in. with four ½-in. square rods, as shown in Fig. 4. The rods are placed in both top and bottom to provide reverse flexural strength which might be induced from the panel above.

The direct compressive stress in AC was assumed at 125,000 lb., and the axial component of the wind load is 400, making a total 125,400 lb., see Fig. 3. The formula

FIG. 11. CONCRETING A HY-RIB ROOF

for direct compression in a concrete strut is $W = (A_c + 15\ A_s)\ 600$ in which

W = The load on the strut
Ac = Area of concrete
As = Area of steel.

Hence, we have (see our previous issue of Dec. 28, 1912)

$125{,}400 = 600\ (A_c + 15\ A_s)$ hence $A_c + 15\ A_s = 209$

Assume the steel reinforcement to consist of four 1-in.sq. rods, then:

$$A_s = 4\ sq.in.$$

and we have:

$$A_c + 60 = 209$$

$$A_c = 149$$

So that the strut should be 12x13 in., but in addition we have the flexural stress of 43,200 in.-lb. to take care of just as in AB above. As before, $bd^2 = \frac{43{,}200}{108} = 400$, and the effective depth of the strut 12x13 in. will be 11.5 in., hence $b = 3$. So that the strut should be 15x13 in. with four 1-sq.in. rods. A similar design for BD gives us a 13x13-in. strut.

There is also an additional compressive stress in the cross struts, due to the moment of wind load. This would be found for AB by taking moments around C, Fig. 1. The moment due to the force P must be resisted by a compressive stress in AB. However, for ordinary structures this stress is comparatively small and we will not consider it in our design.

The complete design of the unit is shown in Fig. 4. Attention is called to the fact that the actual flexural stresses, induced by wind load or other conditions, will be much lower than those obtained by the assumption of

pin connections at *B* and *C*. This is a good thing in a design where the nature of side stresses are indeterminate and where safety factors should be increased for impact.

Certain features of design common to tipples, washeries, power houses, breakers and miscellaneous buildings will now be discussed. These include roof, floor and sidewall construction and may be divided into two groups, namely, those where the skeleton frame is steel and where it is reinforced concrete.

Roof Construction

Under the first group for roofs, we have the solid reinforced slab, and the concrete slab on stiffened-wire lath, as shown in Figs. 9, *a* and *b* and 10.

On steep-roof work it may be found advisable to run the ribs of the stiffened-wire lath horizontal in order to retain the concrete while pouring. This is opposite to that shown in Figs. 10 and 11. Stiffened-wire lath for this purpose is manufactured by the Trussed Concrete Steel Co., of Detroit, Mich., the Corrugated Bar Co., of Buffalo, and the Northwestern Expanded Metal Co., of Chicago. An illustration of such a roof in process of concreting is given, Fig. 11.

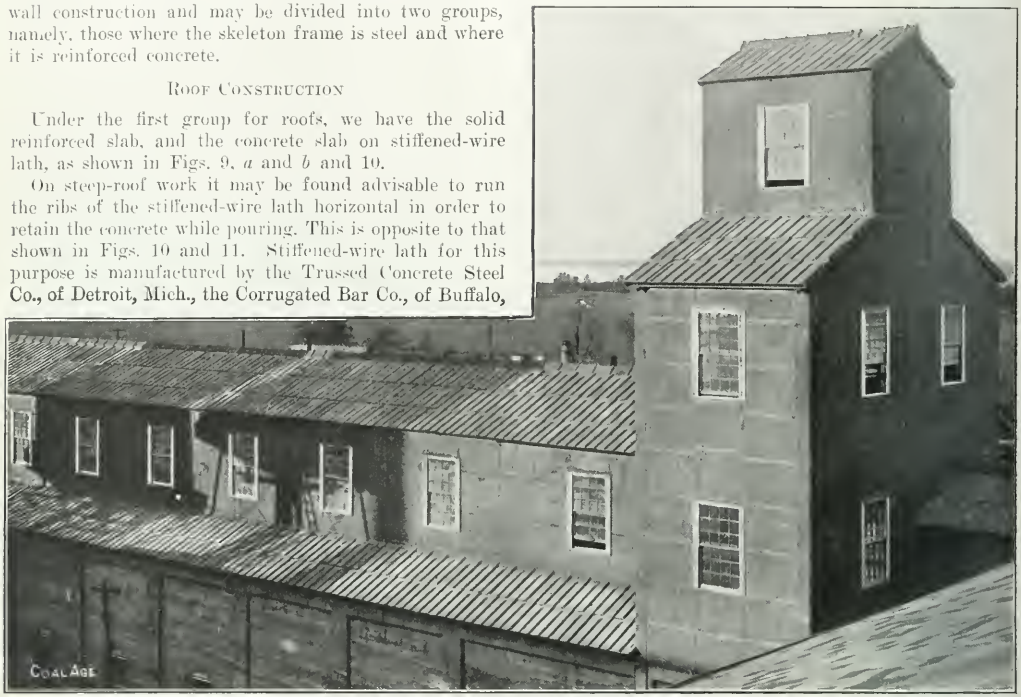


Fig. 12. A Practical Application of American Cement-Tile Roofs

Concrete Purlins—Under this heading we have the beam and slab type, the tile and joist, and the stiffened-wire lath construction shown in Figs. 13, 14 and 15, respectively.

Roof Design

These roofs are designed by computing the flexure on the girders, purlins and slabs by means of the formulas given on p. 901, of our issue of Dec. 28, 1912. Wind stresses are taken care of by knee bracing between the main girders and columns as discussed in this article for the unit frame. Roof live loads should be assumed at 50 lb. per sq.ft. for flat roof and 30 lb. for pitched roofs. Attention is called to the method of forming the T-flange in Fig. 11 by the reduction of the size of the block.

Cement-Tile Roofs—Another economical type of concrete roof is the cement tile. This tile is really a reinforced-concrete slab. It is about ⅞ in. thick and reinforced with expanded-metal lath. It weighs 13 to 15 lb. per sq.ft. The slabs are made to span between purlins on 4-ft. centers. The top surface is treated so that it is impervious to moisture. It will be seen from the illustration in Fig. 12 that the tiles lap and interlock. They should not be used on a flatter pitch than one-quarter rise to one horizontal. This tile is manufactured by the American Cement Tile Co., of Wampum, Penn., and includes a complete line of special shapes such as gutter, ridge tiles, etc.

Floor Construction—The types of construction, shown in Fig. 9 *a* and *b*, 13 and 14, are commonly used in floors.

Sidewall Construction—The commonest forms of concrete sidewall construction are the concrete blocks, terra cotta tile, bricks, reinforced-concrete slab, and hydraulic plaster slab, used in connection with the stiffened-metal lath. The brick, concrete blocks or tile blocks may be used either as bearing walls or in skeleton construction, see Figs. 6 and 7. The formula for stucco is five parts portland cement, 12 parts sand and 1 part hydrated lime; to this may be added the coloring matter and an integral waterproofing compound, such as described in our previous article of Dec. 28, 1912.

Forms or Centers

The appearance of the finished structure will largely depend upon the quality of the forms, so that not only must we build true workmanlike forms, but they must be so stayed that they will not become deformed under the severe strains due to the heavy hydraulic pressure caused by ramming and the weight of the concrete mass.

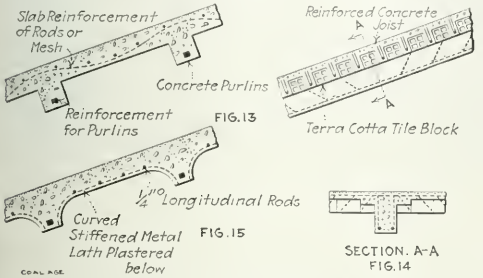
Class of Wood—In selecting a lumber, choose one which will not warp too readily, is not too hard to be easily workable, will not split when the forms are removed and which is also cheap. Spruce is an ideal lumber, and hemlock is coming into use because of its cheapness, but the

latter splits too readily to be a good material for forms. Cypress and yellow pine are suitable materials, but the latter is rather expensive.

Slab and Beam Centering—For forms supported on structural steel, ⅝-in. lumber may be used. Various methods for carrying the centering on the steel are in vogue, the commonest being to carry slab forms on beam boxes and suspend same with wire ties.

For the beam and slab construction, such as is shown in Fig. 13, one-inch material with 2x4-in. framing and 4x4-in. shores is suggested, as shown, Fig. 5.

A typical section of forms for a column is shown in Fig. 8. For octagonal columns the same forms are used



FIGS. 13, 14 AND 15. REINFORCED-CONCRETE ROOFS

with triangular blocks between the frames and the planking.

New Coal Fields in Western Canada

BY PHILLIPS THOMPSON*

D. B. Dowling, of the Canadian Geological Survey, recently visited some new coal fields concerning which the survey had previously but little information. Among these were three small areas on Flathead River, B. C., a newly opened field on Saskatchewan River, east of the Brazeau coal field; and the Coteau in southern Saskatchewan.

One of the Flathead areas which is near the boundary appears to be the most important of these fields. It is a basin of rocks similar to the Crows Nest, but restricted in area to a few square miles. In this basin, seams of 20, 30 and 50 ft. are exposed by opencuts and prospecting tunnels and a very large tonnage can be safely expected. The seams dip at angles of about 20 deg. and are easily mineable. In the center of the valley, 20 miles north of the boundary, a block of these rocks on edge was also found, and the 50-ft. seam has been traced for two miles in a north and south direction. This is probably the extent of those measures. The third locality being prospected is near the North Kootenay pass and is a block recorded by Doctor Dawson, but is probably not so extensive as he supposed. Seams of 6, 12 and 18 ft. are exposed by tunnels. A mass of coal near the fault line is claimed to be the 50-ft. seam.

The coal field on the Saskatchewan is on the line of the Canadian Northern Ry. that is being built west from Stettler. Outside the break marked by the Brazeau hills, the Edmonton formation is brought to the surface and a 10-ft. seam of domestic coal is exposed beneath the railway grade, near the mouth of Shunda Creek. Inside the Brazeau hills, Kootanie rocks are exposed, dipping west at about 20 deg. and four coal seams of 7, 14, 7 and 4 ft., respectively, are being opened for mining at the railway grade. A vast quantity of coal lies above this level, and it is believed that at one place between Shunda Creek and the Saskatchewan, the uprises from the main entry will measure 6000 ft. at right angles to the entry.

The fuels of southern Saskatchewan are found south of the main line of the Canadian Pacific Ry. The nearest coal supply to Moose Jaw, at present known, is south of Lake Johnston, and outcrops on the banks of the Lake of Rivers. This is a seam of about 8 ft. of lignite, which appears to be a good fuel.

G. S. Malloch continued his examination of the Groundhog coal basin, in British Columbia, and determined the southern, eastern and northern boundaries of the area in which coal-bearing strata occur. The southern boundary is situated near latitude 56 deg. 50 min.; the eastern follows the Dooti fork of the Skeena to Shawnee Lake, thence to the valley of the Chatakutahn, from which it passes over a flat divide to the Chuayetz fork of the Stikine and thence over another divide to the east fork of Clappan River. The northern boundary is, approximately, latitude 57 deg. 30 min. Information given by prospectors leads to the belief that the western boundary runs up the east fork of the Nass River and over a divide to the main fork of the Clappan. The dimensions of the field are, therefore, roughly 30 by 45 miles; but in parts of this area the coal-bearing rocks have been removed by erosion.

While many new outcrops were discovered last season, no marked improvement in quality was noted, quartz or calcite veinlets being present in nearly all the seams and niggerheads and numerous thin beds of bone occurring in many of them. Proximate analyses of nine samples, from different localities in Groundhog basin, made in the laboratory of the mines branch, showed great variations in quality, the percentage of fixed carbon ranging from 40.81 to 80.25, the majority of samples, however, carrying upward of 60 per cent.

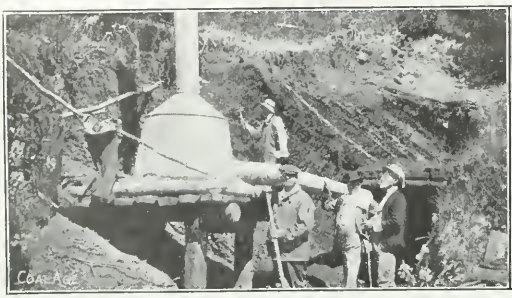
J. D. Mackenzie examined about 250 square miles in southwest Alberta, including most of the foothills area between the valleys of the South Fork River and Pincher Creek. The well known coal measures of Blairmore and Coleman, in the eastern part of the Crows Nest Pass, extend in part southward into this district, and an investigation into their extent and structure shows that there is a considerable amount of coal in this area that can be worked when railway transportation becomes available.

W. W. Leach made a detailed examination of the country covered by the Blairmore map sheet, an area of about 12 to 17 miles, including practically all the producing mines of the bituminous coal fields on the Alberta side of the Crows Nest Pass. Sufficient information was obtained to map closely the outcrops of the coal-bearing beds and the position of the major faults, rendering it possible to represent accurately the location of the coal measures and the quantity of coal available.

Nothing tends to shorten the life of a rope so much as bending and unbending on drums and pulleys which are too small. This fault is more often encountered in haulage drums and pulleys than in hoisting arrangements. The drums of hoisting engines and the head gear-pulleys are generally more than 100 times the diameter of the rope, which, according to many rope experts, is the minimum size of pulley for six-stranded seven-wire ropes. Head-gear pulleys should not exceed 18 ft. in diameter. If over this dimension they become unnecessarily heavy and lead to trouble and excessive local wear.

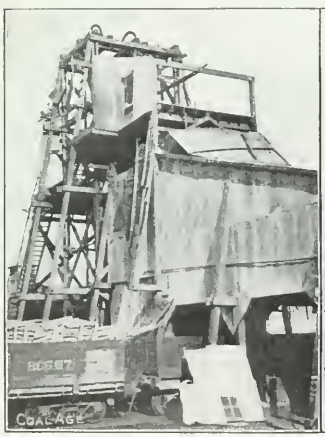
*Toronto, Canada.

SNAP SHOTS IN COAL MINING



VENTILATING A PROSPECT TUNNEL IN BRITISH COLUMBIA

ELKRIDGE POWER HOUSE, NEAR ELKRIDGE, W. VA.



WRECK OF THE W. C. M. CO.'S TIPPLE, AT FRANKLIN, KY.

SURFACE WORKS AND COKE PLANT OF THE ISABELLA CONNELLSVILLE COKE CO. HEIGHT OF HEADFRAME, 180 FT.

GENERAL VIEW OF THE WORKS

TOWNSITE AND COKE OVENS

TWO VIEWS OF THE SUNNYSIDE MINES IN UTAH

Kentucky Mines and Workmen's Compensation

By K. U. Meguire*

SYNOPSIS—The author describes the advantages of that form of compensation which divides the losses evenly among the operators of the state, regardless of the mine at which the accident took place. He compares this with the employers' liability decisions, which are satisfactory to no one but the lawyer who, as a result of the present jury system, is the principal person to be compensated.

In at least 37 of the states of this country there have been adopted or are now under consideration, laws providing workmen's compensation and practically abolishing the old common-law defences, with which the employer could frequently meet suits for personal injuries which arose from accidents to men at work. In 15 of these states, the new system is now in operation; in the other 22, the subject is being considered with a view to legislation. But in Kentucky as yet, personal-injury suits still multiply; courts are clogged; all the other evils of the old era flourish mightily, and no official notice has been taken of what is an epoch-making change all over the civilized world.

Compensation Is Greatest Factor in Social Evolution Since Civil War

The principle of workmen's compensation is declared to be the greatest factor in social evolution since the Civil War; its embodiment in modern law is declared to mark an important step in industrial evolution. Certainly it has been the most prominent feature of labor legislation all over the world for several years. Patterning to a degree after the European nations, the United States Government first adopted this principle for compensating accidents at the naval stations, arsenals and in the limited sphere of federal jurisdiction. Later, one by one, the various states, led by Maryland, have adopted laws, extending this protection to the more numerous individual corporations.

I shall not discuss the abstract principle at length. Its essential value rests in the distribution of the economic loss arising from an accident by removing this loss from one or several employers and employees and dividing it among all the persons engaged in the industry in question, thereby placing that loss finally on the consumer in the form of a slight increase in price on every unit of manufacture which he buys.

The Evils of Employers' Liability

The benefits of workmen's compensation are not yet as certain as are the evils of employers' liability, which it practically supersedes. The old scheme of law devised in England at a time when materials were manufactured by small groups of workmen under the personal direction of the employer, relieved the latter of liability for damage arising from an accident, where the negligence of the injured workman or that of a fellow-employee contributed toward the injury. With the radical change in industrial conditions due to the introduction of modern machinery, the division of labor, and the grouping together of large armies of workers, there came greater danger of accident and greater difficulty in placing responsibility therefor, and it has gradually dawned on the minds of men that negligence is an unavoidable factor in modern industry, and that there will be less disturbance of business and less hardship on human beings when its consequences are borne by the entire industry and not by one or several individuals.

By abolishing the old defences of the employer, the new order of things seeks also to do away with personal-injury suits altogether, to relieve the state of expensive litigation, which now congests the courts, to ease the employer and employee alike of the uncertainty and inconsistency of jury verdicts, to save the employee heavy court costs and lawyers' fees; to exempt the employer from loss of time in court attendance, and, finally, to clear the whole industrial horizon of the ill-feeling invariably attendant on personal-injury actions.

The Uncertainties in Workmen's Compensation

In escaping these known evils, we may expose ourselves to others, which are yet unforeseen. The experience of the 15 states which have compensation or state insurance laws is as yet too brief to have bared all the weaknesses of the new system. In Germany, we are told, the costs of administering the state's industrial insurance are so great as to be burdensome to the industries it was established to protect. In this country, from the mass of data and argument collected by the Bureau of Labor and by private interests, such as the casualty companies, it is impossible as yet to form even an approximate estimate of the cost of compensation.

Nor is the time yet ripe to appreciate the full effect which the system will have on the relations between labor and capital. Even the legality of the various state laws or vital parts thereof is still in question, numerous cases instituted to attack these laws in a number of states being still pending.

It seems to me that the disposition of the large sums of money collected from the various industries to compensate their injured employees must be safeguarded with the utmost care to prevent widespread fraud and graft. That, in addition to the danger of waste and corruption, there is likely to be a continual struggle between labor and capital as to the amounts to be fixed for compensating the several classes of accident, the former seeking to increase and the latter to decrease these amounts unduly, and bringing into play to accomplish these ends all the disorganizing methods of political chicanery.

Whatever be the ultimate cost in money, strife and corruption, the ills of the employers' liability system seem to me so great and the relief promised by workmen's compensation so tangible and attractive that I look for the automatic compensation method to prevail in every state in which the so called hazardous occupations are carried on.

The loss of the entire United States through work accidents is now estimated at about $250,000,000 annually. The figures would convince *economists* that a deficit

*President, Harlan Coal Mining Co., Coxton, Ky.

Note—Abstract of paper read before the Kentucky Mining Institute, Lexington, Ky., May 17.

of such magnitude should be distributed with care, so that individual employers or employees be not swamped by an accident, while their fellows enjoy temporary immunity.

The Employers' Liability Is to the Lawyer Rather Than to the Employee

But economists cannot do much to enact or defeat compensation. For the employer, the strong argument for compensatory laws is furnished by the inconsistency and injustice of many jury verdicts. And on the other hand, the injured employee or his dependents, while they may usually rely on sympathy from a jury, receive little or none from damage-suit lawyers; so that after they have collected a judgment—probably excessively large—against an employer, and after they have paid their 50 per cent. contingent fee, they may have a net balance to their credit amounting to much less than the fair compensation given for injuries by the new system. Indeed it may be said with almost entire truth that under the past laws the principal liability of both employer and employee was the lawyer, rather than the accident.

The coal-mining business of Kentucky is now the second largest of the state's productive occupations, exclusive of agriculture. The gross value of output is more than $16,000,000 per annum, and its importance as an industry in Kentucky ranks next to that of the distilling of whiskey. In addition thereto, it yields to the transportation companies a revenue in freight somewhere between $12,000,000 and $15,000,000 within the boundaries of Kentucky alone, and further revenue to connecting lines serving a territory extending from the far Northwest to Florida and the Gulf of Mexico. Its aggregate payroll, amounting to about $13,000,000, maintains nearly 25,000 employees and their families, and spreads through channels of trade in a hundred different directions.

Not only has the coal industry already assumed this magnitude, but it will soon outstrip all other productive industries of Kentucky, barring agriculture alone. Present mining developments along Kentucky River, the upper Cumberland and Big Sandy Rivers assure that the 20,000,000-ton mark will soon be reached.

The Low Mining-Accident Death Rate in Kentucky

But there is another side to this picture of prosperity and growth, and the more sensitive public conscience of this day will not allow this unattractive side of the picture to escape scrutiny, or its meaning to remain uninterpreted. This side of the picture is an exhibit of the toll of human life and the destruction of health and efficiency, with a consequent loss of money to employers and employees alike, and an added burden imposed on the state by an increase in the ranks of paupers and other public charges.

It is true in Kentucky we may console ourselves that our record of mine fatalities compares favorably with the averages for industry through the entire United States and even bears comparison with the figures from states in which the mining industry has been for some years the subject of much remedial legislation.

The latest publication of the United States Bureau of Mines, shows that in all the mines of the United States the total deaths in 1912 were fewer than in any year since 1906, and conspicuously fewer per 1,000,000 tons of output or per 1000 men employed. But while all the mines of the country killed 4.29 employees per 1,000,000 tons, Kentucky during the same year killed only 3.25. And while the nation's mines killed 3.15 employees per 1000 on the payrolls, Kentucky's mines killed only 2.08 per 1000.

Amount and Manner of Compensation

The laws of the 15 states in which compensation is already required by law, and also the act of our neighboring state, West Virginia, effective May 22, impress us, on examination, with the simplicity of the problem of compensation for fatal accidents. The range of the compensation fixed by the various states is not wide, extending from a minimum of three years' average earnings, or $2000, to a maximum of six years' average earnings, or $6000.

In nearly all states, the commission is instructed to disburse the compensation in weekly or monthly payments, as in the discretion of the commission may best suit the particular case. I cannot overlook an opportunity here to emphasize the merit of this method of payment over the system that now results. After several years of controversy, the dependent family secures by jury verdict a lump sum of money, which is shared with their attorney. They do not have the proper knowledge or experience to handle it, and so it is with them, in most cases, for only too brief and fleeting a period.

The Compensation for Partial Disability Is the Uncertain Factor

A compensation of $3000 as the average economic loss of a death in Kentucky mines would have cost the industry as follows under a State Compensation Law:

1910, 84 lives	$252,000
1911, 44 lives	132,000
1912, 52 lives	156,000

and considering the present premiums on casualty insurance, the industry could well afford to meet the bill. I will say, however, that attractive as the new system appears to me in general, I think we will have to jump in the dark in regard to nonfatal accidents, for I see no means of ascertaining, within any bounds of reasonable certainty, what the bill for minor accidents will be. While several of the annual reports from the state mining inspector give the number and classification of nonfatal accidents, it is certain that under the system of compensation for all injuries, the list of such injuries may soon become appallingly lengthy and the amounts demanded for these accidents will exceed those claimed for deaths and total disabilities.

Though the operator will, under the proposed legislation, eliminate excessive jury verdicts, he need not be too confident that workmen's compensation will necessarily afford less expensive insurance than he is now able to purchase from the companies that are embraced in the so called Conference, much less that it will be cheaper than that furnished by several outside companies, which now make rates as low as 90c. per $100 of annual payroll, and did until the last year or two, write policies for as low as 7 mills on the dollar.

Not cheaper insurance, but more complete protection is due the operator, for the policies now written by the companies to indemnify operators for damages recovered under their present employers' liability, indemnify only within certain limits, and when a jury verdict is rendered against the operator, assessing damages greater than the

maximum fixed in the policy, either due to the loss of one life or the results of one accident, the operator is left to pay a sum which may be greatly in excess of his stipulated maximum.

But this danger is not the only serious objection to the present indemnity policies, as the loss of time and money due to court attendance is expensive alike to the defendant employer and to the commonwealth, and friction between employer and employee is continually aggravated by the personal negotiation of claims for damages arising from a death or from the breaking of a finger. The employee is prone to feel that if he does not take the claim to court, he will be a recipient of charity, and not justice.

A State Commission To Administer Insurance Funds

Therefore, when we come to consider the advantages of the compensation system, let us assure ourselves at the outset that to achieve satisfaction for either employer or employee, it must be reasonably fair to both; that it is not merely a device by which the former may escape being "soaked," nor a scheme of graft by which the latter may recover money for accidents numerous and trivial. Let us bear in mind that the ideal condition is one whereunder all accidents will be fairly compensated, with the least possible interruption to business, by the payment of fixed sums of money in such manner as is best suited to the beneficiary. This should be paid promptly, but with due care, by a state commission, which body should be free of the influence of party politics. Payments should be made out of general funds collected from the several hazardous industries and carefully guarded.

I strongly recommend that the Kentucky Mine Owners' Association, either alone or in conjunction with the body representing the southern Appalachian coal operators, constitute a committee to advise with the framers of a compensation act. If this be done, Kentucky will be as conspicuous in her success in compensating mine accidents, as she now is in reducing their frequency.

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The Belle Valley Mine Explosion

The following letter from J. C. Davies, the state mine inspector of Ohio to the governor, James M. Cox, relative to the Belle Valley mine explosion, needs no further comment:

On the evening of May 17, at 11 p.m., the State Mining Department was notified that an explosion had occurred in the Imperial Mining Co.'s Imperial No. 3 mine at Belle Valley, and that a number of men were entombed as a result of the explosion, the news having been brought to the surface by four of the men who though employed in the mine at the time had escaped the force of the explosion.

Upon arriving at the mine, I ascertained that the bodies of the entombed men had already been reached. Immediately following the explosion, District Mine Inspector Abel Ellwood of the fifth inspection district, in conjunction with General Superintendent Thos. Matthews of the Imperial Mining Co., made arrangements with the Pennsylvania R.R. Co., to run a special train from Cambridge to Belle Valley, carrying rescue equipment and medical aid.

District Mine Inspectors Hill, Grogan, Morrison, Devore, Werker and Wheatley, were also notified of the explosion, and with myself went to the mine to render such assistance as was possible. Upon the arrival of the special train, rescue parties were organized to enter the mine. The ventilating appliances were not deranged, and this led us to hope that at least some of the entombed might be still alive.

Previous to the arrival of the rescue equipment, Henry Fairhurst, of Belle Valley, and several others entered the mine to attempt to rescue the injured. They succeeded in saving J. R. Yeager, who was badly hurt, but Fairhurst died from the effects of breathing the afterdamp.

Superintendent J. B. Morris of the Caldwell mine, John Smolley of the Laura mine, and others, formed a rescue party and penetrated the mine to the seat of the explosion, where they encountered the bodies of several of the victims.

Upon the arrival of myself and the other inspectors, we found the work of the recovery of the bodies well under way, several of them having been brought to the surface. We entered the mine, made our way to the vicinity of the trouble, and rendered what assistance we could, and continued at the work until the last body was recovered, which was about 11:30 Sunday morning.

Upon our arrival at the mine early on Monday, we found Jas. W. Paul, the engineer who is in charge of the federal station at Pittsburgh, and two of his assistants, had arrived for the purpose of making an investigation for the federal government, and to render all assistance.

In company with the above and John Moore, state president of the United Mine Workers of America, Lee Hall and William Thompson, vice-presidents of the same organization, we entered the mine and proceeded to obtain evidence that would enable us to determine as nearly as possible where and what caused the explosion. Returning to the mine on Tuesday, we completed our investigation. A report of this party of inquiry is herewith attached to this report.

* * * * *

Mine Inspector's Report

We have today completed an examination of the O'Gara Coal Co.'s Imperial No. 3 mine., Noble County, O, with a view of determining the cause of the explosion in that mine on the evening of May 17, 1913

This explosion occurred between six and seven, p.m., at which time twenty men were in the mine. Of this number 14 were killed, and several others injured. The number of fatalities was later increased to 15 by the death of Henry Fairhurst, who was overcome while attempting to rescue one of the injured men.

As a result of our investigation, it is our opinion that the explosion originated in the vicinity of No. 5 room, off No. 7 south entry, and that it was produced by the ignition of a body of firedamp in or near this room. The force of the explosion seems to have radiated from this point.

The direction of greatest force was from the vicinity of No. 5 room, in No. 7 entry outward through No. 7 entry and through the crosscuts into No. 8 entry. In the latter heading opposite No. 4 and No. 5 rooms, a number of men were engaged in laying a side track and two machinemen were cutting a skip from the east rib of No. 8 south entry. Ten of the victims were found along No. 8 entry; one in No. 1 east entry, just west of No. 8 south; one in No. 1 room in No. 1 east entry, one in No. 7 south entry between No. 4 and No. 5 rooms; and one in No. 1 room in No. 4 east entry. None of them were mutilated to any considerable extent, but all except the one in No. 1 room in No. 4 east entry were severely burned.

Considerable marsh gas is generated in this section of the mine, and an examination of the workings in the vicinity of the scene of the explosion on May 19, and 20, showed traces of firedamp in most of them.

In our investigation we found no dates marked in the working places later than May 16, indicating that these places had not been examined by the fireboss on the date of the explosion. Evidently, the ventilation had been cut off this section of the mine for a considerable time, thus permitting a body of firedamp to accumulate, and some of the workmen, presumably the one found between No. 4 and No. 5 rooms, in No. 7 entry had entered No. 5 room wth a naked light, igniting the gas.

APPROVED

J. C. DAVIES,
Chief Inspector of Mines.

THOS. MORRISON,
Inspector 9th District.
L. D. DEVORE,
Inspector 10th District.
R. S. WHEATLEY,
Inspector 12th District.
W. H. WERKER,
Inspector 8th District.
THOS. F. GROGAN,
Inspector 11th District.

When testing for gas with a safety lamp, remember that (1) The height of the cap depends not only on the amount of gas present, but also upon the size of the testing flame. (2) That a 1½ to 2 per cent. mixture produces quite a large, though very delicate cap, with a testing flame having a small white apex. (3) That density is a better indication of percentage than height.

Concrete in Mine Construction

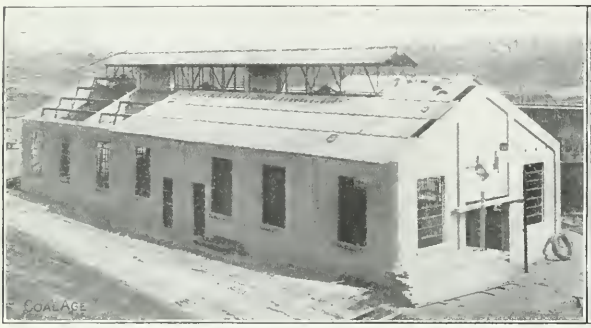
By A. S. Allard*

SYNOPSIS—The modern coal-mining plant uses a large amount of concrete above and below ground to assure permanence and safety from fire. A concrete shaft costs only about one-third more than one cased in wood. The author describes three kinds of concrete shaft-bottom linings and details the appropriate places for their respective use.

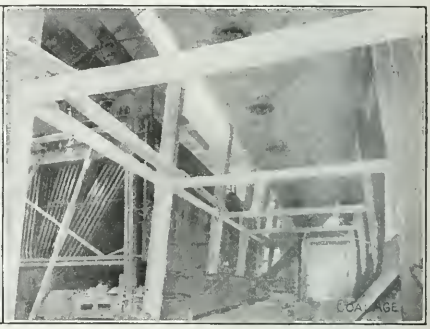
Within the last few years, a great many important advances have been made at the modern coal plant in the use of concrete for buildings, shaft-lining walls and construction inside the mine. The appearance of the up-to-date plant is wonderfully improved with its concrete mine buildings, consisting of the power plant, hoist house, repair shop, miners' bath house, fan house, supply house, powder house and outside stable. These fireproof structures with reinforced-concrete walls, concrete floors and cement roof covering are permanent and involve little or no expense for upkeep during the life of the plant.

The boiler house, with its reinforced-concrete chimney towering to a great height, is substantial and attractive in appearance as compared with an installation of steel stacks which are subject to deterioration from rust and require frequent painting and attention; while no expense for maintenance after first cost is necessary on a concrete stack. Coal-storage bins and water-supply tanks are now erected of reinforced concrete, instead of wood or steel.

This material now replaces the wooden walks and platforms of the steel tipple and the members themselves are protected from rust and mine gases with a covering of the same material. Swimming tanks built of concrete prove a source of amusement and recreation for the employees at a coal-mining plant.



View of Concrete Machine-, Blacksmith- and Carpenter-Shop Building



Reinforced-Concrete Bunker; Capacity, 250 Tons

Granary

Mule Stable

Shaft Walls

As a fireproof and permanent material for the lining of shaft walls, concrete is without a rival. From comparative cost data, I find that the price per vertical foot of a completed concrete-lined shaft is about one-third more than for one encased in wood. As timbers have to be renewed after a short period of time, this additional cost in first construction is soon absorbed by the savings in repair bills. Of all the numerous designs for concrete shafts, rectangular, circular, elliptical, etc., the shaft with straight sides and circular end walls is the most economical. The end space is utilized for pipeways

*Chief engineer, Bunsen Coal Co., Adams Building, Danville, Ill.

Abstract from a paper read at the Mining Conference in connection with the dedication of the Transportation Building and of the Locomotive and Mining Laboratories, University of Illinois, May 10, 1913.

or stairways, and excavation and concrete yardage is reduced to a minimum. The circular end walls adequately resist the pressure of the strata and of the water, forming as they do a concrete arch from the surface to the shaft bottom. However, the sidewall pressures have to be resisted by the thickness of the concrete lining, and this must depend upon the nature and depth of the strata penetrated. Self-sustaining measures, such as rock, sandstone, slate or good shale, generally require a wall of from 6 to 9 in. in thickness. This is sufficient for the anchorage of the buntons. A heavy fireclay or wet sand would require a much thicker wall.

Shaft-Bottom Linings

Shaft-bottom linings can be constructed in one of three ways: First: A wall of rectangular section can be built along either side supporting I-beams. These can be covered with reinforced-concrete slabs having a thickness of three or four inches. The depth of the beam is usually 6 or 8 in. for a single-track span, and from 12 to 18 in. for that of double track, but the size and weight of the beam selected depends upon the nature and condition of the room. My practice has been to place the beams on 4-ft. centers, covered with slabs 2 ft. in width.

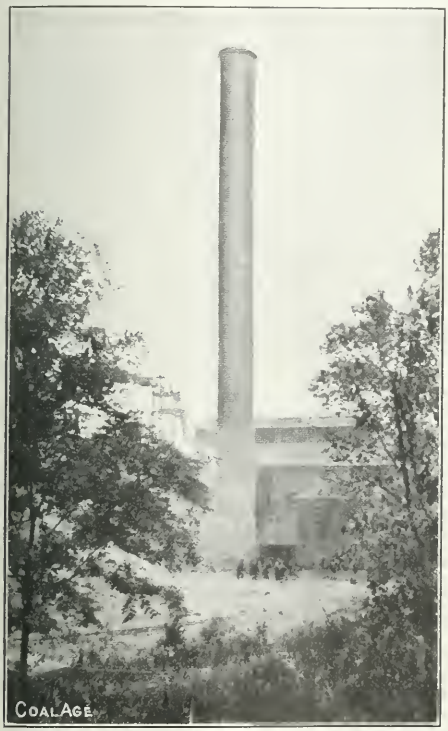
Second: A poured-concrete arch with concrete sidewalls. Third: The concrete-block arch, which is composed of plain concrete blocks molded in steel forms with joints disposed on two radial planes. Blocks are laid up in the arch crown from each side wall with cemented joints, supported on a light framework until the key piece is placed and one section of the arch is thus completed.

Provision is made in molding to provide blocks of different lengths so that joints are broken on alternate courses. Blocks 6 in. thick for single- and 8 in. for double-track spans, and about 18 in. long make a convenient size for men to handle. This method of arch construction is much cheaper than that of the solid-poured sections, for it eliminates the cost of expensive forms and the time necessary for the transporting and placing of the wet mixture.

The first system is preferable at the back of the shaft where it is necessary to provide clearance room for the empty-car lifts and where cutting into the roof with an arch of large span would prove expensive.

The second, or poured-arch section, is generally adopted for a distance of from 10 to 15 ft. on each side of the shaft, the work being connected to and supporting the shaft walls. By continuing the arch with concrete-block construction for the main landing and empty runarounds, an ideal and fireproof shaft bottom is made.

[All the above illustrations are of erections at the Universal mine of the Bunsen Coal Co., Clinton, Ind. Other views of the same plant can be found in Vol. I, pp. 234-236, and in Vol. 3, p. 115.—Ed.]



The 175-Ft. Concrete Smoke-Stack. Lined with Brick for Lower 75 Ft.

Concrete Mine Office

Ventilating Shaft at Universal Mine

COMING SOCIETY MEETINGS

Mine Inspector's Institute of the U. S. A.—J. W. Paul, secretary, Pittsburgh, Penn. Annual meeting at Birmingham, Ala., June 10, 11, 12 and 13.

Coal Mining Institute of America—C. L. Fay, Wilkes-Barre, Penn., secretary. This institute holds its annual meeting at Pittsburgh, Penn., on June 17 and 18.

Michigan-Ohio-Indiana Coal Dealers Association—G. F. Nigh, secretary, Columbus, Ohio. This association holds a joint annual meeting with the order of Kokoal at Cedar Point, Ohio, June 17, 18 and 19.

Order of Kokoal—C. E. Lester, secretary, No. 1 Broadway, New York City. This society holds a joint annual meeting with the Michigan-Ohio-Indiana Coal Dealers Association at Cedar Point, Ohio, on June 17, 18 and 19.

West Virginia Coal Mining Institute—Prof. E. N. Zern, secretary and treasurer, Morgantown, W. Va. This institute holds its annual meeting at Morgantown, W. Va., on June 24, 25 and 26.

American Institute of Mining Engineers—This institute holds its next annual meeting at Butte, Mont., on Aug. 18 to 21 inclusive. Bradley Stoughton, 29 W. 39th St., New York City is secretary.

The Situation in West Virginia

The West Virginia Mining Association, W. N. Page, Pres., has issued the following statement regarding the labor situation there:

"The United Mine Workers of America are making capital out of the forthcoming investigation by the Senate subcommittee of conditions in the coal mines of West Virginia. Thomas Haggerty, the international board member, who has headquarters in this city, issues frequent bulletins recounting the success of his efforts to 'settle the strike on New River,' and of his trips into that region 'to bring the miners and operators together,' when, as a matter of fact, no strike exists on New River, and Mr. Haggerty has never left Charleston. Nor have the miners on New River any desire to strike.

"The most convincing evidence that a strike exists is the fact that the production of the mines on New River for the six working days ending Friday, May 30, was 123,120 tons shipped by the C. & O. alone, which is about the average for the last six months.

"The miners are being told that the Senate subcommittee is coming to put all the forces of the United States Government to work to insure them the full enjoyment of their rights to join the Union, the inference being that they had better join at once and so avoid future trouble at the hands of that organization.

"The Union is also making a play to the galleries by ostentatiously manufacturing tents in a conspicuous place here to 'shelter the strikers on New River.'

"Incendiary articles abusing Governor Hatfield for his efforts to restore normal conditions are being sent to daily papers in the state by ex-Senator Sam B. Montgomery in behalf of the Union, accompanied by letters offering to pay advertising rates for their publication. The Union has ample funds, for the assessment of 50c. a month on all members for use in West Virginia is still in force. This alone yields at least $2,250,000 a year. In addition the United Mine Workers of Illinois in the last week in February voted to give $900,000.

"As the Union has but 3200 members in a total of 79,781 mine workers in the state, it is essential that this should be one of the cases in which 'money talks.'

"These activities have two objects: First, to make the miners believe the Union is carrying everything before it in the state, and that if they do not join at once they may find themselves out of a job; the second is to impress the Senate subcommittee with the importance of the Union and its magnanimous attitude toward the operators in offering its good offices to 'settle' a 'strike' that never existed."

Coal Mining Institute of America

The meeting of the Coal Mining Institute of America is to be held in the Assembly Hall of the Engineers' Society of Western Pennsylvania, 25th floor of the Oliver Building, Pittsburgh, June 17 and 18.

The following is the program beginning on Tuesday afternoon:

"A Pictorial Survey of the Pennsylvania Bituminous Coal Field." Introduced by John Boileau and illustrated by private maps and numerous lantern slides showing distinctive operating and transportation developments of principal mining companies.

Inspection of offices and appliances of the U. S. Weather Bureau by invitation of Henry Pennywitt, Local Forecaster.

H. C. Frick Coke Co.'s "Safety First" show, demonstrating methods of safety instruction used by this company. Stereopticon and motion pictures, combining instruction and entertainment in a novel and interesting manner.

In the evening there will be a banquet.

On Wednesday in the forenoon a visit will be made to the Carnegie Museum, by invitation and under direction of Dr. W. J. Holland, Curator.

In the afternoon, the Bureau of Mines will either arrange a demonstration at the Arsenal Grounds, or a trip to the experimental mine operated by the Bureau

The meeting was to have been held at Wilkes-Barre, Penn., but the place was changed because so many of the operators and other mine officials were too busily engaged to permit of their attending.

A Government-Approved Mine Lamp

The Ceag* portable electric mine lamp has the distinction of being the first to be approved by the United States Bureau of Mines. The approval was granted on June 3 and carries with it the permission to attach a plate to each lamp, reading as follows:

"Permissible electric hand lamp, United States Bureau of Mines, Approval No. 1."

The approval is given under the restriction that any modifications the manufacturers may desire to make at any future date shall first be submitted to the Bureau, in order that they may be subjected to the necessary tests. The Bureau also reserves the right, should occasion demand, to rescind its approval at any time. The use of unapproved changes in the design and construction of the lamp will be considered as sufficient reason for withdrawing the approval, as will also any developments which may appear in practical use that prove it to be unreliable, unsafe, or easily made so.

The Harlan Coal Field in Kentucky

We are informed by Frank A. Carr, of Hendersonville, N. C., that two of the photos used in our article under the above title (See COAL AGE, Vol. 3, No. 21, p. 796) were copyrighted by him. A notice to this effect was unfortunately overlooked.

*For detailed description of this lamp see "Coal Age," Vol. 2, p. 393.

Gates for Run-of-Mine Coal

By F. V. Hetzel*

SYNOPSIS—The disadvantages and inconvenience of the slide gate are well known to mining men. Various types of undercut gates are here described and illustrated.

Most men in the soft-coal business know that it is almost impossible to control the flow of run-of-mine coal by an ordinary slide gate. There are several reasons for this.

First: A gate opening which will pass run-of-mine coal without choking is necessarily large and the weight of the gate plate makes it hard and slow to handle.

Second: If the gate in closing comes down on a lump, the small coal and slack continue to flow under the edge

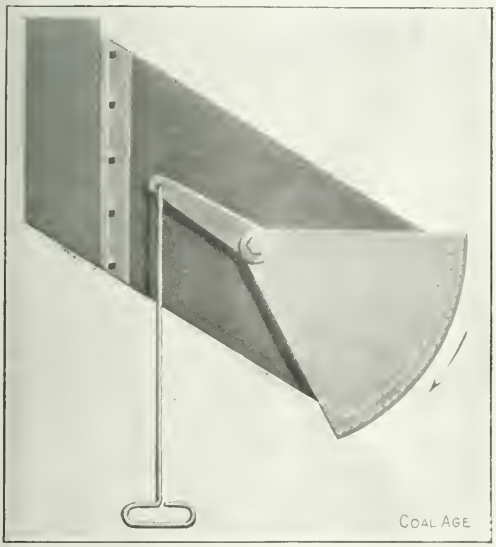


Fig. 1. Pivoted Undercut Gate in Its Simplest Form

of the plate; to stop this the gate must be repeatedly lifted and dropped until it happens to miss all large pieces. Slide gates with rack-and-pinion movement have been used to give the operator a better control of the gate and large plates are sometimes fitted with steam or air cylinders to force the gate down in spite of large or hard lumps.

In principle, however, all such gates are inferior to those of the undercut type and particularly to those which work on a pivot. In its simplest form such a gate is shown in Fig. 1. In opening, the curved plate drops as is shown by the arrow and the coal flows over the top edge. In closing the gate rises and either cuts off the flow partially at an intermediate point or completely when in the position shown in the figure. It is evident that no lump can ever stick this device, because it would be lifted by the upward movement of the curved plate and either stay in the chute or else fall over the edge of the gate.

Tipple Gates Are Usually Counterbalanced

For tipple work the undercut gate is usually counterbalanced to make the movements easier and more rapid,

Fig. 2. "Local Coal" Chute Fitted with Geared Gate

Fig. 3. Run-of-Mine Loading Bin Fitted with Two Large Chutes

*Philadelphia, Penn.

and for large gates the motion is geared for operation by hand chain or handwheel.

Fig. 2 shows a "local coal" chute fitted with a geared gate, and Fig. 3 shows a run-of-mine loading bin fitted with two large chutes. Here the lowering of the chute aprons and the opening and closing of the gates are all under the control of an operator on the elevated platform. This control is so accurate that the loader can deliver the coal at the rate of 20 tons a minute, or he can load the car to its limit by dropping the coal a bushel at a time if he pleases.

Fig. 4 shows the assembly of such a gate with its chute apron, and Fig. 5 illustrates a geared undercut gate set up on the front of a tipple. The cover plate over the chute is hinged and loose; it serves to keep the coal from becoming wet and frozen in cold weather, but it does not prevent the gate from pushing lumps upward in the act of closing.

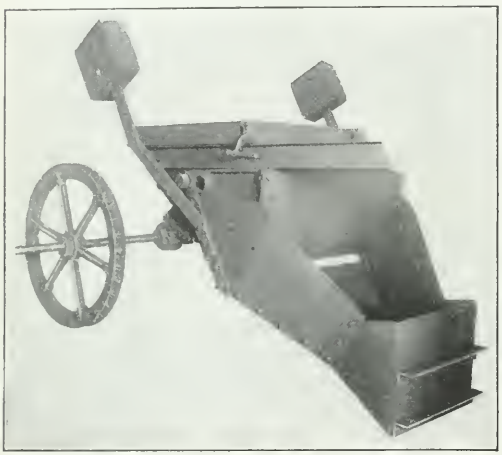


Fig. 4. Assembly of Gate and Chute Apron

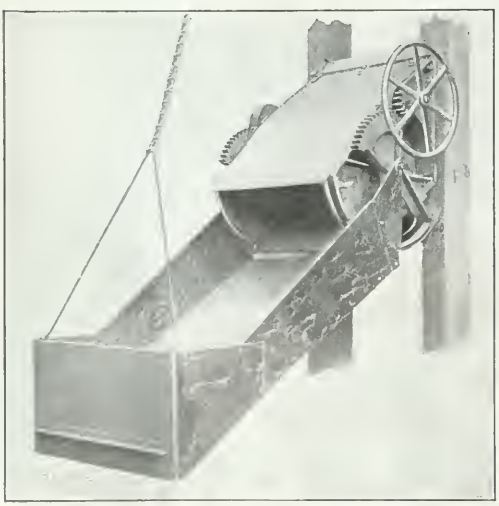


Fig. 5. Geared Undercut Gate for the Front of a Bin or Tipple

At some mines the disposal of rock is a serious problem. If it is put into a bin it is quite a job to get it out again. A large gate is a necessity in such a case.

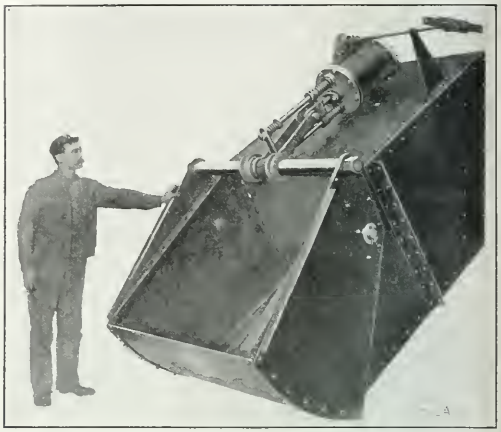


Fig. 6. A Heavy Steam-Actuated Rock Gate

Fig. 6 shows a rock chute 54 in. square in cross-section with a steam-operated undercut gate attached. This is extra heavy in construction and will handle rock as big as a man's body. The gate is controlled by a small hand lever on a four-way valve and is quick and certain in operation.

Mine-Inspection Service in Illinois

During the year 1883, a law was passed creating the office of state inspector of mines. Candidates for this office were required to furnish evidence satisfactory to the state mining board that they were citizens of the state, at least thirty years of age, and that they had a practical mining experience of ten years. All candidates were required to pass an examination to show what practical and technical knowledge they possessed of mine surveying; mining machinery and appliances; the proper development and operation of coal mines; ventilation in mines; the nature and properties of mine gases; the geology of the coal measures in this state; and the laws of this state relating to coal mines.

During the year 1911, the subjects of first aid to the injured and mine rescue methods and appliances were incorporated in the law; but this was the only change made in the law in twenty-eight years. During the same session of the legislature, a law was passed placing all state employees under the civil service rules. This included the state inspectors of mines. Although Illinois is not in the lead in coal production, it has taken an advance step in legislation over all other states in matters pertaining to mining and particularly to the method of appointing mine inspectors. Prior to this time, the inspectors were subject to the changes incident to a change of administration.

The inspectors are required to send to the Civil Service Commission monthly reports stating the number of

mines examined; and also to the state mining board a report of the mines examined during the month. I submit herewith a copy which the inspectors are required to fill out, after making an examination of a mine.

Shipping or Local

ILLINOIS COAL MINE INSPECTION SERVICE

Report of **State Inspector of Mines**
For the **District**
To the Chief Clerk of the State Mining Board,
Springfield, Ill.

Sir: I have this day of .191 inspected mine operated by located at County of State of Illinois, and find its conditions as follows: (If mine has changed hands since last inspection, give old name here)

1. BOILERS AT PLANT:
   (a) Condition
   (b) Date of last inspection
2. HOISTING APPARATUS:
   (a) Condition of engine
   (b) Condition of fans
   (c) Condition of cages
   (d) Condition of ropes
   (e) Condition of safety catches
   (f) Checking system
3. FIRE-FIGHTING APPLIANCES:
   (a) Is the water supply for fighting fire underground provided as required by law?
   (b) Where is it located?
   (c) Is the quantity sufficient?
   (d) Is it conducted into the mine by proper sized pipes and are all required hose connections provided?
   (e) Are they extended to cover the fire-protected area?
   (f) Are they properly installed?
   (g) Is the mine supplied with the necessary hose and is it ready for immediate use?
   (h) Are automatic sprinklers properly located and connected
   (i) What is the distance of the nearest underground stable from the hoisting shaft? feet; from the escapement shaft? feet; if the distance is within 1000 feet, are automatic sprinklers properly placed and connected in the stable?
   (j) If the stable is otherwise located, are extinguishers and hand pump buckets kept therein, including entries and passageways into which stable opens, and are they ready for use?
   (k) Give the number of extinguishers Hand pump buckets
   (l) Are barrels of water and pails properly located in each entry or passageway leading to the stable?
   Give number
4. NUMBER OF MEN AND ANIMALS EMPLOYED:
   (a) Men underground (b) Total employees
   (c) Animals
5. VENTILATION:
   (a) Quantity of air in cubic feet at bottom of downcast
   (b) Quantity of air in cubic feet at bottom of upcast
   (c) Quantity of air in cubic feet at last open crosscut of each division or split of the air current
   1st 2nd 3rd 4th
   5th 6th 7th 8th
   (d) Number of employees supplied in each division
   (e) Is sufficient air supplied in every working place throughout the mine?
   (f) Does the mine generate explosive gas in dangerous quantities?
   (g) Did you discover the presence of gas in the main return airway?
6. ESCAPEMENTS:
   (a) How many roads leading to the escapement shaft?
   (b) Are signboards placed indicating the direction thereto at each intersection?
   (c) Are men hoisted from the escapement shaft, or is it equipped with stairs, or both?
   (d) If hoisted, what time would be required to get men out?
   (e) Area of escapement shaft?
   (f) Width and general condition of stairs
   (g) Distance to each landing
   (h) Are there any obstructions in the escapement shaft?
   (i) Is it wet or dry?
   Conditions as follows:
7. TELEPHONES:
   (a) Are they supplied as required by law?
   (b) Number (c) Conditions
8. RECORDS:
   (a) Are the records required to be kept by the Mine Manager, Mine Examiner and Shotfirers in accordance with the law?
   (b) Are maps made and recorded according to law?
   (c) Give date of last extension
9. DOORS:
   Are doors used for directing the ventilating current constructed so as to close automatically?
10. CROSSCUTS.
   (a) Are crosscuts made within sixty feet?
   (b) Are any rooms opened in advance of last open crosscut?
11. EXPLOSIVES:
   Is the law relating to the storing of explosives and the opening of powder kegs observed?
12. TRAVELING AND HAULING WAYS.
   Condition
13. AIRWAYS.
   What is the condition of the main and return airways? Describe in detail
14. PLACE OF REFUGE:
   (a) Are there proper places of refuge on all hauling roads where workmen are required to travel?
   (b) At what intervals?
   (c) Are the top and botom man at their respective posts of duty half an hour before the hoisting of coal begins in the morning and the same time after hoisting ceases for the day?

For the better protection of the lives and health of the employees, would recommend the following:

State Inspector of Coal Mines.
District

To speak of the inspection service of Illinois and fail to mention the names of two men who are yet in the service, and have given to the state and the mining fraternity the best years of their lives, would be unmindful of duty and obligation. There are many men in the state who can bear witness to the many kind acts and assistance given them by Inspectors Rutledge and Hudson, especially men who were anxious to better their condition so that they could become successful managers. These two inspectors are of the broad-minded type of men, kind hearted and generous and by this token have won many friends throughout the state.

Walton Rutledge, of Alton, and Thomas Hudson, of Galva, were both appointed inspectors in the year 1883 and served until 1891 when a change was made in the political complexion of the state administration. In 1897, they were again reappointed and are still serving in that capacity. Mr. Rutledge is the oldest man in the inspection service in the United States and he is famil-

iarly called the Dean of the Service. Following are brief sketches of their careers:

Sketch of Walton Rutledge

Walton Rutledge, inspector, 9th district, was born at Haswell, county of Durham, England, in 1835. At the age of 14 years he began working in the coal mines at that place. After about a year he was transferred to the surveying division, working with the mine examiners a part of the time. In 1854 he came to the United States, locating in the anthracite coal region, where he worked as a miner for two years. He came to Illinois, in 1856, and settled in Alton, which has been his home ever since. Here he worked in the mines until May, 1864, when he enlisted in company D, 133d regiment, Illinois infantry, as first sergeant. Afterward, in the same year, he raised a company which was mustered into the 14th regiment, and served as first lieutenant to the close of the war of the rebellion.

Walton Rutledge

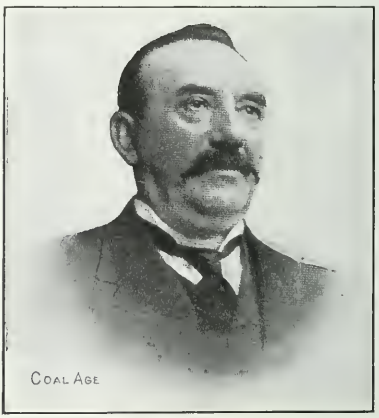
At the close of the war he again went to work in the coal mines near Alton. At the same time he was chosen secretary of the Miners' Benevolent organization, embracing the states of Illinois, Indiana and Missouri, serving that organization for two years. During the session of the constitutional convention of 1870, he was active in securing a clause in the constitution providing for a police regulation for the coal mines of the state. In after years he was a member of a committee of miners to formulate a mining law for the state. After several attempts to secure such legislation he, with others, was finally successful in securing the passage of a mining law at the session of the General Assembly of 1879, but which provided for county inspectors only. In 1883, after the passage of the law creating State inspectors of coal mines, he passed, in the first examination for inspectors, and was appointed inspector for the fourth district. He was reappointed successively each term and held the position until 1894. In 1897 he was again appointed inspector, and is still serving in that capacity.

Sketch of Thomas Hudson

Thomas Hudson, inspector, 2d district, was born in the county of Northumberland, England, in 1846, being now 67 years of age. He attended the schools in the mining districts of Northumbria until he was 13 years of age, when he commenced work in the collieries of the Bedlington coal company, going through the regular courses from trapper boy to miner.

Mr. Hudson came to the United States in 1871, locating at Henry, Marshall county, Illinois. After working two years in the coal mines at Galva, and operating a local mine at Henry, he moved to Streator, LaSalle county, where in 1873 he engaged with the Vermilion Coal Company, as a miner and remained in the employ of that company for ten years.

In 1883 the General Assembly passed an act creating the offices of state inspectors of coal mines in Illinois, dividing the state into five districts, also providing for the examination of candidates for inspectors, by a board of examiners. For some time previous to the passage of this act, Mr. Hudson had been a close student of mining literature, and was fairly well versed in the technical as well as the practical knowledge of coal mining. At the first examination held by the board he successfully passed the examination, and was at once appointed by Gov. John M. Hamilton, as state inspector of coal mines for the second district. He at once transferred his residence from Streator to Galva, the latter being more centrally located in the district. Since 1883 he has been reappointed and commissioned by every Republican governor, and now holds a commission under Gov. Deneen.



Thomas Hudson

The state of Illinois now ranks as third among the coal-producing states. In the year 1883, there were ten million tons of coal produced and twenty-three thousand employees in the mines, and five state inspectors were appointed at that time. At the present time, there are twelve state inspectors and the production for 1912 is over fifty-seven million tons and there are seventy thousand employees in the mines.

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By the use of steel in place of wood for mine timbering waste due to decay, framing and fitting, fire and insects is entirely overcome Steel mine timbers also call for less excavation, cost less to erect, have a greater endurance and tend toward better ventilation. While the first cost of steel is nearly twice that of the wood used for timbering, the ultimate cost is lower, as steel lasts much longer. It can be used again and again and if crushed it has a salvage value.

EDITORIALS

Pyrite in Coal

The action of iron pyrite under heat is not clearly understood. It is commonly believed that when the bisulphide of iron is heated, half the sulphur is driven off but not nearly such a large proportion can be vaporized, at least, under commercial conditions. Valentine has shown that when pyrite is heated for one hour to 1832 deg. F. in the absence of air, it gives up only 26.27 per cent. of its sulphur while at the extremely high heat of 2599 deg. F., which would appear in a furnace fire as a bright white heat, 44 per cent. of sulphur is volatilized after 1¼ hr. of heating. Thus the desulphurization of pyrite is slow and halting.

But while in the absence of air, the sulphur is hard to drive from combination, in its presence, this is easily accomplished. If the pyrite is maintained at a temperature of 1832 deg. F. for one hour, 98.8 per cent. of the sulphur is lost whereas the same degree of heat and duration of time, as has been seen only removed 26.27 per cent. of it when the heating took place where air was excluded.

Hence in a furnace, the sulphur of the pyrite is almost certainly burned away before the compound is even approximated to a monosulphide, and the iron is available therefore, for combination with the lime and alumina to form a slag. Herbert Lang, the author of a book entitled "Metallurgy" writes us as follows: "It is generally held that pyrite ('brasses') of coal become oxidized during or soon after combustion and then certainly appear in the analyses as ferrous or ferric oxide." But he adds: "If the fire were urged at a rapid rate, it is likely that some part of the pyrite would be converted into ferrous sulphide and would appear in the ashes as matte, most probably as small spherical pellets. By vanning the ashes, these spherules might be discovered."

The question arises what is that combustion rate which would produce such a result and the answer is not forthcoming. There is need for a caution which is not always shown by those who argue on this matter. It is far preferable to be non-committal than dogmatic. The temperature, at which Valentine says 98.8 per cent. of the sulphur will be burned out in one hour is that declared by M. Pouillet to be a clear cherry red.

Mr. Lang, in his letter, adds that the intermixture of sulphur compounds whether ferrous sulphides or some other such bodies with whatever portion of the iron was oxidized would not interfere with the scorification of the latter and the formation of slag. This is the condition prevailing in the matting of roasted pyrite ores of lead or copper in a large way, where sulphur is usually left in the roast to the extent of 6 or even 12 per cent. The part not expelled in fusion goes to form matte and its presence does not prevent the forming of slag.

Hence we are not justified, until more exact information appears, in allying ourselves with those who have rejected vehemently the popular idea that pyrite is objectionable. It is *possible* and likely that when sulphur is found in coal, and slag does not form, that the reason is that the iron is held as a sulphate and not in the weaker pyritic bond, but it would be obviously mistaken after what has been said to omit the word "possible" and to fail to grant that another viewpoint might be urged as a feasible working hypothesis. Some analyses introduced to defend the theory that pyrite is non-slagging appear more easily interpretable by the assumption that the sulphur is in the form of a sulphate.

An Ultimate Analysis of Modern Labor Conditions

The labor unrest so strikingly in evidence, not only in this country, but throughout the world wherever industrial development has passed beyond the most primitive stage, is now openly regarded as a serious menace to the prevailing social system. A transitional period is at hand and there is no mistaking the trend of affairs

Tangible evidence of these conditions is found on every hand—in the annual reports of our large corporations which almost uniformly comment on the situation; in the powerful lobbies by which labor is forcing the enactment of class legislation at the sacrifice of every other consideration, and even in the protracted revolution in Mexico, which is, after all, but a futile protest of the masses against the systems of peonage practiced in portions of that unfortunate country.

Capital is being forced into continually granting further concessions each of which is scarcely established before preparations for others are under way; nor does labor show any disposition to recede in times of commercial depression when the revenues of the large corporations are naturally depleted. Obviously such conditions cannot continue indefinitely and the issue *must* be met—sometime, somehow. What is the solution?

Unfortunately no feasible or practical solution has yet been advanced. But in a recent book* we find a clearer insight and a broader exposition of the basic evils responsible for prevailing conditions than seems to have yet been offered. The treatise is based on a series of articles in the *Daily Mail* written by H. G. Wells, an author of international reputation. These precipitated an almost universal discussion from able thinkers in all walks of life—business men of large affairs, labor leaders themselves, economists such as Messrs. J. Galsworthy and F. Harrison, the Duke of Marlborough and statesmen such as Earl Grey. The work is of such importance and so uniquely complete as to justify more than the ordinary review.

Mr. Wells takes the stand that the trouble is largely a psychological one, an imaginary evil, in fact a condition of the mind and hence must be dealt with as such. The situation is not new, except that labor is protesting against the fundamental conditions in our social system, rather than the mere question of hours and wages. The

*"What the Worker Wants."

proletariat is becoming more sensitive, critical and irritable, while with the wider diffusion of education, discontent is equally more diffusive, and as a result the unrest is more general and extended than in the past.

The most striking characteristic of the present-day situation is the close harmony that prevails between the different occupations, the existence of interlocking arrangements, by which the various organizations are being welded into one gigantic octopus. The trouble is most acute where the government is most representative and democratic; where minds are most alert, most intelligent and where industrial development is the greatest.

As to the actual causes of these conditions there is a great diversity of opinion. We find that Mr. Wells is inclined to shoulder much of the blame on the narrow views of the modern lawyer who resorts to unfair technicalities rather than resting his case on its true merits; in such encounters the laborer is usually beaten and hence arises a dissatisfaction and discontent that is deep-rooted and unforgivable.

In addition to this the representatives of labor in the government have been won over by the glamor of the other side and proved untrue to their trust. The representative form of government has been proved ineffective, and we find such men as the head master at Rugby and Canon Bannister, of Hereford, agreeing with the labor leaders that the present social system is unfair, unjust—and permanently so. It is even insinuated that the unrest is a moral issue for which the Church is, in a way, responsible.

One of the leading Socialists in England ascribes the trouble to the lack in purchasing power of money, the ineffective results obtained by the Labor Party, the increasing anxiety over the future and greater pressure of life. Another leading authority on industrial questions lays the disaffection to Socialistic legislation while workmen themselves write of a feeling of hopelessness that pervades the people because of the way they have lost their recent struggles. Others call attention to the change in the character of labor, which is tending towards a loss of individuality and hence creating a lack of interest and a subsequent dissatisfaction.

Mr. Galsworthy points out the evils of the fiduciary system (an essential part of large corporations) wherein the owner is displaced by a manager or agent; in his opinion this condition stands preëminently the first in the prevailing disturbance. There is no latitude granted the manager for the exhibition of generosity, even though the feeling be present, with the result that the relations between labor and capital have been reduced to a cold-blooded commercial basis. And, finally, the effects of the high cost of living are ably discussed by Profesor Ashley of the University of Birmingham. He shows that the cost of foodstuffs increased 19 per cent. during the period from 1896 to 1910, while the advance in wages during this same time was only about 11 per cent. This he regards as the basic cause of all the disturbance, for the reason that it is chiefly felt on the home life and is uniformly in effect everywhere.

Coming now to the question of a remedy, we find equally divergent opinions. Mr. Wells demands a radical readjustment in labor conditions, which, as he pertinently points out, has never been done and is, therefore, all the more necessary. One of his chief plans is the provision of old-age pensions and it is a significant fact that a number of the larger corporations are already seeking the good-will of their employees through this medium. It is, of course, obvious that a man's productive powers and effectiveness gradually develop until the maximum is attained, when it is equally clear that they must deteriorate.

Socialism is, of course, strongly advocated as a panacea of the prevailing troubles, and the exponents of this creed claim that salvation will only be obtained through "disciplined democracy." It is a significant fact, however, that such suggestions do not come from the workmen themselves. But all classes are agreed that there must be a radical readjustment in our social system and a closer understanding and more intimate relationship between the laborer and his employer.

Norman Angell pertinently reminds us that envy of the rich is not new, but boldly asserts that the representative form of government, "of the people, for the people and by the people" has been found impracticable and that this is the new condition which is responsible for all the trouble. He claims that it is an institution developed by conditions that have long since ceased to exist, such as the elimination of the oppressive political power exercised by the old-time monarchy. Now that such have been definitely relegated to the past, the instruments by which this was effected have become none the less obsolete and should likewise be abandoned. This system of government has been found effective in dealing with less intricate problems in rural districts, and even with those relating to capital crimes, but it has not been found so when called upon to decide the more complicated questions relating to credit, foreign competition, insurance, etc.

Coming finally to the question of resorting to violence, we find that both laborer and capital are agreed that such measures can only result in suicide. The stoppage of any vital function will not be tolerated and the party attempting to effect such a national calamity is facing immediate dissolution. Frederick Harrison ultimately sums up the situation with the statement that whatever the remedy, it must be one of gradual evolution; society, he thinks is far too complex, too strongly established, to be changed by any single remedy or by one revolution.

Where an Accident Becomes Suicide

That coal mining is a dangerous occupation no one will attempt to deny. Were it not so the "safety-first" movement would never have been inaugurated. Nine-tenths of the accidents occurring underground, however, are unnecessary, and are the outgrowth of either ignorance or rashness, or both. And it would appear that we need look for no very substantial reduction in the loss of life in our coal mines until all men engaged in the industry have learned to avoid all danger wherever they possibly can.

Superintendents and foremen by exercising care and diligence in properly marking and labeling the points of known danger, may render accidents inexcusable, but hardly impossible. Regardless of how it may be classified in the record of mine, State or Nation, the death of a man who has deliberately crawled over or under or through a barricade or danger sign, is not in a true sense an accident. Such a death is little, if any, short of deliberate suicide.

Mixed Lights in Mining

By J. T. Beard

In presenting the next subject for discussion in Coal Age, we have chosen one that is of greater importance in the prevention of mine explosions than is generally conceded or appreciated. That this subject is of widespread interest is amply demonstrated by the number of contributors that mentioned it, in response to our request made sometime since, asking that contributors should express their preference as to what subjects should be discussed next.

Attention has been recently drawn to the danger of using mixed lights in mines known to generate gas regularly or at intervals, from time to time, by the explosion that recently occurred in the Cincinnati mine. This was known to be a gaseous mine and safety lamps were used in all entries or headings where gas had been found; but, it is stated, the rooms in the mine were worked with open lights. The evidence given at the coroner's inquest suggests the conclusion that had safety lamps been used in the heading where the explosion started, the gas that accumulated in the brief time after the heading had penetrated a clay vein, would not have been ignited, and a great disaster would have been averted.

It is almost impossible to determine in advance when such irregularities will make their appearance and it is questionable, where gassy clay veins are found, whether open lights should be permitted under any circumstances. In the Pittsburgh district it has been customary to use open lights in rooms and then replace these with safety lamps, when the pillars are being drawn. Mining men from other regions have frequently criticised this practice, regarding it as dangerous. This open discussion will give all an opportunity to express their views.

Let us get busy and discuss this important question from a broad, practical standpoint, to determine the question of whether open lights should be used in *any* portion of a mine in which it is necessary to use safety lamps in other portions. In other words, is it safe, under any conditions incident to coal mining, to use "mixed lights," by which is understood the employment of open lights on roadways and traveling ways or in other portions of a mine in which certain sections generate sufficient gas that the use of safety lamps in those particular sections is necessary at all times?

From the standpoint of the mine inspector and the fireboss alike, this question will probably admit of only one answer. These men are charged more particularly with the responsibility of maintaining safe conditions in the mine. The decision in reference to the use of safety lamps or open lights, depending as it does on the gaseous condition of the mine air and the possibility of gas being generated in dangerous quantities, is largely in the hands of the mine inspector, whose duty it is to see that the law is obeyed. The question is often asked: Is the mining law sufficiently specific in this regard, in any of the coal-mining states in this country?

From the standpoint of the mine operator, superintendent and foreman, the question has another bearing. It is recognized that the exclusive use of safety lamps, to a certain extent, reduces the output and increases somewhat the cost of the operation of the mine. The management, however, almost without exception, regard the safety of the mine and that of the workers as the first consideration, and whenever they are convinced that the conditions demand certain requirements, these are invariably met without complaint.

From the standpoint of the miner the question of using an open lamp in preference to a safety, is one of convenience or, in many cases, reckless daring. Except under the strictest regulations and the rigid enforcement of discipline in the mine, the large majority of mine workers are willing to incur unwarranted risks in the use of an open light. The general attitude of the miner is to assume a place free from gas, unless he knows positively to the contrary. He is loath to take any precautions, under ordinary mining conditions, and will generally laugh at the one who expresses fear of a possible danger.

In the discussion of the question of mixed lights, let us have a frank, open expression of judgment and opinion, or we would rather say, conviction born of experience. Let us argue the matter from both sides, always having in view how far the question of safety must give place to convenience and economy in the operation of a mine. Let each contributor aim to present clean-cut, positive arguments in as concise a manner as possible. Let it be remembered that much of the force of an argument is lost by a superfluity of words and the lack of a strict adherence to the question at issue.

It is well to remember also that the mere expression of opinion, even though it be that of a practical man, with a thorough acquaintance of mining conditions, carries no weight unless such opinion is based on convictions that are the result of an intelligent experience. On the other hand, it is true that, owing to the lack of a sufficient knowledge of the theory and principles of mining, the experience of many good practical mining men has led to convictions that would have been different had they possessed the knowledge of those who have made mining a study.

In a few instances, contributors have allowed themselves to wander from the real point of discussion. When a writer does this he fails to arrest the attention and hold the interest of readers. We often hear good practical men, who are able to write and discuss any important mining question, make the excuse that they have not the time at their command. We have generally found, however, that the most successful men in all industries, including coal mining, are those who are never so busy but that they can find time to help in any effort made to advance the knowledge of their particular industry among the workers.

Good mine management requires that a reasonable amount of time and money should be regularly expended in the education of mining men and the advancement of mining. We hope these few words will appeal to all classes of mining men, from manager to miner, and that we shall have from them at the earliest possible moment, brief and concise statements of their convictions, based on experience. Let this discussion be one of the best that has been held in Coal Age.

DISCUSSION BY READERS

The Education of the Miner

Does the coal miner really need an education, in order to become the best coal digger in the world? As a man begins to get a little education, he ceases to be a "coal digger" and wants to start "bossing," although he can earn more money by digging coal than by bossing. As a result, there is, in this country, probably not more than 5 per cent. of English-speaking miners. Under these conditions, the education of the miner means very largely the training of the foreign-speaking miner, and this can only be done by constantly talking and showing them both the right and the wrong way of doing things. No class of men needs education more, and it would seem that this country is just beginning to realize the fact.

I remember, a few years ago, in nearly all the mining villages in the North of England, mining classes were held under the auspices of the County Council. These classes were free to all mining students, and the course embraced all the subjects incidental to mining. It was a three-year course: the first year consisted of elementary work, the second year, more advanced studies; and the third year was devoted to honors work, for securing rank. The students who completed this course were in fair shape for taking any mine foreman's examination.

I have been much interested in the discussion as to whether textbooks should be used in examinations, and would say that, in my opinion, if this became the rule and textbooks were used, everybody would have the same opportunity. As far as I have observed, there are few questions asked in Pennsylvania examinations, requiring the use of textbooks; and a man with a good practical knowledge should be able to answer these questions from his own experience. I believe it is essential that a man should know something about the laws of ventilation and be able to use the formulas required for the solution of mining problems; but I do not think it is necessary for him to master algebra and the higher branches of engineering. In splitting air, practically, in the mine, a mine foreman's experience tells him where to place the regulator; and, after a few trials, he is able to obtain the required division of air.

Speaking of the education of miners, I have heard the remark made by a superintendent that it was a good thing that a man who had taken the examination "did not learn that he had passed, while he was in the mine, as his head would get so big that he would not be able to get out." My experience has been that the majority of men who take the examination know something of the practical side of mining, and the knowledge they have gained has not given them the big head, but rather the effect has been otherwise. I think much credit is due to the man who, by his own efforts, has gained sufficient knowledge to pass a mine foreman's examination. In my own opinion, practically all of our best men are those who have risen from the ranks.

THOMAS HOGARTH.

Heilwood, Penn.

Prizes for Efficiency

I was interested in reading of the prizes offered for efficiency by the Corona Coal Co., and H. B. Swoope & Co., COAL AGE, Feb. 8, p. 229. Fifty cash prizes were to be distributed among all classes of employees who showed their willingness to assist the work in every way possible. While this no doubt will prove an incentive to many workers and accomplish good results in some ways, the fact should not be overlooked that it presents a temptation to the men to violate some of the mining laws or the regulations of the mine when they know that no one is watching them.

More than once I have seen motormen run their motors faster that the law allows. Men will take risks and endanger not only their own lives but the lives of others, in order to bring their record up to the highest possible point. The prize system, in my opinion, presents a very strong temptation to unscrupulous men to do many things that they should not do, and may often result in accidents that will cost the company much more than is to be gained through the extra amount of work done.

J. E. HOMME.

Ellsworth, Penn.

The Coking Qualities of Coal

Some time since my attention was drawn to the necessity of crushing coal in preparing the same for coking, by an article entitled "Preparing Coal for the Coke Ovens," COAL AGE, May 3, p. 683. In this connection, I desire to make the following remarks in regard to testing samples of coal to ascertain their coking qualities.

It has been the custom in some places to test coal, in this respect, by sending a nail keg full of the slack to the nearest coke plant, where it is placed in an oven, covered with the usual charge of slack and drawn out later when the oven is cool. Where this method has been used, however, it is needless to say that it has been found unsatisfactory, as the sample is far too small to give a correct indication.

When it is desired to ascertain whether the coal of a certain seam will coke satisfactorily, at least two carloads of the coal taken from different parts of the mine, should be shipped to the coking plant, so as to enable at least two ovens to be run on this coal. If the result shows that the coal, as "mine run," does not yield a satisfactory coke, it is well to grind 40 or 50 tons to slack and again try the coking test. It has been found that many coals that will not coke, as "mine run," or when the product contains lumps of considerable size, will produce an excellent coke when powdered or crushed to a more or less uniform grade. When this is found to be the case, the treatment of such coal, in coking, will involve the question of installing grinding or crushing and elevating machinery at the mine.

In some cases, it may be desired to ship the lump coal, and coke only the slack or the screenings. In this

case, enough coal should be mined to furnish a carload of screenings for the test; and this will give a very good idea of the quality of the coke to be obtained when the plant is in complete operation. A true estimate of the coking qualities of screenings cannot be obtained by grinding mine-run coal; because the slack and screenings, in the operation of the mine, always contain a larger percentage of impurities than is true of mine-run coal.

If the analysis of the trial lot of coke shows too high a percentage of ash and sulphur, for the purpose for which the coke is to be employed, it may still be possible to obtain a satisfactory coke, by first washing the coal. To determine the possibilities in this case, a carload of slack should be sent to the manufacturers of coal-washing machinery; and then passed through their experimental plant. The washed coal should then be sent to the coke ovens; and, in many cases, the resulting coke will then be found to come within the prescribed limits of purity.

As a general rule, it requires one and one-half tons of coal to make one ton of coke; and, since ash is not removed in the process of coking, a coal containing 6 per cent. of ash should yield a coke containing about 9 per cent. At times, when the analysis of coke shows more ash than might be expected from the analysis of the coal it may be due to the excess of impurities in the slack, owing to insufficient care in mining. This can generally be avoided, wholly or in part, by the exercise of proper care on the part of the miners, or by the adoption of improved methods of mining.

The amount of sulphur and phosphorus in a seam of coal will often vary widely in short distances. Inasmuch as the coke required in a blast furnace must not only contain a low percentage of impurities, but must present a uniform composition, such a variation of these objectionable features must be carefully investigated in the mine. Coke employed in the manufacture of iron, to be used in the Bessemer-steel process, must generally not exceed 10 per cent. ash, 1 per cent. sulphur, 0.02 per cent. phosphorus. A coke of uniform composition, although approaching these specified limits of impurities, is more desirable as a fuel than one averaging very much less but having a variable composition that may unexpectedly run higher than the specified percentages of these impurities. The ash and phosphorus in coal are not removed during coking, but about one-third to one-half of the sulphur is volatilized during that process and, allowing as before, one and one-half tons of coal to 1 ton of coke, a coke containing 6.5 per cent. of ash, 0.75 per cent. to 1 per cent. sulphur, and 0.013 per cent. phosphorus should yield a coke within the Bessemer limits.

GEORGE STOCKDALE, Supt.,
Hogsett Coal & Coke Co.
Percy, Penn.

Study Course in Coal Mining

By J. T. BEARD

The Coal Age Pocket Book

3. What pressure, in pounds per square inch, corresponds to a head of 200 ft of water?

Solution—

$$p = 0.434\,h = 0.434 \times 200 = 86.8 \text{ lb. per sq.in.}$$

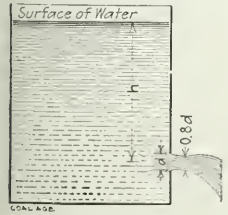
4. What head in feet of water column corresponds to a pressure of 50 lb. per sq.in.?

Solution—

$$h = 2.3\,p = 2.3 \times 50 = 115 \text{ ft.}$$

FLOW THROUGH ORIFICES

When water or other fluid, including air, flows through an orifice of comparatively small size there is always a crowding of the streams of flow toward the orifice, as indicated by the dotted lines in the accompanying figure. This crowding or converging of the stream lines toward the orifice naturally causes a contraction of the sectional area of the flowing particles, a short distance outside of the opening, as shown in the figure. The contraction is greatest at a distance from the orifice about equal to its diameter. In order that the sides of the vessel may not interfere with the converging lines, the distance of any side from the edge of the opening should not be less than 2.7 times its diameter or width.



SHOWING VENA CONTRACTA

The Vena Contracta—The contraction of area in a stream flowing from an orifice is called the "vena contracta." The amount of the contraction depends on the form of the opening through which the stream flows. The theoretical orifice is a hole in a thin plate, and the diameter of the contracted vein, in that case, is found to be 0.8 of the diameter of the hole. This makes the sectional area of the flow, at that point, $0.8^2 = 0.64$ of the area of the orifice. The ratio of the contracted area to that of the orifice is called the "coefficient of contraction." It varies with the style of orifice employed.

Quantity of Efflux or Discharge—The quantity or volume of the discharge, per unit of time, depends on the velocity of efflux, as determined by the head or pressure producing the flow, and the sectional area of the contracted vein (vena contracta). From this fact, it appears that the velocity due to the head or pressure is only attained at the point where the contraction of the vein is greatest. The velocity at the orifice, in a thin plate, is reduced in the ratio of the coefficient of contraction, and is therefore about 0.64 of that of the contracted vein.

Owing to the resistance met by the streams of flowing particles as they crowd the orifice, the velocity, even at the point

The Coal Age Pocket Book

of greatest contraction, is slightly less than the theoretical velocity due to the head, or say 0.97 of that velocity. This latter is called the "coefficient of efflux."

In order to calculate the quantity of flow (Q), for any head (h) it is necessary to combine the coefficient of efflux with the coefficient of contraction. Thus, for the flow through an orifice in a thin plate, $0.97 \times 0.64 = 0.62$ is the true coefficient of discharge. For any area (A) of the orifice in a thin plate, the area (a) of the vena contracta is $a = 0.64\ A$; and the velocity at this point, for any head (h) is $v = 0.97\sqrt{2gh}$. Therefore the quantity of discharge is

$$Q = av = 0.62\,A\sqrt{2gh}$$

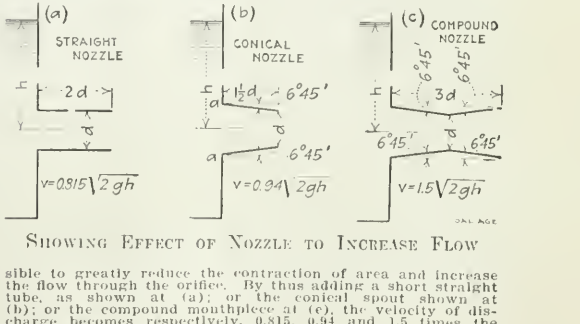
Seeing that the value of gravity (g) is given in feet per second, the head of water (h) must also be expressed in feet, and the area (A) in square feet, then the quantity (Q) will be found in cubic feet per second. The flow or discharge through an orifice having any area (A) in square inches, and for any head (h) in feet and any coefficient (c) of discharge, may be found by the following formulas:

$$Q = 3.342\,cA\sqrt{h} \text{ cu. ft. per min.} \quad (1)$$

$$Q = 25\,cA\sqrt{h} \text{ gal. per min.} \quad (2)$$

$$Q = 1500\,cA\sqrt{h} \text{ gal per hr} \quad (3)$$

Effect of Nozzle to Increase Flow—By adding a mouthpiece or nozzle to the opening, as illustrated by the accompanying diagram, (a), (b) and (c), it has been found possible to greatly reduce the contraction of area and increase the flow through the orifice. By thus adding a short straight tube, as shown at (a); or the conical spout shown at (b); or the compound mouthpiece at (c), the velocity of discharge becomes respectively, 0.815, 0.94 and 1.5 times the theoretical amount.



SHOWING EFFECT OF NOZZLE TO INCREASE FLOW

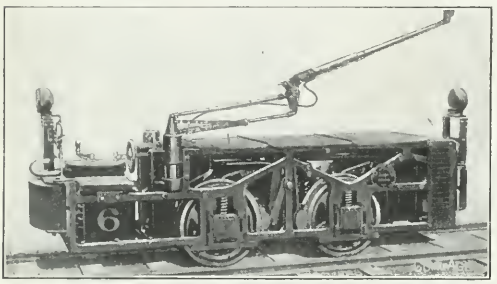
A New Locomotive Trolley Pole

The ordinary single trolley pole as employed on mining locomotives has many disadvantages and is subject to many limitations. When operated where the height of the trolley above the rail varies considerably the pressure exerted between the trolley wheel and wire also varies. This causes poor contact at the higher wire levels and extreme pressure with consequent rapid wear of wheel and harp at the lower levels.

When the wire hangs low and the pressure between wire and wheel is great if for any reason the latter leaves the wire the trolley pole strikes the roof or other obstructions with considerable violence, often causing damage.

Particularly in coal mines where the conditions of roof or overhanging rock is such that narrow entries are necessary, it is often impossible to run one of the single-pole trolley locomotives on account of an inability to reverse the trolley, because of the narrowness of the heading.

Where high cars are used and the trolley wire barely clears them, difficulty is sometimes experienced from the



Side View of Locomotive with New Trolley Pole

trolley pole striking on the top of the car immediately following the locomotive. Furthermore with the ordinary single-pole trolley, the wheel will not follow any considerable transverse variation in the position of the wire.

To overcome these difficulties, the Westinghouse Electric & Mfg. Co. of East Pittsburgh, Penn., have placed upon the market the compound or semi-pantograph motion, trolley pole illustrated herewith. The principle advantages claimed for this device are the following:

(1) The variation in contact pressure for different trolley-wire heights is much less than that obtained by a standard single-pole trolley.

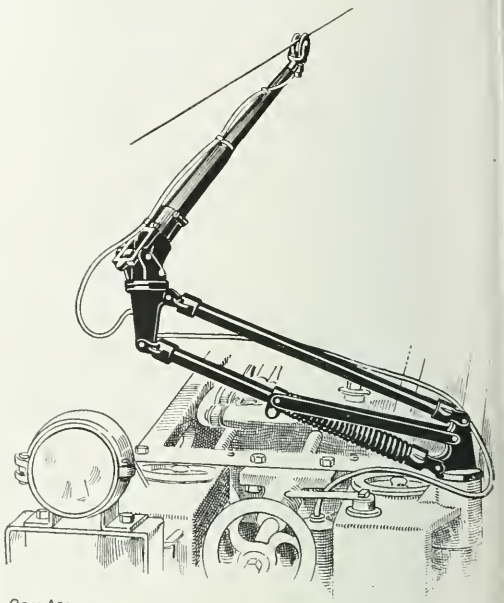
(2) Short length of trolley pole permits of its being turned around in a narrow passage.

(3) The trolley does not interfere with high trailing cars on sections where the trolley wire is low.

When the wire is at a height of five feet from the top of the rail the trolley-wheel pressure is approximately 26 lb. while at the height of 11 ft. it is about 18 lb. This shows a variation of 8 lb. in a range of 6 ft. which is much less than can be obtained by a single-pole trolley.

The new pole can be turned around in a passage from 4 to 6 ft. in width with the socket located approximately in the center of the locomotive. It will operate successfully where the trolley wire may have a variation in its location from the center of the track on which the locomotive is running of 4 ft. to the right or left without change of location of socket on the locomotive itself. This also does away with the necessity on gathering locomotives of two trolleys, one on each side.

The trolley consists of two members which operate in sockets. By means of a latch or pin at the locomotive socket the lower member can be adjusted vertically and kept in a rigid position and also can be swung horizontally and fastened in any definite place required. Furthermore it can be attached to locomotives now in service.



Lower Part of Trolley Swung across Locomotive, Avoiding Necessity for Two Sockets

Coal in Alsace-Lorraine

The quantity of coal mined in Alsace-Lorraine has increased in the 40 years from 1872 to 1912 from 290,206 to 3,538,722 metric tons of 2204.6 lb., the output for 1912 being almost triple that of 1902. Coke was produced to the amount of 94,595 metric tons in 1912, against 90,275 tons in 1911, in addition to the coke used at the mines. The following byproducts were also recovered in 1912: 4250 metric tons of coal tar, 1208 tons of ammonium sulphate, and 967 tons of benzol, against 4577, 1175 and 787 tons, respectively, in 1911. Of the 3,538,722 tons of coal yielded from the mines of Lorraine in 1912, 197,475 tons were used in the works for heating the offices, firing the boilers, etc., against 221,456 tons in the preceding year. The sales amounted to 3,341,247 tons, a gain of 18.8 per cent. over 1911.

Because of its smokeless character, producer gas is destined to become an important factor in the elimination of the smoke nuisance.

EXAMINATION QUESTIONS

Ventilation, Pumping and Surveying

(Answered by request)

Ques.—A slope dips one foot in 12 ft., for a distance of 756 ft., measured on the incline. What is the difference in elevation between the mouth and face of the slope, and what is the horiozntal distance between these two points?

Ans.—From the reading of the question, the distance being measured on the slope, we assume the dip is one foot vertical, in each 12 ft. of slope measurement. This gives a total vertical fall, from the mouth to the foot of the slope, of $756 \div 12 = 63$ ft., which is the difference in elevation between the mouth and the face of the slope.

The horizontal distance between the same points is

$$\sqrt{756^2 - 63^2} = 753.37 \text{ ft.}$$

Ques.—A seam dips 4 in. per yd. of horizontal measurement. What is its angle of inclination?

Ans.—A dip of 4 in. per yd. is 4 in. in 36 in. of horizontal measurement, or one in 9 in. The angle (a) of inclination of the seam is then found as follows:

$$\text{Tan } a = \tfrac{1}{9} = 0.1111$$
$$a = 6° 20'$$

Ques.—How many horsepower will it take to raise 60,000 gal. of water up a shaft 250 ft. deep, in one hour? The resistance of pumps and pipes is 25 per cent.

Ans.—The weight of a single gallon of water is 7.48 lb. The total weight of water lifted per hour is, therefore, $60{,}000 \times 7.48 = 448{,}800$ lb., or 7480 lb. per min. Adding 25 per cent. to this weight for the resistance of the pumps and pipes, we have $7480 \times 1.25 = 9350$ lb. Since this weight is lifted through a vertical height of 250 ft., the work performed each minute is $9350 \times 250 = 2{,}337{,}500$ ft.-lb. The effective horsepower required for this work is, therefore, $2{,}337{,}500 \div 33{,}000 = 70+$ hp.

Ques.—An entry 5x10 ft., and 10,000 ft. long, is driven through a hill from daylight to daylight. If a large fan, say 20 ft. in diameter, placed at the mouth of this entry, circulates 100,000 cu.ft. of air per minute, what will be the water gage on the fan drift? There is no air course, but the air circulates in a single current from the intake to the discharge opening.

Ans.—In this case, the total length of the air course is 10,000 ft.; the perimeter $2(5 + 10) = 30$ ft.; and the area $5 \times 10 = 50$ sq.ft. The rubbing surface is $10{,}000 \times 30 = 300{,}000$ sq.ft. The water gage producing this circulation is calculated in the usual manner; thus,

$$w.g. = \frac{0.00000002 \times 300{,}000 \times 100{,}000^2}{5.2 \times 50 \times 50 \times 50} = 92 + in.$$

Note—Such a water gage is never attained in practice. It is due here to carrying the air in a single current, at the high velocity of 2000 ft. per min., a distance of nearly two miles.

Ques.—If the length of an airway is doubled, how will this affect the power; the velocity and the area of the airway remaining the same?

Ans.—The formula for power, expressed in terms of the velocity of the air current, is

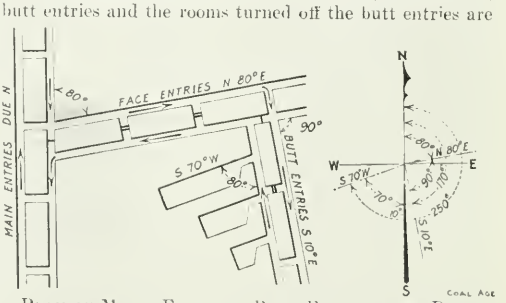
$$u = klov^3$$

It is observed from this formula that, for a given velocity produced by a given power, the *area* of the airway is not concerned. Assuming the cross-section of the airway remains unchanged, the perimeter (o) is constant, and k and v being constant, the power (u) varies as the length (l) of the airway. Therefore, to produce the same velocity of the air current when the length of the airway is doubled, the power must also be doubled.

**

Ques.—(a) If the course of a main entry is due north, what is the course of a face entry turned off to the right, at an angle of 80 deg.? (b) What is the course of a butt entry turned off the face entry to the right, at an angle of 90 deg.? (c) What is the course of a room turned off the butt entry, at an angle of 80 deg. to the right?

Ans.—(a) In the accompanying sketch, the general position and direction of the main entries, face entries, butt entries and the rooms turned off the butt entries are



PLAN OF MAIN, FACE AND BUTT ENTRIES, AND DIAGRAM SHOWING THE CORRESPONDING AZIMUTHS

shown. The course of the main entries being due north and the face entries being turned to the right an angle of 80 deg., the course of these entries will lie in the northeast quadrant, as shown on the right of the figure, and its bearing is N 80° E.

(b) The butt entries being turned 90 deg., again, to the right, the azimuth of their course is $80 + 90 = 170$ deg. Since this azimuth lies between 90 deg. and 180 deg., the course of the butt entries lies in the southeast quadrant. All bearings in the southeast and southwest quadrants being estimated from the south end of the meridian, the angle of bearing, in this case, is found by subtracting the azimuth from 180 deg. Thus, $180 - 170 = 10$ deg. The bearing of the butt entries is then S 10° E.

(c) The rooms being turned 80 deg. to the right of the butt entry, the azimuth of the rooms is $170 + 80 = 250$ deg. Since this angle lies between 180 deg. and 270 deg., the course of the rooms lies in the southwest quadrant, and the angle of bearing measured from the south end of the meridian is $250 - 180 = 70$ deg. The course of the rooms is, therefore, S 70° W.

SOCIOLOGICAL DEPARTMENT

State Miners' Hospital at Fairmont, W. Va.

By A. W. Hesse*

SYNOPSIS—The state of West Virginia has provided three hospitals for its miners of which that at Fairmont is one. It accommodates 49 patients. Those injured at their regular employment are admitted free.

By an act passed by the state legislature of West Virginia, during the session of 1899, three hospitals were created for the free care of those accidentally injured. These, designated as Miners' Hospitals Nos. 1, 2 and 3, were located at Welch, McKendree and Fairmont, respectively.

The site for the Fairmont hospital was donated by the people of that city. It consists of an acre of ground on a gently sloping knoll, easy of access and about four blocks from the Baltimore & Ohio R.R. station. Paved walks and roadways lead to and around the property.

Description of Building

The building consists of a main section and two wings, one at each end extending back 18 ft. The walls are of red brick and the corners finished with buff shale brick; the roofs are of slate. The partitions are built of studding, lath and plaster; the walls are covered with hard plaster filled and finished with paint.

The ground floor has two wards, each having 11 beds and three wards, each accommodating three beds. On the second floor there are nine rooms in each wing each containing one bed. So in all there is provision for 49 patients at one time. The second floor of the main building is for the living and sleeping rooms of the officials, nurses and other employees. Convenient bath and toilet rooms are located on both floors of the main building and wings. The office rooms are in the main building and occupy the ground floor being on the left of the building and facing the front. The operating, preparatory and sterilizing rooms are across the hallway in the rear of the main building and on the left of the same. The kitchen is between the wings to the rear of the hallway and easy of access for the serving of trays to patients. The large well-lighted dining room in the rear center is for the officials and nurses.

The Fairmont Hospital for Miners, Erected by the State of West Virginia

The stable has a stone foundation, red brick walls and corners finished to correspond with the main building. It is seen to the right of the hospital as shown by the front view herewith.

Both buildings are plumbed for gas and water. Electric light and power are furnished by a plant located in the basement of the hospital building.

*Assistant chief engineer, Consolidation Coal Co., West Virginia division, Fairmont, W. Va.

The Power Plant

The generating equipment consists of a 20-hp. Bessemer gas engine driving a 13.2-kw. dynamo and a 5-hp. Bessemer gas engine driving a 2.3-kw. dynamo. A deep-well pump driven by a 3-hp. motor supplies the operating plant, and with the tank and air compressor thrown into use will supply the institution in case of emergency. The refrigeration plant is in a 7x10 ft. room in which a 3 hp. motor drives a one-ton Brunswick compressor.

All laundry work for the institution is done in the building, the laundry being equipped with three large slate tubs with hot and cold water, large hot and cold mangles and a large rotary washer driven by a 3-hp. motor.

Free to Those Injured at Work

The act creating these hospitals provides, "That it shall be the duty of the board of directors of each of these hospitals to admit under their rules and regulations persons requiring hospital care and to treat free of charge persons accidentally injured in the state, while engaged in their regular employment or occupation; preference at all times to be given to persons accidentally injured."

Since this hospital was opened, Oct. 1, 1901, the law governing admission to this hospital has been closely observed and the entries for the eleven following years numbered 2838 or an average of 258 per year. During the year 1910-11, 323 were admitted, this being the largest number since the institution was opened. Besides these cases requiring hospital care, an average of 600 dressings for wounds were performed each year.

Classification of Injuries

For the eleven fiscal years ending Oct. 1, 1912, the admitting diagnoses were about as follows:

Injury	Per cent.
Fractures	40
Wounds	30
Contusions	18
Burns	6
All other	3
Fractures and dislocations	2
Dislocations	1
	100

Of the last 1176 cases of fracture treated, 59 per cent. were simple fractures, 20 per cent. were comminuted compound fractures, 18 per cent. compound fractures and 3 per cent. comminuted fractures. Of these fractures 37 per cent. occurred in the tibia and fibula, 14 per cent. in the femur, 6 per cent. in radius and ulna, 5 per cent. in the skull and the balance scattered in small percentages. Seventy per cent. of all the injuries were incurred in the mines. Up to about 1911, perhaps 53 per cent. of these accidents at the mines were due to coal and slate falls and those due to cars ran about 6 per cent. During 1911 and 1912 the accidents due to falls decreased to about 40 per cent. while those due to cars increased to about 35 per cent.

When this hospital was opened in 1901, Dr. James McDonald was placed in charge and has maintained the position as superintendent since then. His staff consists of an assistant superintendent, matron, two nurses, four assistant nurses and two graduate nurses. With this force he has carried on a charitable as well as an economical work successfully and the hospital has amply supplied a much felt need.

Rear of Hospital, Showing Wings and Central Building, Latter Containing Kitchen and Rooms for Officials

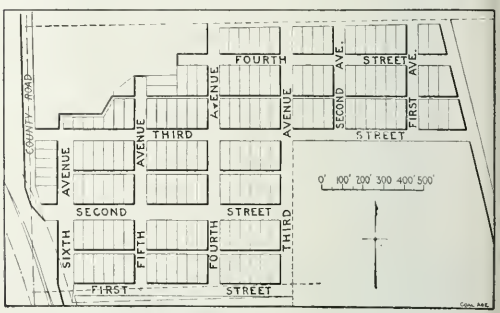
Some time ago a careful classification of fractures was made with the following results:

NATURE OF FRACTURES TREATED AT FAIRMONT HOSPITAL

	Simple Fracture	Comminuted Fracture	Compound Fracture	Both Compound and Comminuted Fracture	Total	Per cent.
Clavicle	56	0	1	..	57	5.28
Femur	134	2	15	15	166	15.37
Fibula	13	1	1	..	15	1.39
Humerus	24	7	8	5	44	4.07
Ilium	19	..	6	2	27	2.50
Ischium	7	..	..	1	8	0.74
Malar	2	..	..	2	4	0.37
Maxillary inferior	19	..	..	6	25	2.30
Maxillary superior	1	..	3	2	6	0.55
Metacarpal	..	..	1	1	2	0.19
Metatarsal	13	..	2	1	16	1.48
Nasal	..	..	1	1	2	0.18
Patella	9	..	..	2	11	1.02
Radius	1	..	..	1	2	0.19
Radius and ulna	37	4	14	12	67	6.20
Ribs	54	..	..	..	54	5.00
Ribs penetrating lungs	..	..	41	..	41	3.80
Pubes and femur	..	..	..	1	1	0.09
Sacrum	2	..	..	..	2	0.18
Scapula	9	2	..	..	11	1.02
Skull	15	..	27	18	60	5.55
Sternum	8	..	..	..	8	0.74
Symphysis pubes	7	..	..	..	7	0.65
Tarsal	..	..	..	1	1	0.09
Tibia	3	..	..	..	3	0.28
Tibia and fibula	204	21	49	162	436	40.40
Vertebra	2	..	1	..	3	0.28
Frontal and nasal	..	..	1	..	1	0.09
	639	37	171	233	1080	100.00
Per cent	59.17	3.43	15.83	21.57	100.00	100.00

The classification of the contusions and wounds is too extensive for this paper and is omitted.

Good houses, the greater number of which cost from $700 to $2800, were built by the purchasers. Most of them were constructed for the mine workers owning them by contracting concerns which furnished all material complete above the foundations; lumber, paint, hardware, roofing, etc. The architecture is pleasing and above the average of that of mining towns.



VILLAGE OF MATHERVILLE, ILL., AS ORIGINALLY PLOTTED

Coal Valley Mining Co.'s Village

The Coal Valley Mining Co.'s village at Matherville, Ill., is an evidence that miners are in many cases desirous of purchasing their own homes. In the spring of 1909, the company laid out a townsite of 150 lots near the line of the Rock Island Southern Ry. about a mile from the mine, and sold the lots under certain restrictions, prohibiting the sale of liquor, reserving the mineral rights thereunder, etc. The prices of the lots varied from $125 to $175 for a 50-ft. front and in each case they were paid for in cash. In less than one year every lot was sold and two additions have had to be made since.

The streets are now being graded and filled with cinders. A good brick school building was erected last year, as well as several churches. The plots for these were donated by the coal company.

The town is lighted by electricity supplied by the corporation, which operates the electric railroad, and a movement has been started to erect water-works. Since the town was laid out several additions have been made by outside parties and by the Alden Coal Co.

Many of the southern Illinois mines are similarly not equipped with miner's houses, the workers being owners of their dwellings and not tenants.

MAIN STREET

THIRD STREET

GENERAL VIEW

METHODIST EPISCOPAL CHURCH

MATHERVILLE PUBLIC SCHOOL

VILLAGE OF MATHERVILLE, ILL.

COAL AND COKE NEWS

Washington, D. C.

The situation produced by the action of the Senate in undertaking to investigate the West Virginia coal strike conditions seems to become more and more serious daily and to involve more and more colateral issues which had hardly been expected to be drawn into the discussion.

During the past week sharp clashes have occurred on the floor of the Senate with reference to this matter while in the process of working up the investigation itself there has been serious difficulty and friction, and in the coalfields the question of prosecuting various men responsible for the mining difficulty or supposed to be so has become involved with the enforcement of the Sherman anti-trust law.

The fact that President John P. White with eighteen officers of the United Mine Workers were indicated in the Federal District Court at Charleston, West Virginia late last week is tending to complicate the situation greatly, particularly as the Department of Justice disavows having instigated or directed the proceedings. It is now stated that if the prosecution of these men is pushed it will be taken as a direct order on the part of the President while if dropped it will be construed as indicating that the President is in sympathy with the terms of the proviso in the Sundry Civil bill now pending, which forbids the use of the funds for the prosecution of combinations of labor in defiance of the Sherman anti-trust law.

Unofficial reports from West Virginia make it appear that the charges against the nineteen labor men are more serious than the technical violation of laws against conspiracy in restraint of trade ordinarily involved in widespread strikes. While indictments so far have been returned only against mine workers affiliated with the labor union, it is hinted that coal operators—not miners—in Ohio, Indiana and Pennsylvania are regarded as co-conspirators with the union men.

According to these reports, the operators in Ohio, Pennsylvania and Indiana wanted to see the unions recognized in West Virginia, wages increased, and the cost of West Virginia coal advanced to a point where these fields could not compete in the markets coveted by the operators in the other states.

If this connection between the union men and the coal operators is established and the operators also are indicted the whole aspect of the case will change. In such a circumstance it is believed, the sympathies of union labor might be on the side of the prosecution. It would not then be a trial of labor men as such. It would be a prosecution of certain laborers charged with conspiring with certain operators to restrain trade.

The proviso in the Sundry Civil Appropriations bill which caused President Taft to veto the measure was reinserted before the bill was reintroduced at the present session. At that time it was said that President Wilson had reason to believe that so many Democrats were committed to the exemption that even if he threw his influence against it many Democrats would support it and party harmony would be imperiled.

The Production of Anthracite Is Large

Information received here by Government officers shows that the production of anthracite coal during the current spring is going on rapidly. The information has been communicated to members of Congress who have been threatening more investigation to the coal situation and has apparently served to mitigate their disposition to be active in regard to the matter. According to the official statements now current about 6,000,000 tons of coal were mined during May while slightly more than the same amount was consumed.

In May of last year the mines were closed about two-thirds of the time pending the wage settlement, and the total production of coal in that month was but 1,429,000 tons. At the close of May, 1912, after nearly two months of strike the loss in tonnage, as compared with the first five months of 1911, was 9,188,893 tons. This year the production in May shows an increase of 4,566,385 tons over last year, and for five months an increase of 8,976,474 tons. From this time on the production of anthrcite coal will compare, until the end of the calendar year, with the largest output ever reported.

Every company, of course, showed a remarkable increase as compared with the output in the strike month of last year. Reading increased 922,000 tons, the Lehigh Valley, 988,000 tons, and the other companies proportionately.

From these figures it is being argued that there will be an unusually heavy aggregate output of coal for the current calendar year, the demand being large up to the present time while stocks are unusually low so that a large production is necessary to replenish the fundamental supplies.

Another Supreme Court Decision

The Supreme Court of the United States in a decision handed down on June 9 closed the long-standing litigation between the International Coal Co. and the Pennsylvania Railroad with reference to shipments of coal by holding that the company could not collect a rebate from the railway owing to the fact that no definite damages had been proven to exist so that a fixation of the damage in money terms was out of the question. The full text of the decision will not be ready for several days.

PENNSYLVANIA

Anthracite

Scranton—United Mine Workers from Scranton to Pottsville in the three anthracite districts held a large demonstration, May 30, at Mt. Carmel in the dedication of a handsome monument to the memory of the late D. F. Gallagher. Mr. Gallagher while a member of the State Assembly introduced a bill known as the Miners' Certificate Law. This law requires a person entering the mines to work as a laborer two years before he can engage as a miner.

The Temple Iron Co. has dissolved in conformity with a decree of the U. S. Supreme Court. This announcement has been made at its main offices June 5.

Wilkes-Barre—The 500 striking employees of the East Boston colliery of the W. G. Paine Co. in Luzerne, have returned to work. During the strike which lasted several days the company took the opportunity to make some necessary repairs. The men whose refusal to join the Union caused trouble have at last affiliated themselves with that organization.

Giovanni Ettor, the organizer of the Industrial Workers of the World, who figured so prominently in the Lawrence strike, is expected to come to the anthracite coal fields on the 10th of this month, to remain for a period of at least 15 days, and possibly a month. He will be accompanied by a Polish organizer and the two will endeavor to arouse interest among the foreign element of the mine workers in the organization of I. W. W. locals throughout the entire Scranton, Wilkes-Barre and Hazleton regions. Already one strike has been caused by the efforts of the I. W. W. organizers to get a foothold in territory which the U. M. W. of A. regard as their field, and there promises to be even more serious trouble should the two become embittered.

Shamokin—On June 6 rescuers equipped with oxygen helmets saved the lives of 23 miners in the Scott Colliery, following a gas explosion. Two men were killed. Fire followed the explosion but it was extinguished without any further fatalities. The colliery is operated by the Susquehanna Coal Co. an adjunct of the Pennsylvania R.R.

Bituminous

Pittsburgh—The American Mine Safety Association will hold its first annual meeting at Pittsburgh in September. A national button bearing the red circle signifying danger and the white arrow pointing the way to safety has been adopted by the society. This society is the outgrowth of the National Mine rescue and first aid conference held in Pittsburgh last fall. It has a membership of 250 and its purpose is to preserve the lives and health of miners and to reduce property loss.

Connellsville—The boiler house at the Colonial No. 4 mine of the H. C. Frick Coke Co. was recently destroyed by fire. The loss is estimated at $15,000.

Workmen in the Cincinnati mine of thhe Monongahela River Consolidated Coal & Coke Co. have found another victim of the explosion which occurred April 23. This brings the total death list up to 97.

Barnesboro—The tipple of the Lennox Mine of the Hastings Coal & Coke Co. was destroyed by fire June 2. About 100 miners will be temporarily thrown out of employment.

WEST VIRGINIA

Charleston—After a long conference with representatives of the United Mine Workers and coal operators in the Paint Creek and Cabin Creek fields, the Senate Committee is preparing to investigate West Virginia strike conditions and hearing began at Charleston June 10.

The trouble at the four mines of the New River and Ohio Coal Co. at Stanford has been satisfactorily adjusted and the mines resumed work June 6. The trouble arose when the company refused to allow a check weighman on the tipple.

Out of a class of 112 who took the examination for first-class certificates for mine foremen and fire bosses at Welch, May 20, 21 and 22, 11 received first-class certificates, 35 second-class certificates and 3 passed the examination for fire boss.

NEW JERSEY

South Amboy—According to decisions rendered by Supreme Court, taxes running into thousands of dollars will be collected by the city of South Amboy on coal of the Susquehanna Coal Co. and other companies which use coal storage yards at this place. The Court holds that the coal is not in the process of interstate shipment, and has come to rest as a part of the property within the State.

OHIO

Yorkville—After a mass meeting held June 2, 300 miners in this vicinity refused to return to work until Italians and Poles, who have been loading coal, were discharged. These nationalities have a deadly feud, and evseral battles have occurred inside the mines. Other miners fear that a battle may be started, which will endanger the lives of all under ground.

Martins Ferry—The miners at the Rush Run No. 2 Mine went out on strike June 5 because new mules had been put into service to haul the coal out of the mine. The 300 men employed declared that the new mules could not haul the coal fast enough, and that they were losing time as a result. Officials of the company sent the old seasoned animals back to the work.

Woodsfield—State Mine Inspector J. C. Davies states that he does not agree with all the findings of Coroner Elmer Radcliffe of Noble Co., on the recent explosion in the Imperial Mine at Belle Valley. The coroner states that the explosion was caused by gas coming in contact with an open lamp of one of the miners, and that the gas was forced down upon the men by a change in the course of air brought about by the removal of a brattice and the closing of a door a few minutes before the explosion occurred. Inspector Davies says the closing of the door had no effect on the explosion, and that the real cause was the failure to maintain proper air courses, which allowed the gas to accumulate.

INDIANA

Vandalia—The validity of the wide mine entry law of Indiana, requiring that the entrance to a coal mine must be kept clear of débris, was recently upheld by the Supreme Court of the United States in a decision in a suit brought by Charles E. Barrett, as agent of the Vandalia Coal Co.

ILLINOIS

Marissa—The Egyptian Coal & Mining Co. has voted a new issue of bonds for $50,000 to purchase the Meek mine at Marissa. All of the mines of the Egyptian Coal & Mining Co. are at the present time on the Illinois Central, but when the Southern Traction Co.'s line is completed that will also connect with them all.

Marion—The Watson Coal Co., with two mines northwest of Marion, has gone into voluntary bankruptcy. One of the mines has not been working for several months, on account of being flooded when the high waters prevailed in southern Illinois.

The Pittsburg Big Muddy Coal Co., operating a mine at Pittsburg, a few miles east of here, has been declared a bankrupt. The cause given is that it is impossible to market the coal at a profit, and that such conditions have existed for several months.

KANSAS

Pittsburg—John Steele, Kansas state arbitrator, has announced that the miners of No. 14 District of the United Mine Workers are right in their contention with the Cherokee-Pittsburg Coal & Mining Co. This means that the miners shall not be compelled to push their loaded cars a distance exceeding 150 feet. Mr. Steele has decided that since No. 14 is a new mine, it comes under the contract made between the miners and operators last year. Some of the other mines of the coal company are operated under old contracts, which allow a distance of 200 feet.

WYOMING

Sheridan—A severe electric storm, in the vicinity of Acme, May 28, caused a blaze which completely destroyed the power house of the Model Coal Co., entailing a loss estimated between $15,000 and $18,000. The building was entirely destroyed, together with much valuable machinery.

FOREIGN NEWS

Vancouver, B. C., Can.—Sixty-one miners brought from England to work in the coal mines at Nanaimo have refused to serve as strike breakers and are being cared for at the local headquarters of the United Mine Workres of America.

PERSONALS

A. T. Shurick of the editorial staff of "Coal Age" is the 4500th member of the order of Kokoal.

Governor Ammons of Colorado has reappointed James Dalrymple as chief inspector of coal mines.

F. L. Natt has tendered his resignation as manager of the Rock Island Fuel Co., of Moline, Ill. He expects to enjoy a short vacation and then enter into business for himself.

J. W. Finney, of Hartford, Mo., has resigned his position as commissioner for the Southwestern Coal Operators Association of Missouri, Kansas, Oklahoma, Arkansas and Texas. T. A. Freese, of Huntington, Ark., has resigned his position as State Mine Inspector, to succeed Mr. Finney.

Wm. Nicholson, who for the past four and a half years has been district mine inspector for the eleventh district has tendered his resignation to the State Mining Department, to take effect June 15th. Mr. Nicholson will assume the superintendent's duties for the Jewell Ridge Coal Co. at Richlands, Va.

Fred S. Green, of Byesville, Ohio, has been made superintendent of the Imperial Mine at Belle Valley, in which 15 miners lost their lives by an explosion two weeks ago. Mr. Green succeeds Harry Dudley, who was held responsible for the explosion by Coroner Radcliffe. Mining in the Imperial mine will be started at once.

Rowland Jones, of Avoca, who has been employed as assistant mine foreman at the Thomas Shaft, Butler Colliery, Hillside Coal & Iron Co., has been transferred to the position of foreman at the Courtright Slope, of No. 14 Colliery, Pennsylvania Coal Co., at Plainsville. He takes the place of foreman Shovlin, who was killed by a fall of rock a few weeks ago. Walter Hutchinson, assistant foreman at the Clarence Colliery, has been transferred to the Thomas Shaft, to fill the vacancy left by Mr. Jones.

CONSTRUCTION NEWS

Mora, W. Va.—The American Coal Co., of New York, is constructing mines in this vicinity, together with a model company store and office building, at a cost of $20,000.

Punxsutawney, Penn.—The Lindsey Coal Mining Co. has work underway on a new opening about three miles from Punxsutawney. It is expected that they will be ready to begin shipments by Aug. 1.

Craig, Colo.—A party of Eastern capitalists is planning on making investments in coal lands in Moffat County. It is understood that these lands will be placed in readiness for extensive operation by Oct. 1.

Connellsville, Penn.—Extensive improvements have been made by Lochrie Bros. Coal Co. at their Argentine, Butler County, plant. The daily output has been increased by nearly 150 tons, and the capacity now reaches 600 tons.

Two Harbors, Minn.—It is rumored that the city of Two Harbors will soon ask for bids for the construction of a coal

trestle to be built near the City Water & Light station, and to be used by the city in hauling coal by the cargo.

Bloomington, Ill.—Officials of the Big Four Coal Co. have received word that the contract has been let for a new coaling station at Lilly, to be erected at the cost of $10,000. This contract has been awarded to the Roberts & Schaefer Co., of Chicago, Ill.

Connellsville, Penn.—It is reported that the activities of the Maryland Steel Co., which is planning the erection of 120 new coke ovens, will soon be broadened to take in the manufacture of structural steel. About $3,000,000 will be spent on improvements.

Blairsville, Ohio—It is reported that the Buffalo, Rochester & Pittsburgh R.R. is to be extended from Josephine, through Blairsville, to Latrobe. It will cross Conemaugh River by a long trestle. A surveying corps is said to have been working out a plan of extension for some time.

Pound, Va.—Several hundred men are at work on the construction of the upper Pound River extension of the Indian Creek & Pound River R.R. from Pound, along and continuous to the Kentucky border line, in Wise County, Va., which will tap rich coal and timber fields controlled by the Tidewater Lumber Co.

Henry, Ill.—The Santa Fé R.R. has recently purchased 10,000 acres of coal land in the vicinity of its station at Toluca. The Santa Fé company is now sinking coal shafts and putting in machinery to develop this field. It is expected that this will be a source of fuel for its system in Illinois, Iowa and Missouri.

Cincinnati, Ohio—In the electrification of its lines in the Pocahontas coal district the Norfolk & Western R.R. will build its own special generating station. Several large firms interested in this class of work have been figuring on the construction. The generating station will have a 24,000-hp. capacity and will be located in the middle of the Pocahontas coal district.

Monongahela, Penn.—Engineers of the River Coal Co. are making locations for a borehole to be driven to the coal in the Cincinnati mine. This will enable to West Penn Electric Co. to run a power line to furnish electric current to run the mining machinery. The West Penn Co. expects to have connections made with all the mines of the coal company within a short time.

Huntington, W. Va.—It is reported that W. A. Liller, of Keyser, has been awarded the contract for $250,000 worth of houses to be erected for the Pond Creek Coal Co., at their operations in Pike County, Ky. This contract calls for the erection of 420 houses of modern construction. Many of them will be finished with baths and other conveniences. Each house will contain from five to six rooms.

Unionville, Mich.—A new shaft for the Handy Bros. Mining Co., near Unionville, has been sunk to a depth of 81 ft. in 12 days. The work has been done under the supervision of John Morris and William Williams. The entire depth of the shaft is to be 200 ft. The coal is of the Pennsylvania bituminous character, and it is understood that the territory will warrant mining operations for approximately 20 years.

Connellsville, Penn.—The Connellsville Coke & Fuel Co. is rushing the construction of 80 new ovens at their plant in the Ligonier Valley and have the railroad from their plant at the Marietta-Connellsville Coke Co.'s works almost graded. The new works will be modern in every respect and will be equipped with a compressed air coke drawing and loading machine, which is being built at the Scotdale Foundry & Machine Co.'s plant.

Denver, Colo.—Announcement has been made that the Colorado Fuel & Iron Co. will spend $500,000 in improvements on the Pueblo plant this summer. These improvements will consist of the installation of three open-hearth furnaces, which will be completed in about six months. These furnaces will increase the output of the mill approximately 20 per cent., and will mean the addition of more than 100,000 tons to the annual output of steel of the company.

Sykesville, Penn.—Work on the improvements at the Cascade Coal & Coke Co.'s plant is progressing rapidly. The new smokestack has been completed. The structural iron workers, who will do the iron work on the power house, have arrived and are now in shape to push their part of the construction to a finish as fast as the material arrives. The foundations for the power house are now practically completed. Work on the new ovens is well under way, much of the masonry having been already completed.

Bluefield, W. Va.—The Baltimore & Ohio R.R. Co. proposes to erect another coal railroad in Kentucky. It has acquired the charter rights of the Long Fort R.R. Co., which owns a location on the left fort of Beaver Creek. The new road, when completed, will connect with the Chesapeake & Ohio Ry. As a result of the construction of this line, there will be about 1000 acres of coal land owned by the Elkhorn Fuel Co., which will be developed. No date has yet been decided upon for starting the construction of the proposed line.

Washington, Penn.—The Chartiers Mining Co., which recently purchased a large block of coal territory in Mt. Pleasant Township, has accepted the surface of three farms on which the new openings will be made, together with other developments to establish the new mining town. The sum of $25,000 was paid for a total of 264 acres of surface land. The coal rights were purchased at the rate of $135 per acre. No active operations will be started toward the development of this block for a year or so, owing to the fact that the company is making extensive improvements in other sections of the county.

NEW INCORPORATIONS

Boston, Mass.—The Atlantic Coal Co.; capital stock, $500,000. Incorporators: P. D. Dean, J. B. Sullivan, Jr., W. G. Todd.

Medora, N. D.—The Western Coal Co.; capital stock, $60,000. Incorporators: L. H. Haliin, M. S. Mitchell, J. T. Roysten.

Portland, Me.—The Brookline Coal Co.; capital stock, $25,000; to carry on a wholesale and retail coal business. E. A. Randal, president.

New York, N. Y.—The Von Bauer-Lively Coal Products Co.; capital stock, $1,000,000. Incorporators: G. G. Stiegeler, E. F. Hellings, W. M. Pyle.

Charleston, W. Va.—The Elmo Mining Co.; capital stock, $50,000; chief works, Elmo, W. Va. Incorporators: R. M Price, R. S. Stilman, D. W. Hill, A. C. Collins, Buckner Clay

Charleston, W. Va.—The Wheeling Monroe Coal Co.; capital stock, $25,000; to operate in Monroe County, Ohio. Incorporators: J. B. McKinley, M. A. Hanning, H. P. Lockwood, L. W. Brown and H. O. Wells.

Anchor, Ky.—The R. C. Teway Mining Co. has been incorporated with a capital stock of $10,000, by R. C. Teway, E. B. Teway and W. F. Burnwinkle, for the purpose of developing a small property in that vicinity.

Leslie, Ark.—The Red River Coal & Mining Co. has been organized here with a capital of $100,000, to develop the 14-in. seam of coal near here. The officers are: G. S. Thompson, president; Edward Mays, vice-president, and A. G. Killibrew, secretary and treasurer.

Springfield, Ill.—Hickman Williams & Co., of Louisville, Ky., have been licensed to incorporate in Illinois. The capital stock is $600,000. To buy and sell pig iron, coal, coke, alloys and steel and iron products, and to own and operate glass furnaces, coke plants, coal and ore mines, and steel and iron works.

INDUSTRIAL NEWS

Roanoke, Va.—The Heuser Coal Co. has purchased 300 acres of coal and timber land on Pine Creek, near Mayking, Ky., and will develop the same within a short time.

Maracaibo, Venezuela—Development on a limited scale has been begun by the Caribbean Coal Co., an American organization, on the coal deposits on the Guajira peninsula. A diamond drill is being forwarded to the property.

Grand Haven, Mich.—A large deposit of coal has been discovered on the beach in this vicinity by a gang of workmen who were putting in the new water main.

Shelburn, Ind.—The Canada Oil Co., which is drilling on the farm of Thomas Dix, has recently shot a well at a depth of 615 ft. From all indications, it will produce from 50 to 60 bbl. a day.

Paducah, Ky.—The West Kentucky Coal Co. will begin at once the construction of 50 new barges at its plant, for the purpose of taking care of its increasing production. Since Jan. 1 the company has built 47 barges, but requires still more.

Hulbert, Ark.—Last week the Roberts & Schaefer Co. secured a contract from the Rock Island Lines for a fireproof counterbalanced bucket (Holmen type) coaling station, to be built immediately at Hulbert, Ark. Contract price approximately $15,500.

Morgantown, W. Va.—J. V. Thompson, of Uniontown, Penn., has failed to purchase several valuable tracts of coal land in this county upon which he secured options some time ago. The options were for 45 days and have expired. It is understood that the price ranged from $600 to $800 an acre.

Lynn Hollow, Ky.—The Lynn Hollow Coal Co. was recently organized by local men on the new Wasioto & Black Mountain R.R. in the Harlan field. This is another new company which is starting development work on a large scale, with promise of large production later on.

Burkburnett, Tex.—The Corsicana Petroleum Co., which has purchased the lease on 3600 acres of land in the Burkburnett oil field will bore a number of wells upon the property. There is already one well which has a production of more than 100 bbl. per day located upon the land.

Monongahela, Penn.—It is reported that leading operators of the Pittsburgh district have refused orders for 1,000,000 tons of coal during the past week or ten days, owing to the fact that they were already sold to capacity. Indications are that the mines will run steadily during the entire summer season.

Lexington, Ky.—The miners' short course which is given by the State University College of Mines and Metallurgy is proving exceedingly popular with miners, and many additions to the class which will take the course during the summer have been made, the students coming not only from all parts of Kentucky, but from other states as well.

Louisville, Ky.—A 2,000,000-bushel coal fleet arrived in Louisville a few days ago from Pittsburgh, principally intended to supply the local yards for the summer storage business. Large tows of empty barges were awaiting the arrival of the towing steamers of the fleet, to be taken back to Pittsburgh for immediate loading for the South.

Denver, Colo.—J. G. Gwyn, chief engineer of the Denver & Rio Grande Ry. Co., Denver, Colo., has just awarded a contract to the Roberts & Schaefer Co. for the building of two large counterbalanced bucket (Holmes type) locomotive coaling stations for installation on their line at Salida and Minturn, Colo. Contract price approximately $22,500.

Sargent, Ky.—A large acreage of coal and timber land on Smoot Creek has been purchased by A. H. McClure and associates, of Frankfort, Ky., and it is intended to develop the property at once ,for which purpose a complete coal-mining plant will be opened up shortly. Subsequently lumber mills will be installed for the purpose of cutting up the timber.

Harlan, Ky.—The Harlan Coal Mining Co. is taking bids on lumber to be used in the construction of 120 miners' houses which it proposes building at its mines. They will be of a little better class than the average run of such houses, as a good grade of yellow pine is to be used for the most part, and cypress shingles will be used in the roof, instead of tin or composition roofing.

Johnstown, Penn.—Mine No. 33 of the Pennsylvania Coal & Coke Corporation, at Patton, resumed operation June 2, after having been closed down for three months. The company now has about 100 men at work and is putting out about 300 tons daily. The capacity of the mine is about 1200 tons. It is said that the company is driving new headings in preparation for a rush in the coal business next fall.

Boonville, Ind.—The Big Four Coal Co. has secured an option on several hundred acres of coal land and is completing arrangements for large stripping operations in Southern Indiana. A company, which will include the Big Four company, together with outside capital, is now being formed to mine this coal by a stripping process. It is claimed that the output will reach a thousand tons daily and the company expects to be able to put the coal aboard the cars for 20c. a ton.

Owensboro, Ky.—Announcement has been made of an increase of 5c. a ton on coal from the mines in western Kentucky, on the Louisville & Nashville, after June 1. A similar increase has been ordered, also, upon the Illinois Central. The reason for the increase on the part of the Louisville & Nashville has not been given, but it is understood that the step has been taken to equalize the rates from western Kentucky mines with those from the mines in southeastern Kentucky.

New Cumberland, Penn.—The Monongahela River Consolidated Coal & Coke Co., which has lost two boats on the Ohio River, near Louisville, within the past month, suffered the loss of another a few days ago when the towboat "Tornado" struck Dam No. 9, on the Ohio River, near New Cumberland, and sank. The boat was on her way to Pittsburgh with a tow of empties when the current and high water combined to cause the accident. The crew of 28 men escaped by leaping into the river as the boat went down. It will probably not be possible to recover her.

Salt Lick, Ky.—The Licking River R.R. Co., which has been operating a 32-mile line running from Salt Lick to Yale, in Bath County, has filed notice in the office of the Kentucky Railroad Commission of its intention to quit business. The road served a region which showed considerable promise of coal and timber, but operations have evidently not proved profitable. The company has a capital stock of $50,000, and is bonded for $100,000. Stockholders holding 497 of the 500 shares filed the notice, these including J. H. Fulmer, Jr., W. W. Hubbard, H. G. Niles, Jr., J. A. Roper and Charles Bygate.

Lexington, Ky.—J. B. Allen, who is in charge of the Slemp-Camden-Mayo coal interests in Perry, Knott and Letcher Counties, Ky., proposes to conduct an elaborate and exhaustive system of prospecting over the properties which he handles during this summer, and for that purpose recently secured the services of Henry L. Noel, a member of next year's graduating class of the Kentucky University College of Mines and Metallurgy. It is intended to ascertain exactly what the properties are worth for coal-mining purposes, in order that development may proceed intelligently when it begins.

Beaver Creek, Ky.—The charter of the Long Fork R.R. Co., which owns a location for a railroad on the left fork of Beaver Creek, and whose proposed line will render accessible about 100,000 acres of coal lands owned by the Elkhorn Fuel Co. and about 8000 acres owned by the Milwaukee Coal & Gas Co., has been acquired by the Baltimore & Ohio R.R. Co. The latter company will proceed with the construction of the line, although the exact date of the beginning of the work has not been decided upon. F. L. Stuart, of Baltimore, Md., is chief engineer of the Baltimore & Ohio. The road will be about 30 miles in length.

Jenkins, Ky.—It is reported that the Consolidated Coal Co. has now increased its output to the point where it is shipping 200 cars a day from its mines at Jenkins and 60 cars from the McRoberts workings; and the output from the latter is to be doubled within two weeks. This largely increased output has necessitated the operation of more and larger trains over both the Sandy Valley & Elkhorn and the Lexington & Eastern railroads in that section. The Louisville & Nashville is rapidly getting into service in this field its new steel coal cars recently provded for, and is doing everything in its power to meet the increasing requirements of the coal operators.

Columbus, Ohio—The Chapman Mining Co., of Columbus, which has offices in the Wyandotte Bldg., is branching out and has established sales agencies at a number of points. At Mason City, Iowa, L. B. Hagerman has been stationed and A. M. Fisher is located at Detroit. W. H. Spencer is stationed at Grand Rapids. In addition to these agents the company has assigned A. S. Tingley to cover Indiana and A. L. Vogt to cover the state of Ohio.

Arrangements have been made with the New York & New England Coal Co., of Albany, Penn.; the Nayaug Coal Co., of Dunsmore, Penn., and the Mohawk Coal Co., of Carbondale, Penn., to act as selling agency in this territory.

Louisville, Ky.—The Kentucky Court of Appeals has granted to the Illinois Central R.R. Co. an order restraining Judge J. J. Rice, of Muhlenberg County, from proceeding with the trial of the 1600 damage suits filed by the miners in that section against the railroad on account of last winter's car shortage. One of the reasons alleged for the issue of the order was that Judge Rice is a candidate for reëlection, and that the number of plaintiffs involved in the suit might influence him. The amount involved in the cases is $50,000, and the appellate court holds that they should be tried in the circuit court, from which an appeal may be taken to the appellate court, in order that the full merits of the matter may be adjudicated.

Stonega, Va.—The Virginia Iron, Coal & Coke Co., which operates large coal and coke plants at Stonega, Va., two miles from the Kentucky line, has announced that it is about to start the biggest operation ever attempted in the Virginia coal fields. The new development will be along the headwaters of Guests' River for seven or eight miles along the Kentucky line, and will be reached by the Interstate R.R., the company line, which is to be extended from Norton, Va., for that purpose. For years it has been the company's intention to develop this part of its property, and it is now ready to spend in the neighborhood of $25,000,000 in the work. The construction of the railroad has begun, and engineers will soon locate the first town of the series which will be built in connection with the operation.

COAL TRADE REVIEWS

GENERAL REVIEW

The retail demand for hard coal is the best it has been for years at this season, which has enabled dealers to buy more liberally than usual. Shipments by the companies are steady and promise to continue so. There is a perceptible tendency to drag, however, and stove coal which has been the leader for several months is now comparatively easy, with broken a close second.

Some bituminous shippers in the East are so short of coal that they are being forced into the open market for small tonnages to fill out their contracts. This is a most unusual condition for this season of the year when the market is ordinarily at the lowest point. The inadequate labor supply is probably the direct cause of this condition, but the situation has been further aggravated by a heavy buying movement on the part of some consumers seeking to cover their requirements against a possible further advance in quotations. The Eastern bituminous trade is in a commanding position with the market steadily strengthening, and indications are that there will be a further shortening up in tonnages unless the labor situation improves. Forced sales, even in the low grades, are practically unknown; coal is to be had only on reasonable notice, while operators are slow about taking new business and there is a general feeling that higher prices will prevail later.

Mining in the Pittsburgh district continues active, although consumers are well taken care of on contract. The labor supply is inadequate, but not sufficiently so as to seriously affect operations and there appears to be sufficient car supply to take care of shipments; slack is the only heavy feature of the market. In outlying districts the car shortage is becoming more pronounced, particularly where prompt shipment is required. The asking price is stiff and there is no difference of opinion regarding the firm condition of the market. Operators are well sold up for several months and there is little prospect of any increase in the production.

Although the car shortage in Ohio is restricting operations, it is now evident that the lake shipments will exceed all previous records. There is still a shortage at the Hampton Road piers, and some producers are having difficulty in meeting their contracts; the dumpings at the piers fell off last week, due principally to a lack of tonnage. The Southern markets remain steady, because of the light production, as a result of a scarcity of both cars and labor.

The wave of prosperity in the coal trade now seems to have been definitely established in the Middle Western markets. Contrary to expectations, the trade continues to improve and it is now clear that there is little danger of any immediate slump in quotations. Prices are advancing because of the shortage of Eastern coal, which is forcing buyers into the Middle Western markets. Some large contracts are open and operators are showing a tendency to hold for higher prices.

BOSTON, MASS.

Bituminous—Pocahontas and New River continue quite firm in price. Some of the shippers are even short of coal for early June loading and are in the market themselves to buy of other interests at the contract figure. This is a most unusual situation for June and it points to a strong market through what is ordinarily the slow season. The far-sighted people in the trade are expecting such a shortening up of tonnage on account of the poor supply of labor in most of the districts that they are trying hard to pile up coal as fast as it can be had. There is no accumulation at any of the loading piers and the demand from the West is reported as unusually brisk. In all directions bituminous is in a commanding position.

It is significant that a further slowing up is apparent on the Georges Creek tonnage coming to tide. Steamers at Baltimore are having fair despatch, but sailing vessels and barges are now required to wait for a few days at least. At Philadelphia and New York the receipts are just beginning to be intermittent. The same is true of the highest-grade coals from Pennsylvania.

Cargoes arriving on the market are now seldom heard from and spot coal for inland distribution is only to be had on reasonable notice. There are no auction sales just now. Most of the all-rail shippers are behind on orders, but consumers have learned to be forehanded and to provide storage more liberally than used to be the case.

Water Freights are hardening from all the ports; 70c. has been paid from Hampton Roads to Providence and 80c. to Boston, both on fair-sized tonnage, while 45c. continues the rate on barges for Long Island Sound, for New York loading.

Anthracite—A slight easing up is noticed, but dealers in New England are still after shipments. The retail demand has been the best in years and it has enabled the dealers to take on rather more coal than ordinarily. Individual shippers are doing little in this market, but the few companies that are serving the trade are sending coal around with almost clock-like regularity. Stove is still the size hardest to get, although broken is not far behind.

Current wholesale prices on bituminous are about as follows:

	Clearfields	Cambrias Somersets	Georges Creek	Pocahontas New River
Mines*	$1.05@1.40	$1 30@1 60	$1.67@1.77	
Philadelphia*	2 30@2.70	2 55@2 85	2.92@3.02	
New York*	2 60@3 00	2.85@3 20	3.22@3 32	
Baltimore*			2 85@2 95	
Hampton Roads*				$2 85 *firm*
Providence†				3.73@3.78
Boston†				3.83@3 95

*F.o.b. †On cars.

PITTSBURGH, PENN.

Bituminous—Coal mining continues active but the market is relatively quiet as buyers are well taken care of by existing contracts. Free coal usually brings a premium, though not always. The labor supply is not altogether adequate, but does not curtail production materially. The car supply, while not ample, is sufficient to take the coal which can be produced, though in spots shortages develop. Shipments in the lake trade are practically at record rate for this stage in the season and the prediction continues to be made that the season will show a new record by a comfortable margin. Slack continues in heavy supply in consequence of the lake movement and frequently sells down to 60c., though some large operators refuse to shade the 90c. price. Noting that prompt lots outside of slack frequently bring premiums of 5@10c. a ton, we quote regular prices as follows: Slack, 90c.; nut and slack, $1.05; nut, $1.25; mine-run, $1.30; ¾-in., $1.40; 1¼-in. steam, $1.50; 1¼-in. domestic, $1.55, per ton at mine, Pittsburgh district.

Connellsville Coke—Prices continue to be well maintained despite light inquiry. There is a small turnover of prompt furnace, generally at $2.15 or $2.20, while the nominal asking price is $2.25. It is to be noted that sales have been made at the lower figure by operators who are committed to the $2.25 figure. Furnaces have not yet arrived at the point of being willing to pay prices asked on second half contracts, but their apathy is in large part due to the stagnant pig-iron market. It is becoming understood that the operators who have been naming $2.50 as their price for second half would be willing to close at a concession of 10 or 15c., depending on the desirability of the contract. We quote: Prompt furnace, $2.15@2.25; contract furnace, $2.35@2.50; prompt foundry, $2.85@3.25; contract foundry, $3@3.25, per ton at ovens.

NEW YORK

Bituminous—The soft-coal market has shown a tendency to ease off slightly in this section during the past week. The indications are, however, that the condition is only temporary and the unusual strength noticed in the report last week still exists, although not so clearly evident at this writing.

Mines are working about the same as last month, and the production is heavy. The growing scarcity of labor is developing to such proportions that operators are becoming seriously alarmed over the outlook. Concessions of many kinds are being offered in order to attract the men to the mining regions, but in spite of this fact operations are being seriously crippled, especially in the more undesirable districts. With production thus restricted the car supply has been sufficient, but predictions are being freely made that the situation in this respect will be quite serious the coming fall. It is a well known fact, however, that the roads are providing a great deal of additional equipment, so that it is probable they will be able to handle the situation better than is anticipated.

We continue last week's quotations on the following basis: West Virginia steam, $2.55@2.60; fair grades Pennsylvania, $2.65@2.70; good grades of Pennsylvanias, $2.75@2.80; best Miller, Pennsylvania, $3.05@3.15; Georges Creek, $3.25@3.30.

Anthracite—While there is not a great deal of snap to the local market, the trade continues moderately active and about normal for this season of the year. The demand for the prepared sizes, particularly egg and stove, is excellent; most of this is, of course, for stocking purposes, although there has probably been more than the usual consumption lately due to the rather cold weather for this period of the year. Buckwheat and barley are quite heavy and some of these grades are now going into storage.

While the hard-coal market as a whole will probably touch a still lower level in midsummer, there is a strong healthy undertone and indications point to a heavy business the coming fall. The anthracite companies are being supplied with plenty of equipment, the mines as a rule are working good, and the production is about normal.

We quote the New York hard-coal market on the following basis:

		Individual	
	Circular	Lehigh	Scranton
Broken	$4.70	$4.45@4.65	$4.50@4.70
Egg	4.95	4.90	4.95
Stove	4.95	4.90	4.95
Chestnut	5.15	5.15	5.20
Pea	3.50	3.30@3.45	3.35@3.50
Buckwheat	2.75	2.15@2.45	2.50@2.75
Rice	2.25	1.70@1.95	2.25
Barley	1.75	1.35@1.70	1.60@1.75

PHILADELPHIA, PENN.

Just at the present time, the coal trade in this vicinity, particularly in the local market, is not as favorable as both the retailer and wholesaler would like to see it. While it is understood that the companies are taking care of their output of the prepared sizes, there is a tendency to drag in almost all grades. This is particularly true of the local market, where even the demand for stove coal, which has been the leader for months, has fallen off, but this has given the operators an opportunity to furnish this size on calls in other directions. The reports of business at tidewater, however, still continue favorable, large quantities of coal going by barge to the down East points, where the demand is said to be strong.

There is, however, an unmistakable lack of snap to the market, and until after the middle of the month, not much improvement is looked for; but the approach of the first of next month, which marks a further advance of 10c. per ton, is always characterised by a spurt. Operations at all the mines are still good, and large quantities of coal are being sent to market; while it is not expected that it will be necessary to curtail production during the month of June, some of the pessimistically inclined hint at a possible intermittent suspension of mining during the next two months.

The bituminous trade is gradually rounding into shape, but the improvement is so slight that it takes an optomistic operator to indicate what it amounts to. Prices appear the same as last reported, with some few variations.

BALTIMORE, MD.

The feature of the local market during the past week was the heavy tonnage handled over the railroad piers. The Curtis Bay piers of the B. & O. R.R. were particularly active, one company alone having contracts for 66,000 tons of export and coastwise coal to be shipped at this point. The business showed a marked increase over previous weeks and promises to continue so for the next two weeks, a number of vessels being due here within that time, which will be loaded at both the Curtis Bay piers and the Port Covington piers of the Western Maryland R. R.

General market conditions continue good, with prices firm, especially on the low grades, which are selling freely at from 80@90c. Quemahoning and Georges Creek are, of course, in active demand. Some companies are reported to have insufficient production to meet their contract obligations and are being forced into the prompt market; the trouble is due to the inadequate supply of miners in the mining district.

The spot line business is exceptionally strong, with consumers insisting on prompt delivery. This would seem to indicate that buyers are stocking up at present prices rather than taking chances on the possibility of a restricted output in the future. The depression reported in other lines of industrial activity has not reached the coal trade in this vicinity as yet and operators continue to take an optimistic view of the outlook.

Export business for May was slightly below that of April, but still of sufficient proportion to show a substantial increase in this branch. The total exports for May were 88,138 tons, or a reduction of 2492 tons over that for April. Of this amount, 25,417 tons were shipped to Egypt; Brazil, Mexico and Cuba, being the other main points.

BUFFALO, N. Y.

The interest of the coal dealers and consumers is just now centered more on the threatened strike of the teamsters than on the price of coal. It is noted that there are a great many buildings in the city, with elevators and sometimes other machinery to run, that seldom have more than two days' supply ahead so the problem may be a serious one.

Otherwise the situation is without much change. The complaint of car shortage in the bituminous trade is increasing, especially where cars are to be hurried to a consignee who is about out of coal; it is usually then discovered that passing and junction points are badly congested. One shipper states that it takes from a week to ten days to make sure of a car consigned from the Alleghany Valley mines, a matter of 150 miles or so, to Black Rock, for which the East Buffalo yard probably is more or less to blame.

As a rule the members of the bituminous trade are not forgetting the long years of selling coal at cost and the consumer was not then interested in helping them out. It is felt now that coal is bringing a paying price, not on account of any corner or stress that the consumer is obliged to stand for, but because business is good and the consumer can well afford to pay a good price for his coal.

There is a growing scarcity of cars as well as miners, which makes it certain that there is no coal waiting on track to be picked up. If the jobber has no mine connection he is finding it difficult to get much coal of any sort. The bituminous trade is feeling much more confident of the future than ever before.

Quotations, therefore, are strong at $2.80 for Pittsburgh lump, $2.65 for three-quarter, $2.55 for mine-run and $2.15 for slack, with Alleghany Valley about 25c. lower, chiefly on account of freight rate, the reduction being partly divided with the consumer. Coke is unchanged and not especially strong at $4.75 for best Connellsville foundry.

There is an increasing complaint from the Allegheny Valley mines about the lack of both miners and cars. With such a large amount of coal sold on contract the situation is anything but pleasant, though it may be fully as satisfactory as when it was sold at cost. Nobody claims now that there is no profit in the business.

The anthracite situation is without feature and no stir is expected until fall except a little at the end of each month, when consumers show an interest over the saving of 10c. a ton. Shipments of anthracite from this port for the week amounted to 135,000 tons, a fairly good average. Most of the coal went to Chicago, as return cargoes from Lake Superior are not plenty.

COLUMBUS, OHIO

The chief feature of the local market is the continued strength although some weakness has developed in the small sizes. On the whole the trade is firm and prices are well maintained. No important weakness has developed and every branch of the business is on a sound basis. Prospects for the future are generally considered favorable.

The lake business is still one of the strong points of the trade. Thousands of tons are moving from Ohio mines to the Northwest, via the lakes, and since the demand from that section is strong it is freely predicted that the present season will be one of the largest in the history of the lakes. Chartering of boats is still going on and the movement of vessels is good since the early congestion at the upper lake ports is over.

Production has been somewhat restricted by an increasing car shortage. In the eastern Ohio district where cars are the scarcest the output is estimated at 70 per cent. of normal and the Pomeroy Bend district shows up with about 60 per cent. of the average. In the Hocking Valley there has been less trouble on this account and the output is close to normal. In the domestic fields there is a slight increase in the output.

Domestic trade shows some activity, although it is yet too early for much movement. Retailers are gradually accumulating supplies so as to be prepared for the stocking season when it comes. Some of the larger domestic users are already laying in their winter supply. On the whole there is bright prospects for an active domestic trade in all parts of Ohio and adjoining states.

The steam business is rather active along all lines although some factories are not buying as well as formerly. Iron and steel concerns are buying as usual. Railroads are also using quite a good deal of fuel. The freight movement is gradually increasing since the flood damage has been repaired. Some few steam contracts have not been renewed

although most of them have been closed up for the year. Most of the railroad contracts have also been signed.

Quotations in the Ohio fields are as follows:

	Hocking	Pittsburgh	Pomeroy	Kanawha
Domestic lump	$1.50		$1.50	$1 50
2 inch	1.35	$1 25	1.35	1 30
Nut	1.20		1.25	
Mine-run	1.15	1 10	1.15	1.10
Nut, pea and slack	0 70		0.70	0.65
Coarse slack	0.60	0 65	0.60	0.55

HAMPTON ROADS, VA.

Dumpings at Hampton Roads piers have not been as heavy as expected. Some large foreign shipments have been made during the week but coastwise business has not been brisk. There is still a shortage of coal at all piers and some suppliers are finding it difficult to take care of contract business. Producers having free coal have been able to dispose of it at $2.90 but even at this price there have been only one or two small sales as no one has had a large surplus at tidewater. There has been some inquiry for spot high volatile coal and no sales as suppliers are practically cleaned out of this grade.

While it was expected that the Norfolk & Western Ry. at Lamberts Point would lead in the tidewater dumpings for May yet it was hardly anticipated that they would reach over 350,000 tons. The actual dumpings, however amounted to 490,917 tons. The Chesapeake & Ohio Ry. at Newport News dumped during the month 289,990 tons and the Virginian Ry. over the one pier at Sewalls Point dumped 281,537 tons. The total dumpings for Hampton Roads for May amounted to 1,062,444 tons. The dumpings at Sewalls Point broke all previous records of that pier.

BIRMINGHAM, ALA.

The most satisfactory market locally is that on foundry and furnace coke; the usual summer weakness has not yet made its appearance, although the pig-iron market has been steadily declining for several months. The demand seems to easily absorb all coke offered by ovens which do a merchant coke business. The companies operating the furnaces make most of the coke and use same at their own smelters.

Anything that we might say regarding the coal market as a whole would be practically a repetition of last several reports. There is no price cutting worthy of serious mention, but the situation might be changed very quickly for the worse if all mines were supplied with plenty of cars and a little more labor. Unless the production is increased it is not believed that prices will reach as low a level as during former summers.

LOUISVILLE, KY.

The situation locally has not materially changed from last week, with the exception that the steam coals are slightly weaker and notably over-supplied. This is due to a heavy demand for domestic grades resulting in an excessive production of the smaller sizes; there has also been an easing off in the demand for these, due to a curtailment of industrial activity. In addition to this, railroads are taking rather more than the usual amount of the larger sizes which has further over-stocked the smaller grades. Several operators have found themselves with more of these sizes than they could dispose of, but it is believed that the demand will shortly catch up.

Domestic sizes of the better grades are in heavy demand in eastern Kentucky at $1.65@1.70, with the off qualities at about $1.50. No. 2 mine-run is selling at 90c.@$1, and 3-in. steam at 85c. The better grades of nut and slack are quoted at 70@80c. with the second quality in rather light demand at 40@60c., this latter price also prevailing on western Kentucky nut and slack. Pea and slack are weak at 30c. f.o.b. mines.

INDIANAPOLIS

Retailers of this city report a good market, the June movement of coal promising to equal or excel that of May. This buying is practically all of Eastern coals, those who burn anthracite being particularly anxious to get their winter's supply before the usual advances in price. Last winter consumers had trouble in getting anthracite, even at the highest prices on record in this market. This experience is hurrying up their orders and few will take the risk of waiting until fall to lay in their supply.

The mines of the state show little change in the extent of their operations, three to four days a week being the rule. Some operators report an improved movement to the larger industries of the state that carry a large quantity of coal in storage.

Indiana mines continue to put in half time or slightly better. Reports reach here of a slackening in industrial activity in the East, which is probably reflected to the coal business, but while the tariff may be causing some uncertainty and hesitation in the West, the wheels are kept going although factory owners have a keen eye out for any new developments. While the larger steam consumers are renewing contracts, the smaller ones seem willing to take the risks in the open market for their winter needs.

The movement of domestic from retailers' yards is fairly well divided between anthracite and the harder bituminous coals. Of the latter Pocahontas has the heaviest call, followed probably by Kanawha, Luhrig, Raymond City and Ohio Jackson in the order named.

The local wholesale market is about as follows:

No. 4 mine-run	$1 10@1 20	Domestic 4- and 5-in	$1.50@1.60
Nos. 5 and 6	1.05@1 10	Screenings No. 4	0.90@1 00
Steam lump, 1¼-in.	1 15@1.35	Screenings 5 and 6	0 80@0 90
Nut and egg	1.20@1.55	Brazil block	2.00@2 10
Domestic 3-in	1 40@1 65		

DETROIT, MICH.

Bituminous—Contrary to expectations, the soft-coal trade continues to improve, and prices are becoming stiffer generally all along the line. It is now clear that if lower prices are to appear, it will not be very soon. As a matter of fact consumers who have neglected to cover their requirements will now probably have to pay substantially higher prices. Contract business is becoming decidedly better, some operators claiming that they have all the tonnage, available for this purpose, now covered.

It is doubtful if local contract prices have ever before been as stiff as they are today, and it would only take a light buying movement to precipitate a runaway market. The only easy branch is the spot market, which is slightly softer than last week. There has been considerable slack offered in the open market, but the smaller grades as a whole have not suffered materially, and, while they will probably weaken toward midsummer, there is no reason for discouragement.

The feature of the market at the present time is the high price level on the better grades of spot coal; these have stiffened to such a degree that prompt shipment can only be had at from 5@10c. below contract figures for the year. There is a feeling that what little coal yet remains in the spot market will be commanding higher figures than contract tonnages. The market in general is regarded as exceptionally strong for this period of the year.

Prices have shown little change during the week, and the market is now quotable on the following basis:

	W. Va. Splint	Gas	Hocking	Cambridge	No. 8 Ohio	Pocahontas	Jackson Hill
Domestic lump	$1 50		$1 50			$1 99	$1 90
Egg	1 50		1 50			1 99	1 90
1¼-in. lump	1 25						
¾-in. lump	1.15	$1 15	1.15	$1.15	$1 15		
Mine-run	1 05	1 05	1.05	1 05	1.05	1 25	
Slack	0 80	0 85	0 40	0 85	0.80	1 10	

Anthracite—Operators of all kinds are holding firm on prices, but it is generally conceded that the outlook from now on until the fall trade opens up is rather dull, to say the least. Wholesalers are already complaining that there is a falling off in demand, although not of sufficient magnitude to restrict shipments. Supplies are coming forward as rapidly as required and no delay is experienced in satisfying the demand.

Coke—The market on this product is brisk, Connellsville, being quoted at $3, Semet Solvay, $3.10 with gas house at $2.85, all f.o.b. ovens.

MINNEAPOLIS—ST. PAUL

While it is a fact that most Illinois coals have been sold at a low price during the past month, there is a general expectation of a rise during the next two weeks and a steadiness which will prevail during the summer and fall. Eastern coals were never held on as firm a basis as they have been this year, and an actual scarcity of these exists which, with the strained labor conditions, fully warrants a maintenance of price. The amount of coal coming to the head of the Lakes was heavy during May, but the height of the ore carrying season is on and if coal is not available at Eastern loading ports, vessels will come up empty instead of waiting for cargoes

CHICAGO

Owing to a shortage of Eastern coal, increases are evident in contract prices. During the week lump, egg and nut has sold for $1.25 on the spot market. Recently buyers who have been depending for their supply upon the western Pennsylvania, Kanawha and Hocking Valley fields, found these to be practically exhausted and have turned to the Western districts for their supply, with particular attention given to the Franklin County field.

Both the contract and spot market has been strengthened as a result of this western inquiry. The coke market has been just about holding its own. Signs of activity are beginning to show in the anthracite trade, indicating that June trade will make up somewhat for the latter part of April and the first week of May.

Prevailing prices are:

	Springfield	Franklin Co.	Clinton	W. Va.
Domestic lump	$1 97@2.07	$2.30@2.40	$2.27	
Egg		2.30@2.40		$3.85
Steam lump	$1 82@1 87		2 07	3 85
Mine-run	1 77@1 82	2 20@2.30	1.97	3.30
Screenings	1 62@1 67	1.95	1.57@1 62	

Coke—Connellsville and Wise County, $5.25@5.50; byproduct egg and stove; $4.75; byproduct nut, $4.55@4.75; gas house, $4.65@4.75.

ST. LOUIS, MO.

There is an indication that prices will get better; as a matter of fact, things are picking up a little bit now in the Carterville field. However, the reverse can be said of the Standard field, for 6-in. lump has finally got down to a basis of 80c. with mine-run at about 72½c. and 2-in. lump at 77½c. Anthracite is moving remarkably well right now, and coke is coming forward rather plentifully, while smokeless is in a somewhat doubtful position.

There is very indication that business is going to be remarkably good in July, and that will also affect market conditions the latter part of the present month. Some large contracts are open at the present time, and the prices asked in many instances indicate that the operators are at last realizing that they should take advantage of the coming season to make up what they have lost in the past.

The circular has shown little change in the past few weeks, and at the present time is:

	Carterville and Franklin Co.	Big Muddy	Mt. Olive	Standard
2-in. lump				$0 80@0 85
3-in. lump			$1 20	
6-in. lump	$1 15 @ 1 25		1 25	0 85@0 90
Lump and egg		$2 00	1 20	
No. 1 nut	1 10 @ 1 20			
Screenings	0 80 @ 0 85			0 75@0 80
Mine-run	1 00 @ 1 10			0 75@0.80
No. 1 washed nut	1 40			
No. 2 washed nut	1 25			
No. 3 washed nut	1 25			
No. 4 washed nut	1 20			
No. 5 washed nut	1 05			

PORTLAND, ORE.

It is reported that the railroads in the Pacific Northwest are figuring on abandoning oil fuel and returning to coal, but no confirmation to that effect has been obtainable here as yet. The first report was to the effect that the Great Northern which is using oil fuel between Everett, Wash., and Spokane, is planning to make the change and it is also reported that many large buildings in the Pacific Northwest will install coal burners shortly. A prominent railroad operator, here, however, states that he does not take much stock in the report that the Great Northern is planning to fall back on coal after having used oil with success, instead it is possible that oil will be used farther east than Spokane, over the Rocky Mountain division. Coal men on the other hand assert that the demand for crude oil for refining is so heavy that the big oil companies find it to their advantage to refine the oil rather than dispose of it in its crude state.

PRODUCTION AND TRANSPORTATION STATISTICS

ANTHRACITE SHIPMENTS

The following is comparative statement of the anthracite shipments for May and the first five months, of the years 1912-13, in long tons:

	May			%	5 Months		%
	1913	1912	1913		1912	1913	
Phila. & Reading	1,123,869	201,575	5,703,277	19 75	4,094,665	20 57	
Lehigh Valley	1,191,632	202,747	5,408,310	18 72	3,536,978	17 77	
Cent. R.R. N. J.	745,247	128,099	3,724,219	12 89	2,521,302	12 67	
Del. Lack. & West	882,661	277,140	3,961,646	13 72	2,881,219	14 47	
Del. & Hudson	591,499	184,598	2,936,187	10 17	1,902,881	9 56	
Pennsylvania	574,468	145,702	2,656,765	9 20	1,799,217	9 04	
Erie	671,972	235,986	3,417,900	11 83	2,458,634	12 35	
Ont. & Western	214,304	53,510	1,073,503	3.72	710,437	3.57	
Total	5,995,742	1,429,357	28,881,807	.....	19,905,333	.....	

Stocks at Tidewater at the close of May were 502,626 tons as compared with 546,243 the month before.

THE CAR SITUATION

American Ry. Association reports surpluses and shortages of coal equipment for two weeks ended May 31, as follows:

	Surplus	Shortage	Net*
New England Lines	0	95	95
N. Y.; New Jersey, Del.; Maryland; Eastern Penn.	1,444	1,018	**426**
Ohio; Indiana; Michigan; Western Pennsylvania	1,538	109	**1,429**
West Virginia, Virginia, North & South Carolina	969	1,464	**495**
Kentucky, Tenn.; Miss.; Alabama, Georgia, Florida	318	249	**69**
Iowa, Illinois, Wis., Minn.; North & South Dakota	2,100	35	**2,065**
Montana, Wyoming, Nebraska	400	0	**400**
Kansas, Colorado, Missouri, Arkansas, Oklahoma	2,265	65	**2,200**
Texas, Louisiana, New Mexico	401	0	**401**
Oregon, Idaho, California, Arizona	1,991	16	**1,975**
Canadian Lines	175	58	**117**
Totals	11,601	3,109	**8,492**
Greatest surplus in 1912 (Apr. 25)	94,692	2,144	**92,548**
Greatest shortage in 1912 (Oct. 10)	6,491	14,897	8,406

*Bold face type indicate a surplus.

SOUTHWESTERN TONNAGE

The following is a comparative statement of the southwestern tonnage for March and the first three months, 1912 and 1913:

	March		Three Months	
State	1912	1913	1912	1913
Missouri	365,314	276,779	952,526	843,190
Kansas	585,217	466,709	1,625,266	1,404,727
Arkansas	187,014	137,901	618,890	451,437
Oklahoma	311,492	245,449	928,205	909,312
Totals	1,450,037	1,126,838	4,124,887	3,608,666

FOREIGN MARKETS

GREAT BRITAIN

May 30—Best Admiralty coals are still scarce, but other qualities are more plentiful.

Quotations are approximately as follows:

Best Welsh steam	$5.28@5.40	Best Monmouthshires	$4.68@4.80
Best seconds	5.04@5.16	Seconds	4.56@4.62
Seconds	4 80@4.92	Best Cardiff smalls	3.24@3.36
Best dry coals	5.04@5.16	Seconds	3.12@3.24

The prices for Cardiff coals are f.o.b. Cardiff, Penarth or Barry while those for Monmouthshire descriptions are f.o.b. Newport; both exclusive of wharfage, and for cash in 30 days—less 2½%.

SPANISH IMPORTS

Spanish imports of coal for the first three months of the current year were 640,958 tons as compared 614,593 for the same period last year. Coke imports for the same periods were 81,397 tons and 108,669 tons respectively.

COAL SECURITIES

The following table gives the range of various active coal securities and dividends paid during the week ending June 7:

Stocks	Week's Range High	Week's Range Low	Week's Range Last	Year's Range High	Year's Range Low
American Coal Products	87	87	87	87	87
American Coal Products Pref	109¼	109¼	109¼	109¼	109¼
Colorado Fuel & Iron	30	25	27	44½	25
Colorado Fuel & Iron Pref	....	....	155	155	150
Consolidation Coal of Maryland	102½	102½	102½	102½	102½
Lehigh Valley Coal Sales	200	180	190	....	....
Island Creek Coal Com	52	51	51	....	....
Island Creek Coal Pref	85	84	84	....	....
Pittsburgh Coal	17¼	15	16	24⅜	15
Pittsburgh Coal Pref	80½	74	75½	95	74
Pond Creek	22½	19¼	19¼	23¾	19¼
Reading	159¼	154¾	156⅜	168⅜	152¾
Reading 1st Pref	88½	88	88½	92½	88
Reading 2nd Pref	88½	85	86	95	85
Virginia Iron, Coal & Coke	39	38	38	54	38

Bonds	Closing Bid	Closing Asked	Week's Range or Last Sale		Year's Range	
Colo. F. & I. gen. s.f.g. 5s	93	97	97	May '13	95	99⅛
Colo. F. & I. gen. 6s	....	....	107½	June '12	..	..
Col. Ind. 1st & coll. 5s. gu	78¼	Sale	78¼	78¾	78¼	85
Cons. Ind. Coal Me. 1st 5s	..	..	85	June '11	..	..
Cons. Coal 1st and ref. 5s	..	94	93	Oct. '12	..	..
Gr. Riv. Coal & C. 1st g 6s	..	100	102½	April '06	..	..
K. & H. C. & C. 1st s f g 5s	..	96	98	Jan. '13	98	98
Pocah Con Coll. 1st s f 5s	..	88	86	....	86	87¼
St. L. Rky. Mt. & Pac. 1st 5s	..	78	76	Mar. '13	76	80
Tenn. Coal gen. 5s	..	100	100	May '13	100	103
Birm. Div. 1st consol. 6s	100½	103²	101	April '13	101	103
Tenn. Div. 1st g 6s	..	102	102	Feb. '13	102	102
Cah. C. M. Co. 1st g 6s	..	104	110	Jan. '09	..	..
Utah Fuel 1st g 5s	..	..	..	..	..	..
Victor Fuel 1st s f 5s	..	80	80	May '13	79¾	80
Va. I. Coal & Coke 1st g 5s	92	93	93	93	93	98

No Important Dividends were announced during the week

PRICES OF MINING SUPPLIES

THE MARKETS IN GENERAL

Business is a great deal better than most of the reports emanating from New York would lead the readers to think. It is true that there is a tightness of money in New York, considerable unrest and a diminution of business in a financial way. Moreover, it is equally certain that some of the large corporations are unable to get the funds they desire at attractive rates of interest. If these companies are not able to secure a reasonable return as a result of the improvements they contemplate making, they will certainly be unwilling to pay any interest. There is no law compelling them to build fine stations or double-track their roads. They have been able to live without this and they will probably continue so for some time, and while the plea for higher freight rates is illegitimate, or at least is so considered, they will probably secure it. The great trouble is that a financial upheaval in Europe has had a serious effect in New York, through draining from New York a large supply of gold which might be used as a substantial basis for business in this country. It is probable, however, that by fall there will be some let up in the demand from Europe and by that time money will be available for the much needed crop movement in this country.

Price changes have tended toward lower levels in almost every instance, and the iron and steel markets are $1 to $2 per ton lower than a month ago, but it is significant to note that the leading interest is operating its steel production to more than 90% of capacity and in the month of May more pig iron was made in the United States than ever before in history.

The cement trade is active and prices are firm.

The tariff hill has not yet been settled and its delay in the Senate is undoubtedly having an influence on business.

Precipitated liquidation of securities in New York and foreign financial centers about the middle of June had an important effect on new construction. Until this selling runs its course and the markets of the world are able to save new capital, new construction work will be less active with a consequent reduction in the demand for supplies. This should make for lower quotations in the material markets. Contrary to the belief expressed in certain quarters the financial troubles were incident to, and not caused by, the "Rate Decision" handed down, June 9, by the U. S. Supreme Court.

LABOR

Unrest has been more widespread this month than before in several years. The number of strikes in all parts of the country is unusually large, but most of them have occurred among unskilled workers and, for the most part, those laborers securing less than $12 a week Fair-minded men believe that such laborers should have a just compensation and in many instances these strikes have been settled, the laborers securing a substantial increase. The strike of greatest importance among the skilled trades was the machinists in Baltimore, asking for higher wages and shorter hours, while the same is true in Buffalo. This, of course, has had its inception from the tremendous business automobile manufacturers have been doing, and they are still scouring the country for capable machinists.

Coal miners are in exceptionally good demand and the supply seems to be short. Immigration coming to these shores is large, the total steerage passengers arriving during the first ten months of the year numbering 750,000, while the arrivals at the port of New York alone in May there were approximately 100,000 immigrants.

IRON AND STEEL PRODUCTS

New business in April did not develop large and in fact it was a general disappointment to all classes of manufacturers. There had been a boom for a year which was expected to continue indefinitely. New orders were few and very far between and salesmen were unwilling to make quotations while consumers seemingly had no interest in the market. On the other side, it is worthy of note that the U. S. Steel Corporation were operating their finished-steel mills to 92% of capacity, while the ingot production was 99% of production, and other steel companies are working in like ratio. It is true that the unfilled orders for steel products have been rapidly declining, but on the other hand there is little suspicion that the steel mills of the country could not be kept actively engaged for six months if no other orders should come in and there should be no postponements. It is also significant to note that a prominent street railway company in applying for certain franchises urged the commission to expedite its work as it would be impossible to secure equipment in less than six months after the orders were placed.

The automobile manufacturers of the country are working as never before, one company making a popular low-priced car, being 60,000 cars behind in its orders. This means that for nearly ten weeks this company will not be able to make prompt shipment even though no other orders come in.

Railways are not buying equipment with anything like the liberality of a year ago, but the New York Central recently ordered 175 locomotives.

Unfilled orders on the books of the United States Steel Corporation decreased 650,000 tons during the month of May.

Steel Rails—A marked decline in the demand for light rails was a distinct disappointment to the steel trade and a most unexpected one. It has been conceded for some time that the railways would probably curtail their orders for standard section, but it was not believed that light rails would be so inactive. The only order of importance during the month was for 10,000 tons for export.

Quotations continue unchanged at 1.25c. per lb. per standard section weighing from 50 to 100 lb. per yard; 1.21c. for 40- to 50-lb. rail; 1.30c. for 16- to 20-lb. rail. These quotations are for carload lots, f.o.b. Pittsburgh.

In Chicago, 16- to 20-lb. rails are 1.30c.; 12-lb., 1.35c.; 8-lb., 1.40c. Relaying rails, Chicago, are $24 per gross tons and can be obtained at other points at approximately the same figure although not in any considerable quantities.

Track Supplies—Business is very inactive, although there was an enormous order for tie plates early in the month by the Lake Shore & Michigan Southern. Spikes are 2.10c. base for large lots; track bolts with square nuts, 2.40@2.50c. base, and tie plates, $34@36 per net ton. These quotations are for Chicago delivery. In Pittsburgh angle bars are from 1.50@1.60c. and spikes 1.95@2.05c. All these quotations except the tie plates are per lb. and fairly good sized lots.

Pipe—The demand for pipe has not fallen off to the same degree as has been noted in other commodities and while some revision of discounts has been made the general pipe business continues active. The fuel companies are buying in large quantities and the pipe mills have all the business they can take care of for the present. They are, however, able to make fairly prompt shipment.

Discounts are as follows:

	Black	Galvanized
¾- to 2-in. butt welded	79½%	70%
2½- to 6-in. lap welded	78½%	70%

Based on these discounts, the net price of pipe per foot are as follows in carload lots f.o.b. Pittsburgh:

Size, inches	Black	Galvanized
¾	2.35	3.40
1	3.50	3.46
1¼	4.75	6.60
1½	5.55	8.00
2½	12.60	17.50
3	16.50	23.10

Sheets—Much weakness has been manifested in the market and considerable price cutting is noticed, especially in the West. Some of the mills, which were securing premiums for prompt delivery three months ago, are now most actively engaged in cutting quotations. At the same time, the Steel Corporation is obliged to curtail operations to about 25% of capacity at the Vandergrift mills because of the lack of semi-finished steel. Shipments are fairly prompt and can easily be made eight weeks after specifications are received.

The following quotations are for lots of a few bundles f.o.b. Pittsburgh and Chicago. The price for large lots is unchanged at 2.30c. f.o.b. Pittsburgh for No. 28 black.

	Cents per Pound			
	Pittsburgh		Chicago	
	Black	Galv.	Black	Galv.
Nos. 22 and 24	2.75	3.55	2.70	3.50
Nos. 25 and 26	2.80	3.70	2.75	3.65
No. 27	2.85	3.95	2.80	3.90
No. 28	2.90	4.00	2.85	3.95

Structural Materials—Business is less active in the East and similar conditions prevail in the West, although there it is expected that considerable railroad business will develop within the next few months. The diminution in building, which is prevalent in the East, seems likely to continue for some time, and from the present outlook, when railways are obliged to pay such high rates of interest on capital, it is doubtful if they can secure the funds with which to make their improvements. Under such circumstances an early return to a large volume of business in fabricated materials is unlikely.

Quotations are without change, except the premium for prompt shipment has disappeared. Plates, beams and angles are held at 1.50c. base from Pittsburgh, and in Chicago 1.68@ 1.73c. All of these prices are per 100 lb. in carload lots.

WIRE PRODUCTS

New orders are coming in slowly and there is far less demand for wire products in the farming community than was expected early in the year. The mills are not rushed with orders and are able to make shipments fairly prompt. Quotations are as follows for large lots: Painted barbed wire, $1.86; galvanized, $2.20; annealed fence wire, $1.60; galvanized, $2.05. In Chicago annealed fence wire is $1.78 and galvanized $2.18. Barbed-wire fencing in the Chicago market is $2 and galvanized $2.40. All of these quotations are per 100 lb. For smaller lots bought from jobbers' store in these centers advances will be about 25c. per 100 lb.

Wire Rope—The demand is steady and prices are unchanged. Two-inch rope in Pittsburgh is held at 50c. per lin.ft.; 1¼-in., 23c.; ¾-in., 10c. These quotations are for the highest grade, but cheaper grades can be had at considerable concessions from these figures.

Copper Wire—Business is not especially active, but several of the important trunk lines of the country are making preparations to electrify portions of their system. This will call for an immense amount of copper and stimulate trade more than at any time since 1906. The base price of copper wire is unchanged at 17c. per lb.

Telegraph Wire—Business is fairly active with quotations unchanged as follows:

Prices are as follows in cents per pound for wire measured by the Birmingham wire gage: "Extra Best Best," Nos. 6 to 9, 4¾c.; Nos. 10 and 11, 4½c.; No. 21, 4⅝c.; No. 14, 5⅛c.; "Best" Nos. 6 to 9, 3½c.; Nos. 10 and 11, 3⅜c.; No. 12, 3½c.; No. 14, 4c. Actual freight is allowed from Trenton, N. J., where it does not exceed 25c. per 100 lb.

HARDWARE

Bar Iron and Steel—Prices are steady. Quotations from jobbers' stores in New York and Chicago are as follows:

Refined iron:	Per lb.
1 to 1⅞ in., round and square	2.10c.
1½ to 4 in. x ¾ to 1 in.	2.10c.
1½ to 4 in. x ¼ in. to ⅝ in.	2.30c.
Norway bars	3.60c.
Soft steel:	
¾ to 3 in., round and square	2.05c.
1 to 6 in. x ¾ to 1 in.	2.05c.
1 to 6 in. x ⅛ and ¼ in.	2.20c.
Rods—⅝ and ½ in.	2.15c.
Bands—1½ to 6⅜ in. to No. 8	2.35c.
Beams and channels—3 to 15 in.	2.15c.

Chain—There is less demand than a month ago. Ruling quotations per 100 lb., f.o.b. Pittsburgh, are as follows:

⅜ in.	$7.50
¼ in.	4.95
5/16 in.	3.95
⅜ in.	3.40
7/16 in.	3.20
½ and 9/16 in.	3.00
5/8 and 11/16 in.	2.90
3/4 and 13/16 in.	2.80
⅞ and 15/16 in.	2.70
1 to 1¼ in.	2.60
Extras for BB	
¼ in.	1.50
¾ in.	1.50
½ and larger	1.25
Extras for triple B (BBB)	
¼ and ½ in.	2c.
¾ and larger	1.75c.

Nails—In the East the demand is not as active as a month ago and some falling off in the West, although not in the same proportion as along the Atlantic Coast. Prices are steady, large lots being held at 1.80c. Pittsburgh and 2.10c. Chicago. For small lots from jobbers' store the price is 2c. in Pittsburgh and 2.30 in Chicago. Approximately the same figures may be obtained in important jobbing centers throughout the Middle West as in Chicago.

Rivets—The demand continues less active than a month ago and users seem to have a sufficient supply on hand to meet their needs. Quotations are $2.20 for structural rivets and $2.30 for boiler rivets. These prices are per keg of 100 lb.

METALS

Copper—Consumers abroad continue to buy copper in large quantities and exports for the first five months of this year established a new high record for the period. American consumers are likewise buying freely and the recently published statistics of the Copper Producers' Association show that the stocks of unsold copper were again reduced during the month of May. Prices have been shaded somewhat during the last few weeks, chiefly because of the financial situation, and electrolytic can now be had at 15½@16c., while Lake copper can be had at 15¾@16¼c. These prices are for comparatively large lots.

Tin—The market continues steady, although slightly lower. Consumption abroad is large, but in the United States is falling off somewhat. The price is 47c. per lb.

Lead—The market is not as strong as a month ago, and quotations have been revised downward. In New York lead sells at 5.35c. and in St. Louis at 5.20c.

Solder—Strictly half and half solder can be had in New York at 20@27½c.

MISCELLANEOUS

Castings, Gray-Iron—The foundries making a specialty of castings having low-carbon content and being used for general building work, are anxiously looking for business, and in consequence some very low prices have been named. Rough castings of large sizes can be had at 1.65@2.20c. per lb. Small castings can be had at 2.50@3c. per lb

Portland Cement—A rather extended inquiry covering all parts of the country has been made from reports of managers of cement mills and while it is found that business is fairly satisfactory, in every part of the country except northern Indiana, Michigan and Kansas, none of the mills are especially well supplied with orders and they do not believe a serious shortage will result this year. It is thought that in some quarters a slight advance will possibly be made later in the year, but the shortage of freight cars in which to ship the cement is more likely to be an important factor than any other one thing. There have been no price changes and the following quotations are per bbl. in bulk at the mill, to which should be added 40@50c. per bbl. for the packing, giving the price f.o.b. mill; to this should be added the freight from the mill to destination. In Pittsburgh the price is 90c.@$1; Chicago, $1.05@1.10; Missouri district, $1@1.05; Chattanooga, Tenn., $1@1.05; Texas and Oklahoma, $1.10@1.20. A few mills are quoting around $1. In New York and Pittsburgh $1.58 is quoted with an allowance of 40c. per bag returned.

Bars, Concrete Reinforcing—The demand is not as large as it was early in the spring, but still it is fairly satisfactory and there has been little price cutting. The following quotations are for small lots from warehouse stock:

PITTSBURGH PRICES IN CENTS PER POUND

	Warehouse Stock
¾-in.	2.00@2.10
⅝-in.	2.05@2.15
½-in.	2.10@1.20
⅜-in.	2.25@2.35

Shafting—The largest consumer of shaft for automobile purposes entered an order for 4000 tons last month. This temporarily stiffened the market. Business continues active, and the discounts are unchanged at 58% from list for carload lots and 53% from list for less than carload lots. The following net prices per foot are based on the discount of 53%:

Diameter in inches	Cents per foot	Diameter in inches	Cents per foot
¾	4.25	2¼	31.50
1¼	10.80	2½	39.30
1½	14.05	2¾	48.00
1¾	19.20	3	56.50
2	25.00	3½	84.00

Triangular Mesh—Business is not especially active.

From mills in De Kalb, Ill., quotations are 18c. per 100 lb. higher than those quoted below, which are per 100 sq.ft. f.o.b. Pittsburgh. These are for lots of less than 10,000 sq.ft.

No. 4	$1.23	No. 32	$2.62
No. 23	2.05	No. 36	1.05
No. 26	1.42	No. 40	3.25
No. 28	1.97	No. 41	2.48

Brattice Cloth—The scarcity of material continues, and orders are in as large a volume as ever. No hope is held out that the situation, as far as lower prices are concerned, will improve during the summer.

COAL AGE

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"To work hard, live hard, die hard and go to hell after all is hard indeed." Here we have expressed in few words the creed of the average miner. When we say this we do not wish to infer that this creed is peculiar to mining folk, it was framed long before civilization had need of the miner; in truth it is the creed of the "under dog" in all walks and occupations and probably has been since "under dogs" became necessary to the scheme of things mundane.

The peculiar thing about this creed, however, is that so few of those who have to deal with these self-styled "under dogs" are aware of its existence.

The state of mind produced by the blind acceptance of such a creed is responsible for many of the mysterious actions observed in those who profess allegiance to it. A little serious consideration of its effect on the average human being might eliminate many of the endless misunderstandings between employee and employer.

Reducing this down to words of "two syllables" here's an example:

A miner goes to a check window to draw a check; the clerk recognizes him as one who never has time ahead and promptly turns him down without taking the trouble to investigate (that's what the clerk would describe as "doing a thing on general principles"). The miner realizes that he has not been given a square deal; never having been taught that the best way to get a thing out of one's system is to run it down immediately and get rid of it, he accepts the clerk's "slap" as a thing to be expected and nurses a grudge. It has never occurred to him that possibly his employer desired that all men be given fair treatment; his creed assures him that his lot must be hard and hard he finds it.

That clerk won't always have the "whip hand." As a matter of fact when conditions become strained this miner will be one of the most enthusiastic agitators for a "strike with no quarter" and if opportunity is presented he'll make an end of that Mr. Clerk and no one will be able to explain the motive.

Of course, a conscientious boss will assure himself that he is giving his men a square deal as he can easily do. Then if the men themselves weigh and consider they will always agree with him, even though some of the under bosses, in the exercise of a little brief authority, do conduct themselves provokingly.

But until a great change is manifested in that part of the human make-up popularly known as "human nature," you must not expect men to weigh and consider. It will not do to let grudges develop and fester; you must actively exhibit some concern in the welfare of the discontented; otherwise the one vial of grievance will poison all your copious springs of good will.

Not less important than generous dealing is that spirit of friendship which destroys suspicion and supplies the key to the motives which actuate us.

When the sure-enough strike with all its enmities and misconstruction is upon us, we shall never regret that we have tried to make our manners as benign as our acts.

IDEAS AND SUGGESTIONS

Technical Language in Educational Writings

By M. E. Wadsworth*

Apparently one of the most important factors in mining education is to bridge the chasm between the uneducated and the educated mining man; and stimulate and encourage the former to undertake the necessary drudgery to acquire more or less education, at least in his chosen work. The term "practical mining man" is one that seems to be greatly abused and misused, as the educated mine expert is often as practical or even more so than the uneducated miner.

There is a common misapprehension among men uneducated in any special study, that papers upon the subject can be readily written so that they will be easily understood by those who have given it no consideration. While this simplifying process may be and ought to be applied to a greater or less extent in textbook writing, it seems to be difficult if not impossible to do so within the limits of an article prepared for a journal. As the object of a textbook is to start upon the level of the student, for whom it is designed, and to lead him up to a higher plane of knowledge, care should be taken in it to begin at the proper point, and to define and render clear every technical term and every step of the way; so that the science and its principles can be easily understood by the attentive reader. The mental discipline should be provided by the practical application of the principles and not through difficulties placed in the way of understanding those fundamentals by an obscurity of language.

It must be acknowledged, however, that the vast majority of our textbooks fail in not being adapted to the use of the persons for whom they are supposed to have been written. The uneducated mining man has a right to complain in regard to the teaching afforded by the average textbook.

While the technical language of any subject is difficult to comprehend for one unlearned in that study, it seems, as before said, impracticable for any special journal article to be written in untechnical language, unless the writer uses an excessive number of words.

Technical terms are the shorthand of scientific language that allow one, in a few words, to save many pages of untechnical writing. In fact, to the scientifically trained man, these terms are the common everyday language in which he thinks, and they are perfectly simple and clear to him. In truth, in most cases, it seems impossible for him to use different language.

All men in every walk of life employ special (technical) terms suited to the occupation they follow. All have to use that language to a greater or less extent, and when anyone desires to be at all versed in, or to understand, any subject, he must become the master of its technical language. The miner, the farmer, the baker, the brewer, the hunter, the fisherman, the printer, the merchant, the dressmaker, the milliner, and the housewife all have and use their technical phrases, which it is necessary for others to know, if they wish to talk with them understandingly upon their chosen subjects.

Even the domestic animals know to a greater or less extent some of this technical language. If this is doubted let one who has never been in a mine try to drive a mine mule, or one equally ignorant of the special language employed endeavor to guide an ox team, a cab-, coach- or race-horse, or manage a hunting dog. The street urchin, the school child, the cowboy, the burglar, sneak thief, the pickpocket, as well as the banker, lawyer, doctor, geologist and engineer all have their distinctive technical language, and, if we are to converse intelligently with them in their specialties, we must instruct ourselves in it.

Slang is technical language in which a word or a sentence conveys to the initiated that which it would take a tedious description to express—hence, however much we may frown upon it, it will ever be in popular but changing use. Even the miners themselves use different special terms in their work; for example, the coal miner and the metal miner, the German and the English miner, the Cornishman and the Australian, New Zealand and South African mining man.

Who is there who would understand a report of a game of baseball or football, if it were reported in common untechnical language or what journal would print it? Yet it is as just to ask that the language of our athletic sports shall be translated into the venacular, as to demand that mining language shall be. To bring this about, the uneducated miner would have to change the world, as his language is as obscure to others as that of the most abstruse mining article is to him.

That all writings for general or for class teaching should be made as simple as possible is a truism, but it is as necessary for the uneducated mining man to educate himself up to the standard of others as it is for the learned writer to forsake that which has become to him as his mother tongue, and use language that he has long ago forgotten; and which usually has so many different shades of meaning that it cannot convey a clear and positive technical idea. Neither class of mining men should despise the other, but both should strive to approach each other as far as practicable and become mutually helpful.

*Professor emeritus, mining engineering, University of Pittsburgh, Pittsburgh, Penn.

The Evolution of the Mine Foreman

By a Pennsylvania Engineer

The mine foreman, though employed by the mine operator, has a double service to perform, his duty to the operator and his duty to the state; these services are often in apparent or actual conflict. He serves, in effect, as both mine foreman and deputy inspector. It is almost an axiom of government that such dual service should

never be imposed on one man. There should be, therefore, at every operation, sufficiently large to justify it, two men—a mine foreman and a deputy inspector.

It is observable that the tendency of mining legislation is to place on the mine foreman a larger and larger burden of responsibility for the safety of the mine. Not only must he see that the miner is safeguarded against the hazards incident to machinery, but also he must guard him against his own misjudgment and neglect, by constant visits, inspection and counsel.

There has been no law passed compelling a woods-foreman to visit his woodsmen and to see that they use due care in handling their axes and in regulating the direction in which trees are felled so as to avoid personal injury. True, it is the duty of the company to provide safety appliances around the saws and boilers, but the absence of the mill foreman from the mill temporarily or all the time, and his omitted counsel would not subject him to reprimand and to the equivalent of dismissal or legal incapacitation for reëngagement, should any employee be hurt through some misjudgment. In fact, there is no requirement that any mill or woods-foreman should be engaged. The owner himself is the responsible party.

Mining legislation is more completely developed along paternalistic lines than any other. The larger corporations are not inclined to regard this as a disadvantage, rather adding to, than attempting to evade the requirements of the drastic laws. The main objection to such legislation is that smaller corporations are prone to seek every means of evasion rather than to fulfill the obligation of the law. In such cases, on the mine foreman rests the brunt of this fatherly law making.

He is not disposed to carp at the provision for close inspection. The ignorance of some miners, many of them aliens, nearly all of them reared in other occupations, whose mutual dependence on one another against a multiplicity of hidden dangers, the nature of which they inadequately comprehend, necessitates a close inspection of their individual methods and working places. The complaint of the mine foreman is not against inspection in itself, but against being at once both a servant of the company to advance its interests by increasing its output and by diminishing the cost per ton, and also the servant of the state, inspecting without cost to the commonwealth, the mine equipment, working methods and places of the miners and others.

Clearly his duties are peculiar in kind, almost without parallel in law. He is responsible to the law for himself, his employers and his employees. He is custodian of the law and boss in many matters both of himself, his employing operators and his men. Yet to his employer he must look for his pay, his advancement, his comforts, his reference on leaving—an anomalous position surely. He can only bring pressure to bear on his employer by resigning or by reporting the case to the inspector—an officer who cannot do anything to hold him permanently in his position should the employer be displeased at his advocacy of a lawful conduct of the duties of his office—an officer who does not wish to exercise pressure on the foreman's employer in his behalf, for fear of receiving censure for any economic inability which might be alleged or proved against his protégé.

The mine foreman should be relieved of the necessity of harmonizing conflicting purposes and of the duty of serving two masters. He cannot be both the state's man and a private employee and fill both antagonistic offices with credit to himself and satisfaction to others. The foreman of today should evolve into two specialized functions.

Does It Pay?

By W. H. Droll*

We are beginning to realize the existence of a great problem in this country, especially in our mine camps, where the problem of sanitation is a leading question. Formerly we opened a mine, and the camp soon grew up around the pit's mouth, without due regard to sanitation, building laws or layout. The development of a mining town was a helter-skelter proposition.

The more progressive coal companies realize the evil of this method and are beginning to straighten out their camps and clean them up. We all know that health is essential to good work and that a sick miner cannot accomplish as much as one who is in good health. When miners work in pairs, the sickness of one man throws his "buddy" out, and in a pitching seam this means the rearrangement of cars.

We are beginning to realize that the most important enemies of the mining companies are the typhoid germs in the drinking water. We know that the mosquito carries these bacilli and that the insect breeds and thrives in damp and wet places. We realize that the old "summer complaint" found among mining communities comes from the same source. We no longer build our camps haphazard. We lay them out so that the rain in soaking through the ground does not carry the germs from the outhouses to the nearest spring or stream. We no longer build open closets, where the deposits are picked over by chickens and hogs. We have ceased to regard the latter as a scavenger, placing our faith instead in a sanitary department, which removes the food from the housefly and prevents the mosquito from breeding.

The Coal Fields of Michigan

The coal fields of Michigan occupy an isolated basin covering approximately 11,000 square miles in almost the exact center of the lower peninsula. They are estimated to have originally contained 12 billion tons of coal, from which the exhaustion to the close of 1912 has amounted to about 30 million tons.

The principal coal-mining operations are in Bay and Saginaw Counties, but a smaller production, chiefly from local mines, is made in Clinton, Ingham and Tuscola Counties.

Coal was known to exist in Michigan early in the last century and some mining is said to have been done in the Jackson field as early as 1835. Other mines were opened at Grand Lodge in Clinton County, in 1838. It is known that some coal was produced in that place in those early years, but there is no record of the output prior to the census report of 1860, in which Michigan was credited with a production of 3320 tons. It is only within the last 12 years that the coal fields of Michigan have been worked to any considerable extent, and their development has followed in some degree the depletion of the forest resources.

*Johns, Ala.

Manure as a Protection for Concrete

By Newell G. Alford*

SYNOPSIS—The general conditions governing the setting of concrete and the results of a trial in utilizing the heat-producing qualities of fresh horse manure upon a large reservoir in an exposed location during severe winter weather.

Founded upon the basic heating qualities of manure from horse or mule stables lies a practical possibility for construction men to erect concrete in freezing temperatures without incurring undue expense or having to anticipate anything but the best setting results in the mixture handled. Not only will the cost of such protection be moderate, but it decreases directly as the area of the surfaces to be treated increases. Furthermore, the temperature of the manure remains practically a constant for comparatively long periods.

Not infrequently is a mine manager or superintendent confronted with the necessity of installing concrete about his surface operations in the winter season. Even though low temperatures make such construction hazardous and expensive, at the same time the work must be undertaken and pushed through in the face of possible ruin through freezing.

The new construction may be a retaining wall, a reinforced reservoir, foundation piers or some other work common to the class of concrete construction usually found about the surface plants of coal mines. However, it goes without saying that when the necessity for this character of installation occurs in the winter time it devolves upon someone to devise a scheme for accomplishing the desired result.

Cold Concrete Sets Slowly

Extensive experiments in concrete work done under severe weather conditions, and low temperatures, show that the use of calcium chloride furnishes a partial safeguard against the dangers encountered in cold weather. But this will not prevent ruin to the mixture unless there is a sufficient heating element surrounding the forms inclosing the concrete to permit it to set under normal conditions.

To quote from Prof. F. E. Turneaure: "The effect of temperature on the rate of setting and hardening in cement is very great and often requires special consideration in processes of construction. At or near 30 deg. F., the rate of setting and hardening is very slow. Experiments on natural cement mortars indicate a speed of hardening at 40 deg. about one-half that at 80 deg. on 60-day tests. Tests on portland cement show that at the temperture of 40 deg. the strength at 30 and 60 days is about two-thirds that attained at a temperature of 70 deg. At or near 32 deg. the time of setting is greatly prolonged. Cement setting in 8½ hr. at a temperature of 65 deg. required 38 hr. at 32 deg."

Under the usual conditions in winter, it is impossible to predict with any accuracy whether fires at intervals about the concrete forms will yield the desired results. In isolated cases, there are perhaps walls of neighboring

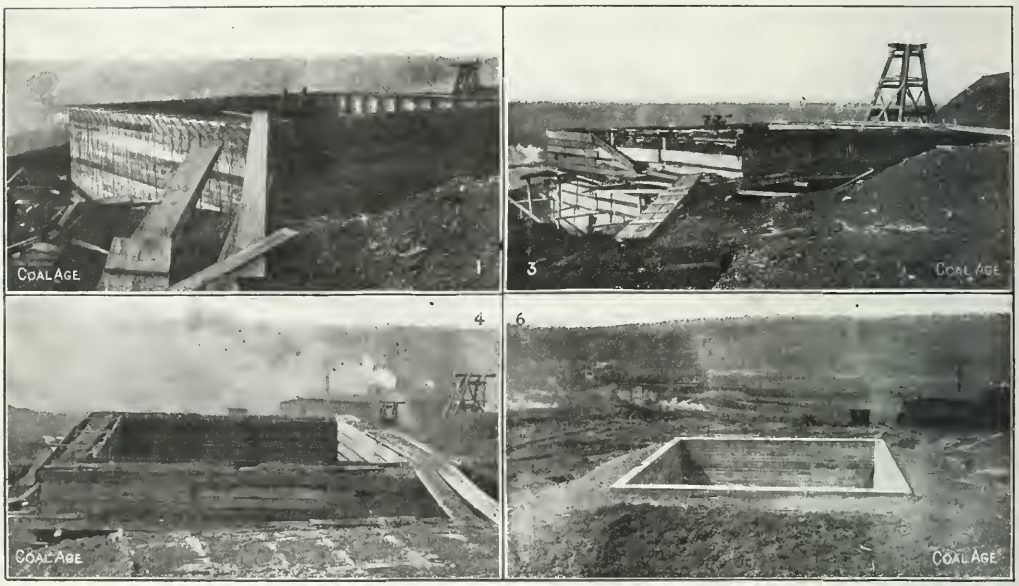


Fig. 1. One Half of Form Complete
Fig. 3. Concrete and Manure in Place
Fig. 4. Completed Structure with Forms
Fig. 6. Reservoir after Completion

*Asst. Chief Engineer, St. Bernard Mining Co., Earlington, Ky.

structures or like shelter provided by local conditions, but these are infrequent.

Ordinarily the wind can sweep down upon the structure, always detracting from some portion of the protection afforded by the fires. Thus the temperature in which the concrete sets is variable, compelling a wide range of setting conditions for the cement mixture. Therefore, it is easily comprehended how a packing of manure within suitable retainers about the forms produces a heat, at no time subject to sudden changes, and which affords simultaneously a constant setting temperature for the entire mass of green concrete.

During the winter of 1912-1913 a reservoir was needed at the coal-washing plant of the St. Bernard Mining Co., at Earlington, Ky. Since shipment on a steel tank of the necessary capacity could not be had under 100 days, and conditions demanded an adequate water storage in 60 days, a reinforced-concrete reservoir was chosen. It was also held that the approximate life of a steel tank would be 15 years, at the end of which time the concrete installation would have only attained its maximum strength.

The reservoir was constructed 10 ft. deep and 25 ft.

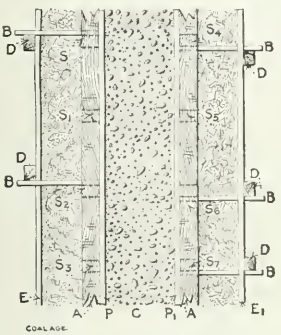


Fig. 2. Plan View of Wall with Concrete and Manure in Place

square, with walls 1 ft. thick, reinforced by ⅜-in. diameter steel rope. The capacity of the reservoir was, therefore, approximately 46,750 gal., being slightly above the amount of water required.

To facilitate proper setting of the concrete, fires were suggested, but the engineer in charge decided to substitute manure as a heating element, believing that he could thus secure better results. In order that an accurate conclusion might be arrived at concerning the effect of the manure, a minute record was made of the work as it progressed.

Details of Form Construction

The inner ring of the form was first put in place and the reinforcement suspended as shown in Fig. 1. To facilitate pouring, the outer side of the form was put up in four sectional rings, each tightly joined upon the other. When the concrete had been poured level with the top of the first section of the outside ring of the form, secondary framework was attached to the primary.

To make the method clear, consider Fig. 2, showing a section of the structure's plan. Looking down from the top, P and P_1 represent the tongued and grooved pine siding containing the concrete. C shows the concrete in place. A and A_1 represent the 2x4-in. plates, which were placed horizontally upon the ends of the vertical studding S, S_1, S_2—S_7.

To such convenient studding as S, S_2, S_4, S_6 and S_7, small boards of sufficient length were nailed to act as cleats. To the cleats B, uprights D were nailed 6 or 8 in. from the outside faces of P and P_1. The 1-in. boards E, of any width, were then nailed to D, forming a box on both sides of the concrete in which the manure was to be packed.

Manure hauled from the mine stables had been piled conveniently close to the work. This was next wheeled in barrows, dumped and tamped tightly between the vertical faces of E and P and E_1 and P_1.

This method was followed out until the entire form,

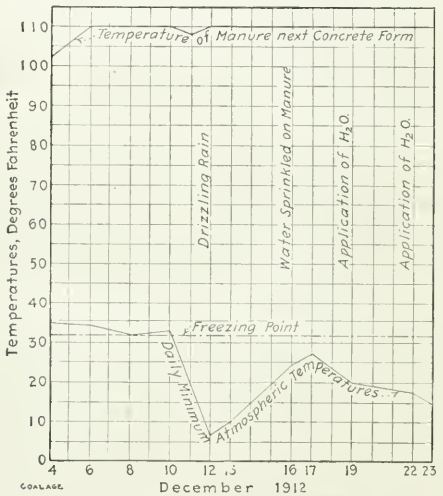


Fig. 3. Temperatures of Air and Manure Protection

10 ft. high, had been filled with concrete and manure. It then presented the appearance shown in the side view, Fig. 3, or from the hill immediately above as shown in Fig. 1.

The floor of the reservoir was also protected with manure, but was first covered with canvas to prevent its being marked. Then a layer of manure 6 in. thick was spread over the canvas, this in turn being covered carefully with 1-in. boards to prevent disturbance from the wind.

The concrete pouring was completed with the manure intact about the form on Dec. 4. In order that any variance in the temperature of the manure might be observed, readings were made and recorded during the succeeding 19 days. In observing these temperatures, a standard Fahrenheit thermometer was placed next the pine siding P and P_1, which held the concrete. In other words, there was the thickness of the manure between the thermometer and the atmosphere. Ten observations on the temperature of the manure were made at one time, the mean being taken as a fair result. These figures are recorded in the upper curve given in Fig. 5.

In order to show the existing difference between the

temperatures of the air and the manure next to the concrete atmospheric temperatures have also been plotted. These are the minimum readings recorded by the Government Weather Bureau Station, at Earlington, Ky.

The only variance in the manure temperature curve is found on Dec. 11, when the heat dropped 2 deg. This was undoubtedly caused by the severe wind which had blown during the two preceding days, and which tended to drive the moisture from the manure.

On Dec. 12 there was a slight drizzling rain despite the low atmospheric mercury reading, after which the manure was seen to steam perceptably. The temperature was, therefore, taken and found to have resumed the constant of 110 deg.

This experience indicated that periodic sprinkling of the manure with water would sustain the chemical action producing heat. Accordingly, on Dec. 16, it was given an application of water with a hose, and this was repeated on the 22nd. This effect of the moistening, as shown in the upper curve on Fig. 5, was the maintenance of a constant temperature in the manure. It will be seen that this temperature, with the exception of one day, remained at 110 deg.

On the other hand, a glimpse at the atmospheric curve indicates that the minimum temperatures ranged from 35 to 7 deg., the average being approximately 23 deg. Thus the average difference in temperature afforded by the manure was 87 deg. In this connection it is interesting to take into account the latent chemical action which causes the results.

Why Manure Heats

Horse manure is rich in nitrogenous substances, contains nitrifying bacteria, and also hydrocarbon compounds, such as cellulose, starches, etc. The nitrogenous material is first broken down by the bacteria, and in the presence of substances containing hydrogen (such as straw) forms ammonia, which is later oxidized.

If any sodium salt or potassium salt is present, sodium nitrate ($NaNO_3$) or potassium nitrate (KNO_3) is formed, so that saltpeter (KNO_3) is usually found in old manure.

The bacteria referred to will not work except in the presence of moisture, so that when water is added to the manure they work very fast, producing sufficient chemical reaction to account for an increased quantity of heat. Manure, if dried, will not ferment, but the bacteria are not killed. All they need to revive their action is an application of water. This explains the rise in temperature of the manure, shown in Fig. 5, on Dec. 12.

The manure protection on the work described above cost $59.95. If the protection had been accomplished through the medium of fires the cost would have probably reached $195.70. An analysis of the manure protection expense reveals the following:

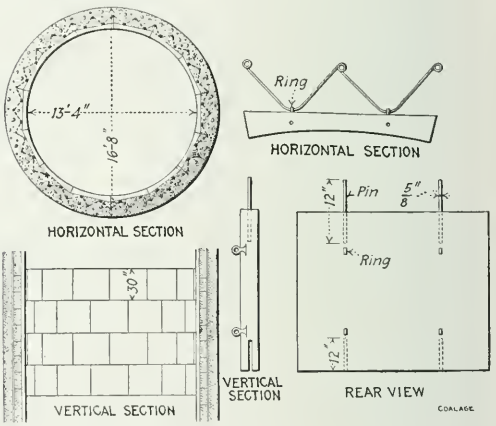
Timber for framework, etc.	$40.45
Hauling manure 1¼ mile	10.25
Labor	9.25
Total	$59.95

Since the manure possessed a fertilizing value after its removal from the concrete forms no charge was made for its use. Two thousand nine hundred and seventeen square feet of concrete surface was involved in the undertaking, which constituted a cost per square foot of $0.02. Compared with this, using driftwood with charge, the same protection by fires would have amounted to $0.067 per square foot.

Finally, the concrete was constructed at the summit of an ascent about 100 ft. above a natural basin from which the timber has been cut. The wind had access to the four sides of the structure, which, despite fires, would have made uniform setting conditions for the concrete wholly impossible. Fig. 6 shows the reservoir as it is at present, the forms having been removed and a dirt fill made next to the outer concrete surface.

Concrete Shaft Lining

At No. 1 mine of the United Collieries of Charleroi, Belgium, a small 133-ft. shaft has been sunk recently. It is about 13 ft. 4 in. in diameter and 16 ft. 8 in. over all. The lining is formed of concrete blocks, with their vertical joints staggered. Between these voussoirs and the rock, concrete is poured. The blocks were made at the mine in wooden molds. They are 30 in. high and 3.2 in. thick, in the thinnest place. Fourteen of them are needed to make a complete ring in the shaft.



Concrete Lining and Forms of Concrete for a Belgian Shaft

In each block are embedded two iron dowels 0.6 in. in diameter and 12 in. long; these project 6 in. from the top edge of the block and fit into holes in the voussoir above.

In the concrete between rock and inner lining is embedded a bent rod of iron about ½ in. thick, which is laced through rings anchored in the backs of the blocks, there being four rings to each block. The V's formed by this bent rod are joined together by bars 30 in. long and 0.4 in. in diameter. There is understood to be a further reinforcement of the cement mass, not indicated by the drawings, and reinforcement in the several blocks.

The cost of construction is figured at $8.65 per running foot. Tests have shown this lining to be equal in strength to one of masonry 32 in. thick, which would cost $13.50 per running foot of depth.

The concrete mixture used is six parts of gravel, three of sand and three of cement.

Note—Translated and abstracted from the "Annales des Mines de Belgique," by E. P. Buffet for "Coal Age."

Explosions at the Cadeby Main Colliery

By Our British Correspondent

SYNOPSIS—A brief abstract of the report of the British chief mine inspector on the explosions at the Cadeby main colliery, which killed 88 men, including 53 rescuers. A fire in the mine, which ignited the firedamp present, is believed to have been the cause of the explosions. This fire was supposed to be walled off, but apparently an inlet was left, probably along the longwall face. The inspector questions whether it is wise to risk life to bring out dead bodies.

The report of the British Home Office into the causes of the explosions at Cadeby Main Colliery, in Yorkshire, on July 9, 1912, has recently been issued. It will be remembered that there were two principal explosions, the first destroying 35 and the second 53 lives, making the total death roll 88. Among those killed, were several mine officials, including the mine manager, also three inspectors of mines, including the divisional inspector, W. H. Pickering. The report is by R. A. S. Redmayne, the chief inspector of mines of Great Britain and Ireland.

Description of Mine

The two shafts of the Cadeby main colliery are sunk to the Barnsley bed, which is the only seam worked at this mine. It lies at a depth of 2289 ft. from the surface, on the dip side of a large fault, which has a throw to the south of 378 ft. (see Fig. 1). The coal on the north side of this fault is won by a pair of headings driven through the rock at that displacement.

The output from the Cadeby mine is about 3000 tons a day, coal being hoisted at both shafts. These are 16 ft. in diameter. No. 1, the downcast, is 2256 ft. deep, and No. 2, the upcast, 2214 ft.

Thirty-Five Fires at Cadeby

It will be seen that about 49 ft. above the Barnsley bed is a seam of coal 2 ft. 2 in. thick. The top coal of that bed is of inferior quality and mixed with dirt. The immediate roof of the seam is a shale, variable as to hardness, but of moderate reliability. The Barnsley bed is a gassy seam, which, in South Yorkshire, is peculiarly liable to spontaneous combustion. At Cadeby there have been no less than 35 fires ascribable to that cause. To work this bed safely, requires the greatest care and vigilance. The dip of the seam is 1 in 14 to 1 in 12 to the southwest.

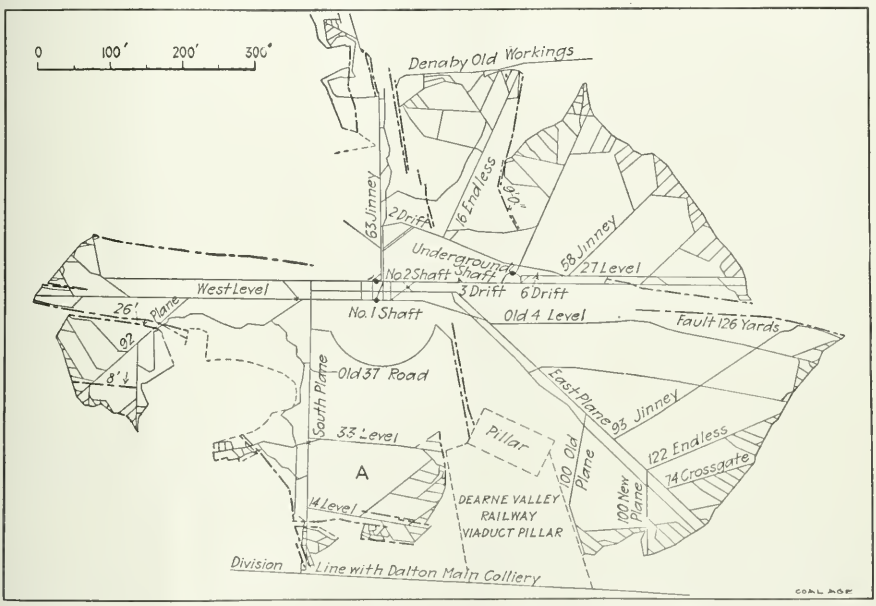


Fig. 1. Cadeby Main Colliery in South Yorkshire, England. The Section Marked *A* Was the Scene of Two Severe Explosions

Methods of Working

The system of working practiced is long wall, the distance between the gate roads being usually 120 ft. Packs, 7 ft. 6 in. wide, are built on either side of these roads, and every 21 ft. a gob pack, 6 ft. wide, is built. The material used for building the packs is stone, obtained from the waste and from the ripping in the gates. In the main roads much of the brushing has to be done in the shale roof, thus forming a large amount of stone dust. This dust considerably decreased the extent of the explosions. All the coal was mined by hand; neither coal cut-

ters nor conveyors were in use. The coal being fairly friable, a certain amount of dust was made at the face, but not an unusual quantity.

The following is a section of the seam at the shafts and of the strata immediately above and below the Barnsley bed:

SECTION OF STRATA IN CADEBY MAIN SHAFTS

		Ft.	In.
Coal	1ft.5 in. coal, hards 2-in. bituminous shale 7-in. coal, cannel	2	2
Dark blue shale		4	0
Coal			1
Dark blue shale		1	7
Bank			2
Dark blue shale		4	0
Strong shale		6	0
Grey rock		6	7
Strong shale		16	0
Blue and black shale		7	0
Strong shale		1	0
Shale with ironstone bands		2	0
Coal	Day beds	1	1
	Bagmuck		6
	Bags		7
	Parting		½
	Bags		8½
	Parting		1
	Top softs	1	11
	Clay seam		4
	Top hards	2	0
	Bright hards		3
	Bottom hards		9
	Bottom softs	2	0
Shale		2	0
Hard fireclay		6	0

Manager Fired All Shots

No shots were fired except in rock headings, and then only at week ends, when few persons were in the mines. As an additional safeguard the manager alone was permitted to fire the shots.

The cars were hauled in the main intakes by an endless rope, electrically-driven from the bottom of the shaft; the secondary haulage was performed by horses and ponies.

At the time of the accident, the volume of air circulating in the mine was about 163,000 cu.ft. per minute, under a water gage of about 3½ in. The air was drawn through the mine by a Schiele fan, 21 ft. in diameter, making about 119 r.p.m. Although the Cadeby and Denaby mines are connected by means of an emergency outlet, the ventilation system of the two mines was entirely separate, the iron doors in this connecting airway being kept locked.

The Marsaut type of safety lamp was used exclusively by the unofficial workmen. The lamps found after the disaster were examined and all those in places where the gas might have been fired were found to be intact.

Precautions against Screen Dust

The surface arrangements are described as admirably designed to prevent the floating dust produced by the movement of the coal at the dumps, screens, conveying belts and hoppers from being carried down the downcast shaft, and so on to the roadways of the mine. The dust is collected wherever made, by means of funnels attached to pipes connected to an exhaust fan, which creates a partial vacuum (2½-in. water gage), the current of dust-laden air passing from the fan into a cyclone where it enters a steamy atmosphere maintained by a steam jet from the boilers; this prevents any of the lighter dust from escaping by the chimney to the outer atmosphere. Where necessary, the screens and hoppers are almost entirely inclosed. This arrangement, which has been in operation for about five years, has proved effective in clearing the air of dust about the headframe and tipple. Practically none of the powdered coal is carried by t ventilation down the intake shaft to the undergrou workings.

South Plane District

The effect of the explosion was limited to the distri tributary to the South Plane, see Fig. 1. This area is d scribed as dry and dusty. The endless rope worked as f inby as the 14th level, the haulage along that road for distance of about 450 ft. being by tail rope attached the endless rope by means of a clip. Beyond this poi horse haulage was employed.

The volume of air entering the south district was 21 661 cu.ft. per minute. About half this air went alo 14 level to ventilate the district in which the explosio occurred, returning by way of 33 level, which crosses t south plane at a point about 2900 ft. from the shaf The other half went into the area at the end of the sout plane and ventilated the workings at that point.

This South Plane district had not a long life before i It was near the boundary of the Dalton Main collier on the south, while to the east, it was approaching the pi lar of coal left to support the Dearne Valley Viaduct.

Fires, Gas and an Explosion in South Plane District

Gob fires had been known in the neighborhood of th face fault for some time past, the first developing i August, 1906, at the face and occurring right up agains the fault in old 37 stall. This fire was dug out.

A second fire occurred not far away from the first, be ing on the upper side of the crossgate out of 33 level o the fault side, where some timber had been left.

A third fire, to which the explosion was probably due occurred at old 121 stall, also against this fault. Thi was discovered on Nov. 20, 1911, and when scouring road were driven to it, it was found that the fire had backe from the fault for a distance of 24 ft. into the gob. O Jan. 20, 1912, a small explosion of gas occurred at thi fire, slightly burning four men who were engaged in work ing at the face. The effect of this explosion on the ai was felt about 450 ft. distant; it frightened all the me in the district and they came out.

Five flashes were seen on Feb. 2, and also on Apr. 10 while on Apr. 2 a gas cap on the flame of the safety lam was noticed on top of the old scourings. Coming to July "gob stink" was reported in 121 old gate by deputies o the 5th, 6th, 7th and 8th of the mouth, but gas was no mentioned as being present on any of these days.

The First Explosion

From a consideration of the evidence presented, Mr Redmayne concludes that the first explosion originate about 64 gate, mostly probably in the neighborhood o the face of 7's working place, and traveled in two direc tions. Apparently, the fire just mentioned had been shu off along all the gateways leading to it, but along th front of the face fault an inlet for air had been left. Thi received the intaking air current, which, however, ha passed along the line of face from gate 131 onward, an consequently possibly contained some gas. Mr. Redmayn believes that this inlet should have been closed, and i fact urges that the intaking air current should be shut of before the return.

The explosion directed itself partly toward the intake

going down to 121 crossgate and running along that haulageway and also along the face to 12 gate. On reaching 14 level, the explosive blast seemed to have developed its greatest violence, either owing to accumulations of coal on the landing or because along this intake airway it found enough air to render the mixture of gas and dust more explosive. There was no evidence of burning by the first explosion for any distance beyond the end of 19 crossgate, but there was evidence of force up to the end of 14 level, as the cars at the outby end of this level were blown on to the plane.

The explosion also projected itself toward the return, passing down 64 gate, and with force and flame continuing along 19 landing to 19 crossgate. Mr. Redmayne does does not think, however, that the flame reached the end of 19 crossgate, but that the explosion died out along that road. He thinks it stopped for want of fuel to feed it.

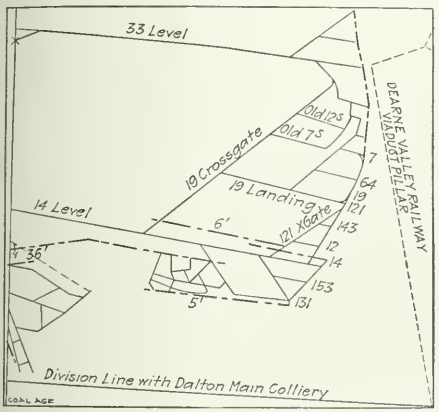


FIG. 2. THE PART OF CADEBY MAIN COLLIERY WHERE THE EXPLOSIONS OCCURRED

The supply of gas was exhausted, and the dust was too much intermixed with stone dust to allow of the continuance of the explosion. An analysis of the sample taken when an entry was made to the recovered workings in 19 crossgate below 19 landing, showed it to contain 80.81 per cent. of ash and the dust was coarse, only 10.52 per cent. passing through a 100-mesh sieve.

Probably the blast in 14 level was stopped by the same immunizing stone dust for a sample from this level at the foot of 19 crossgate contained 48.31 per cent. of ash.

THE SECOND EXPLOSION

The second explosion seems to have traveled wholly on 14 level and along the face, as there were no signs of force or burning other than were occasioned by the first explosion in gates 64 or 19, nor along 19 level or crossgate.

Mr. Pickering suggests that there was a large accumulation of gas on the rise side of the district after the first explosion, which, igniting at the fire, burnt more or less quietly up and down the face until an explosive mixture was formed at about 14 level, when it detonated. The force in 14 level was very much greater than in the first explosion, and the flame probably extended nearly to the outby end of that level. Had the explosion extended far on the South plane, Mr. Redmayne thinks it is probable that the whole colliery would have been wrecked, analyses of samples of dust showing that it was of a dangerous character.

POINTS IN RESCUE WORK

Mr. Redmayne condemns the lack of organization which permitted men to enter the mine after the explosion without written authorization. A guard should have been placed on the outby end of the South plane to prevent unauthorized persons entering from other parts of the mine. Had this been done the loss of life occasioned by the second explosion would have been much less heavy.

Mr. Redmayne does not think, however, that the management of a colliery is justified in allowing persons to risk their lives in the recovery of dead bodies. There is always great risk of a second explosion when a fire is known to exist underground. It sometimes requires much moral courage to restrain oneself and to prohibit others from undertaking a risk of this nature.

The correct number of casualties was not definitely ascertained until three days after the disaster, owing to the indiscriminate issue of lamps after the first explosion.

Mr. Redmayne urges that until the fire had been completely isolated by stowings and stoppings, all the men not engaged in combatting the fire should have been withdrawn from the district in which it occurred.

Mr. Redmayne quotes the evidence of W. H. Chambers, the manager of the Cadeby and Denaby Main Collieries, who has had 30 years' experience of underground fires at Denaby and Cadeby, during which period he has dealt with 56 cases, some at the coal face and others in the worked-out areas.

FIRE STARTS IN CRUSHED COAL OF CREVICES

He said that a large proportion of the face fires had occurred in the neighborhood of faults, this fact being due to presence of pulverized coal in the fissures, which offers a considerable area for the absorption of oxygen from any air, which may be found in the fissures.

There is often sufficient air to start such chemical action, but insufficient to carry off the resultant heat, and hence the fine coal gets hotter and hotter until it reaches the point at which combustion commences.

A number of fires, however, have occurred in the worked-out areas, but they generally originated in the fissures *above the goaf*, the oxygen necessary for combustion finding its way along these crevices. He said there was a "rotten" roof, and that was the reason why they could not work the whole of the seam. They had to leave the top coal to prevent the fall of the shales above it. Fires break out freely, if the workings are allowed to stand even for a few days, and even when the progress of advance of the coal face is slow, as when impeded by faults. Therefore, he found it necessary to keep the face continually advancing irrespective of the state of the coal market.

Mr. Chambers defended his present system of leaving 21-ft. wastes between gate packs 7 ft. 6 in. wide. Intermediate packs were also used, mainly because the latter were necessary to keep the face open. He did not favor the hydraulic method of stowing the waste, because he had doubts as to its efficiency in preventing the formation of fissures, and he foresaw insuperable difficulty in the way of its adoption at Cadeby colliery, owing to the fact that water was necessary if this system was used.

He had experimented with water as a means of laying the dust upon roadways, but he had found that even the small quantity required for this purpose had such an injurious effect upon the roof that the roads were closed.

Since the explosion at Cadeby Main, Mr. Chambers had, however, devised a method of dealing with gob fires by excluding the oxygen altogether, which had proved successful in the recovery of the South Plane district after the recent explosion. If a sign of heating in the gob is detected by an analysis of air or otherwise, the ordinary ventilation of the pit is excluded from that particular area, and there is forced into it a gas deficient, or entirely wanting in oxygen so that instead of the fire being fed by air containing 21 per cent. of oxygen, it is gradually stifled by an inert atmosphere of increasing density.*

Leakage, if any, would then be outwards from, not inwards to, the fire. To facilitate this procedure he would lay along the roads a system of pipes, which could be put into operation at any moment. The gas to be employed should be absolutely inert, consisting solely of nitrogen and carbon dioxide, so as to be practically innocuous from the point of view of leakage.

Occurrence of Gob Fires

J. R. R. Wilson, one of the British mine inspectors, said that at three or four collieries working the Barnsley seam in the Doncaster area, these fires were becoming increasingly frequent, and were a source of great danger. He thought it rather more than a coincidence that the system of working at each of the collieries was the same, viz., longwall, with narrow wastes and numerous gob packs, and he could not help thinking that this method was responsible for much of the trouble which was experienced with gob fires. He considered that next to stowing the goaf tight by artificial means, for example, the hydraulic method, the best course was to let the roof "stow itself" by falling. Hence he considered that wastes only 21 ft. wide with intermediate packs were inadvisable, on the ground that such a system prevented heavy breaks and did not let the roof fall sufficiently freely to tighten up the waste and exclude air until a considerable period had elapsed.

System of Working Compared

The inspector pointed out that in other parts of the same coal field, the Barnsley seam, with top coal as thick if not thicker than at Cadeby, is worked with little or no trouble from gob fires, and he thought it was significant that at all these collieries, with a 9-ft. gate and 7-ft. 6-in. gate packs, the gates are 66 ft. apart with no intermediate packs. Under this system the wide area of unsupported roof tended to fall freely to a good height, and then if the roads are well ripped and the packs tightly built, the roads are ultimately wholly in the hard stone above the goaf.

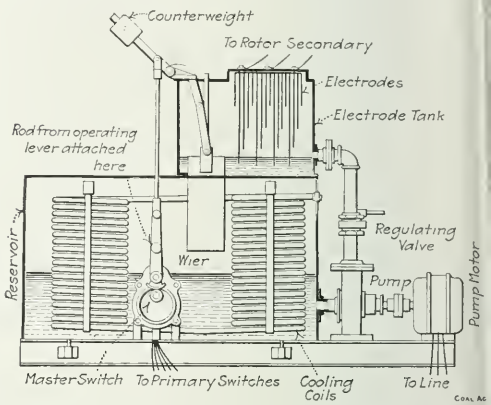
He was aware that this method had been criticized on the ground that to dispense with gob packs involved great difficulty in keeping the face open between the gates, but by the use of wood chocks this difficulty had been surmounted. He had never found that air would leak past heavy caves in sufficient measure that gob fire would be sustained.

*We do not believe that such a system needed devising, so often has it been advocated in American technical journals.—Ed.

Liquid Rheostats for Large Motors

The use of large alternating-current slip-ring motors for driving mine hoists, rolling mills, etc., has increased largely during the past few years and has created a demand for a simple, efficient and economical controller. To meet this demand the Westinghouse liquid rheostat in capacities of from 400 to 1500 hp. was developed.

These rheostats provide an infinite number of steps between the minimum and maximum limits, thus permitting fine speed adjustments and smooth acceleration. The rate of speed increase can be definitely fixed and is independent of the rate at which the operator manipulates the starting lever; it is therefore impossible to injure the motor or the machine connected thereto by too rapid acceleration.



Cross-section of Rheostat, Showing Mechanism

The principle of operation of these rheostats is clearly shown by the accompanying diagram. The apparatus consists of two compartments, an upper tank for the electrodes, and a lower reservoir. The three phases of the rotor are connected to electrodes suspended in the upper tank. A small motor-driven pump circulates a steady stream of liquid, usually a solution of soda, from the reservoir into the electrode tank, and back again over the weir.

Now by raising or lowering the weir, the height of the liquid in the electrode tank is correspondingly varied. The resistance in the rotor circuit decreases as the liquid level rises, and *vice versa*, and the motor speed, of course, changes with the rotor resistance.

The operating lever of the rheostat controls both the master switch and the weir. When the lever is in its central or off position, the primary switches are opened and the weir at its lowest level, so that the secondary resistance is maximum. Moving the lever in one direction closes the proper primary switches for starting the motor forward and raises the weir. Moving it in the opposite direction reverses the motor and again raises the weir.

A valve in the intake pipe of the electrode tank regulates the rate at which the liquid is pumped in, so that no matter how quickly the operating lever is moved, the liquid can only rise at the rate for which the valve is adjusted, thus fixing the rate of acceleration.

Erecting an Engine Underground

By B. J. Lowe*

SYNOPSIS—The methods followed to prevent the foundation from slipping upon a slanting foot-wall, of determining how much was to be removed from the lugs to bring the cylinder center lines parallel and making the two-piece flywheel tight upon the shaft with an 18-in. wrench are here described.

Properly erecting such a piece of machinery as a hoisting engine is by no means a difficult piece of work when all circumstances are propitious. Doing the same job some hundreds or thousands of feet underground by the weak, uncertain and often deceptive light of candles and carbide lamps may be a different proposition.

The writer was recently called upon to install underground, 2500 ft. from the surface, a cross-compound hoisting engine. The cylinders of this machine were 13½ and 21 in. in diameter while the length of piston travel was 24 in. Motion was transmitted from crank- to drumshaft through gearing at the ratio of 2½ to 1, the drum being 6 ft. in diameter. The engine was to operate on compressed air at 70-lb. gage and was designed to pull six loaded cars up an incline of 15 deg. at a speed of five miles per hour.

A chamber was first blasted out of the solid rock for the engine and foundation. This left a rough and decidedly sloping bottom. The height of floor line or bottom of engine base, as well as the center line of the engine, was next laid out by the mine surveyor. An ordinary template was prepared and set in place on this engine center line, with the foundation bolts properly placed therein. More than half of the foundation had to be built upon rock which sloped about 45 deg. to the horizontal, and, as considerable blasting was being done nearby, it was feared that the shock and vibration would cause the foundation to crack and slip.

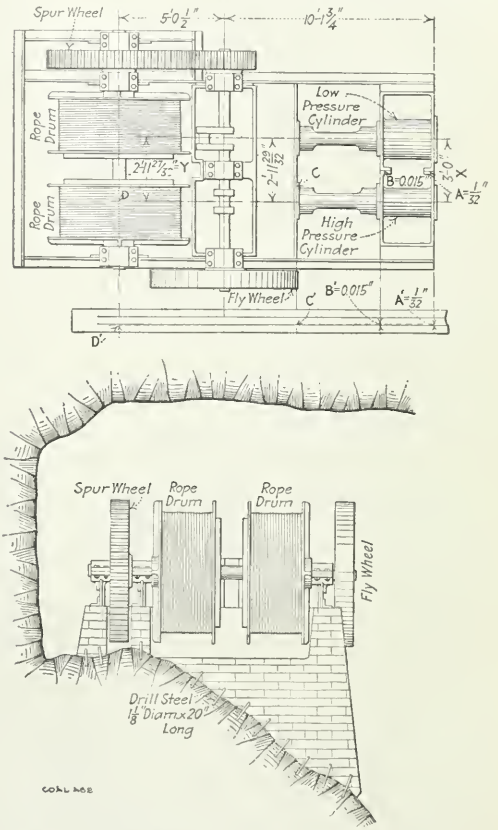
To prevent this, a number of holes were drilled into the bottom rock 10 in. deep and spaced 2 ft. each way. Pieces of old drill steel about 20 in. long were then grouted into these holes and, as the masons built up the foundation, they built in these "dowels."

When the foundations were finished, they were allowed to set for a week before any machinery was placed upon them. As many of the parts of the engine weighed over 2000 lb., a number of eye-bolts were securely fastened in the roof at convenient places for lifting purposes.

After the side frames, cylinders, trunks, pedestals, crank- and drumshafts had been put in place and securely bolted together, and the entire unit made level, fine steel wires were stretched through each of the two cylinders, extending to the drumshaft, and made central in the ordinary manner. The distance between these two wires was then carefully measured, and it was found that they converged, being $\frac{5}{32}$ in. closer together at the drumshaft than at the back of the cylinders.

As the cylinders and guides of an engine must be parallel, it became necessary to know how much must be removed from the lugs marked *A*, *B* and *C* to render the center lines of the cylinders parallel. To obtain this, a board about 12 in. wide, 2 in. thick and 18. ft. long, surfaced on one side, was placed beside the engine bed at the same height as the center line of the crankshaft. By means of a long straight-edge, two fine pencil lines were then drawn upon this board, each being parallel with one of the steel wires. These lines were accordingly out of parallel by $\frac{5}{32}$ of an inch.

Next points *A'*, *B'*, *C'* and *D'* were located upon these lines in positions exactly similar to *A*, *B*, *C* and *D* upon



Plan of Engine and Partial Section of Foundation, Underground Engine Room

the engine. As *C* was the point where the trunks were bolted to the main frame of the engine, this was considered as the pivot point, or the one where no change in the distance between center lines should take place.

The straight-edge was now placed at *C'* and swiveled until its edge became parallel with the first line. A third line was then drawn, intersecting the second at *C'* and continued each way to *A'* and *D'*. The distance between this line and the second line at the points *A'* and *B'* gave the amount which must be removed from the lugs in order to bring the center lines of the cylinders and trunks parallel.

*Germistown, Transvaal, South Africa.

It was found upon examination that the low-pressure cylinder was correct and square with the main shaft, while the high-pressure cylinder was the one at fault. This was accordingly taken off and the lugs filed down to their proper place. It was then put back and securely bolted up. The steel wire was recentralized and measurements at X and Y showed that the lines were parallel within the thickness of a fine pencil line. This was considered sufficiently accurate for all purposes.

By laying off these two lines upon the board and proceeding in the manner above described, it was only necessary to remove the cylinder once, it was not a case of "cut and try" on the amount which should be removed from the lugs, this being accurately known in the beginning.

When lining up the cylinders and trunks, as no inside micrometer caliper was at hand, touch gages made of a light piece of wood with an ordinary pin in each end were used. Being light in weight, an extremely sensitive touch could be felt. They had the further advantages of being cheap, easily made and extremely effective.

Rather strangely a 7-ft. flywheel was placed on the end of the crankshaft of this engine, a hand brake being fitted thereon to assist in holding the cars. This wheel was made in two pieces and bolted upon the shaft. As some trouble was experienced in tightening down the 1½-in. nuts, with an ordinary wrench, the bolts were removed one at a time, heated black hot, returned to their places and screwed up with an 18-in. wrench. Upon cooling off, these bolts, of course, shrunk and bound the two halves of the wheel together extremely tight.

The writer is pleased to state that this machine has now been working for some time and, to all appearances giving perfect satisfaction to all concerned. In setting up any engine under similar conditions, great care should be taken in making all measurements, as, under the very best of circumstances, the light of a candle or carbide lamp is liable to be deceptive.

Peabody Coal Co.'s Tipple at Nokomis, Ill.

SYNOPSIS—At this tipple the coal is hoisted 85 ft. above the surface and screened over bars and perforated plates, the latter being of the shaker type. The tipple will handle 3000 tons per day and hoisting will be by electricity.

The Peabody Coal Co., of Chicago, is reconstructing its mine at Nokomis, Ill. Here a 6-year-old operation, indifferently equipped and able to hoist less than 500 tons daily, is now being outfitted with an entirely new plant, above ground and below.

For a long time the mining work done below ground has only been such as to prepare the workings for a daily production of 3000 tons. It is expected that this output will be obtained as soon as the present plant is complete. The entries have been driven long distances in all direc-

TIPPLE OF PEABODY COAL CO., AT NOKOMIS, CHRISTIAN COUNTY, ILL.

tions, and upwards of 750 rooms have been necked off and widened out, ready for the mining machines and wide-work production.

The shaft has been enlarged, and a complete new surface plant installed. Everything is to be electrically driven, by power brought in from outside generating plants. It is said that the tipple will be the largest in the state of Illinois.

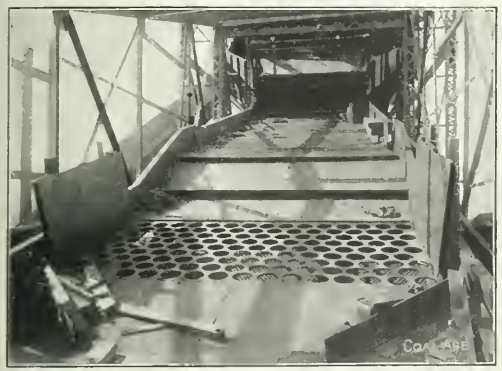
The shaft as now enlarged is of such size as to permit operation of double cages, and two cars will be hoisted at a time, side by side. The cars are to hold about four tons each, when the coal is well built up at the sides, so at each hoist there will be brought up and dumped about eight tons of coal.

The shaft depth is 640 ft. and the total hoist about 725 ft. The cages will be self dumping and operated by an electric hoist.

As the two cars brought up on each cage will usually have been loaded by different miners, there must be separate weigh hoppers to receive their contents.

The Screening Equipment

After weighing, the coal will descend directly over fixed bar screens for the removal of slack. Passing these



View of Shaking Screens, Looking Back Toward Weigh Hoppers

bars, the lump will be converged to the width of the shakers, and fed to them over an adjustable apron. The shaker screens are carried by a supporting structure completely separate from the main tipple framing. Hence, no shaker vibrations will be felt in the tipple tower.

The photograph of the screens was taken from the extreme end of the shakers, looking back at them toward the weigh hoppers. It shows clearly the arrangement of screens, veils, etc., for the preparation of all desired grades of fuel. Loading spouts beneath the screens catch the coal as it falls through and deliver it in its several sizes to railroad cars on the four tracks which will pass beneath the shaker when the grading is completed. The shakers are carefully counterbalanced and will be actuated by an electric motor.

The tipple was designed by the Peabody Coal Co.'s own engineers, and the structure was fabricated by the Wisconsin Bridge & Iron Co. The entire operative equipment, from weigh hoppers to car loading chutes, was furnished and installed by the Webster Mfg. Co., of Tiffin, Ohio.

Wastefulness at Power Plants

Addressing the meeting of the American Institute of Mining Engineers, Apr. 18, 1913, C. W. Beers made the following remarks, but it is a matter for doubt whether greater economy in mine practice would not be better than the purchasing of power for the mining load curve is often reasonably uniform.

"To understand correctly the reasons why a large producer of anthracite should find it economical to purchase central-station power, it is necessary to have a clear understanding of the ordinary steam production, and the uses to which it is applied in and around the various collieries.

"About eight or ten years ago, I was discussing with the mechanical engineer of a coal company the seemingly large amounts of steam used in various collieries, as the cry of the colliery management was constantly for more steam, although the installation of new steam-consuming devices was in no way proportional to the constantly increasing amount of steam generated.

"The mechanical engineer in reply advised that it was simply a waste of money to install more boiler capacity, and made the remark that the surest and best method of increasing the usefulness of the boiler plant was to get busy with the pumps and engines, meaning that if these steam consumers were kept in suitable repair, or rejected, and an entire new outfit substituted, that the duty of the existing boiler plants would be largely in excess of the actual steaming capacity required, and they would operate with better load factors with a consequent reduction in steam expense. A statement of this kind, coming from a liberal-minded engineer, is the unadulterated truth.

160 Lb. of Steam per Horsepower-Hour

"There are old-fashioned pumps in the mines today working on 24-hr. service that vary in age from 40 years down, and as long as they are able to push water they apparently fill the bill, regardless of the fact that they can consume easily 160 lb. (72.5 kg.) of steam per water horsepower-hour. Pumps on long-duty service are seldom touched on account of the time necessary to make suitable repairs, and when repairs are made the question is not "how economically will the pump operate?" but, rather, "how short a time will it take to make repairs?" One can imagine the condition of the cylinders, pistons, valves, etc., and with tight packing and a poor water end it is not a hard problem to guess where the steam is wasted.

"The same is true of engines. There are fine specimens of old-time workmanship and material in service 8760 hr. per year. Fans usually must be kept running at any cost, and, owing to the inability to shut down the engines to make necessary repairs, the pistons, rings and valves become badly worn with the result that large quantities of steam are used with a remarkably bad distribution. More than one fan engine shows 90 lb. (40.8 kg.) of steam per indicated horsepower-hour. These statements are advanced to show the condition of much of the machinery in use today. Colliery operations are usually conducted with the idea of getting maximum coal output, and little attention or money is spent in keeping the machinery in repair so that it may work at maximum economy."

Shaking Screens in a Concrete Tipple

By O. G. Petersen*

SYNOPSIS—A description is given in this article of a change in the design of shaking screens, so as to adapt them to use in concrete tipples, a long screen being replaced by a short-arm screen, in order to reduce the horizontal strains set up by their operation and at the same time increase the vertical strains. Moreover, the efficiency of the screens is increased by shortening the hangers, as it increases the action of gravity.

A company daring to place a device that gives as much trouble as a large shaker screen in a concrete frame, was strongly criticized at the time of completing the structure. Now that the plant has been in operation for a year and a half, the Stearns Coal & Lumber Co., of Stearns, Ky., feel that they have made a good investment.

Two factors entered into the successful design and construction of this plant. One was a shaker frame designed particularly to meet the periodical strains incident to shaker-screen operation. The other, a shaker-screen suspension system which replaces the usual longitudinal strains by vertical ones, strains that the concrete frame is well fitted to withstand.

An examination of the law governing the motion of the pendulum discloses some interesting facts when applied to shaker-screen operation.

$$T = 2\pi \sqrt{\frac{l}{g}}$$

in which

T is time of complete vibration in seconds;
π is 3.1416;
l is length of pendulum in feet;
g is value of gravity, assumed at 32.16.

The particular item of interest in this case is that the time of vibration varies as the square root of the length.

A well known and almost universally used type of shaker screen has hanger rods, which are six or seven feet long. By considering all the hanger rods as brought into one and the weight of the screens as concentrated at a point corresponding to that of the bob at the end of the pendulum and inserting the usual values in the above formula, we have

$$T = 3.1416 \sqrt{\frac{7}{32.16}}$$

$T = 2.88$ seconds for a complete swing or period. This corresponds to 21 complete swings per minute. If there were no friction at the bearing points and the screen were set in motion it would swing of its own accord at this rate.

It will be noticed from the diagram of the pendulum, Fig. 1, that when the pendulum is seven feet long and the swing or double amplitude is 4½ in., the effective component due to gravity causing the weight to move is 540 lb., when the bob weighs twenty thousand pounds.

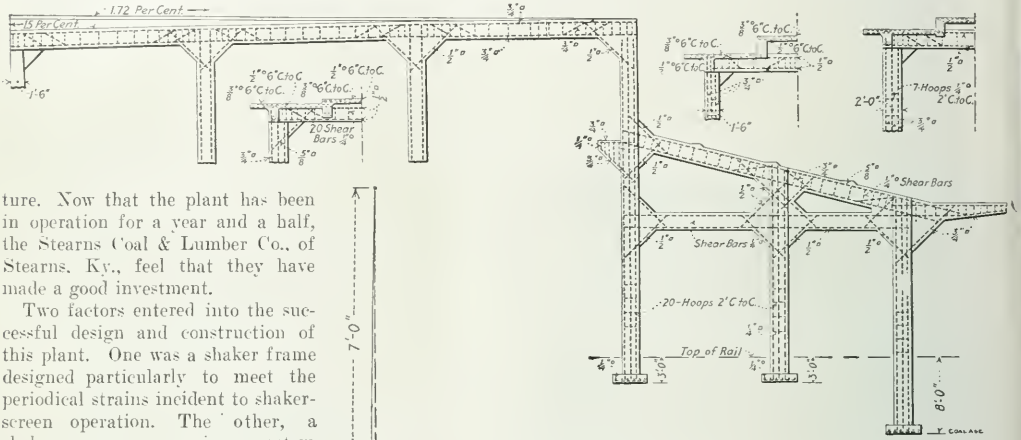


Fig. 3. Elevation of Concrete Tipple

Pendulum Diagram

Inserting new values in the first used formula by giving the pendulum a length of six inches, or 0.5 ft., we have

$$T = 3.1416 \sqrt{\frac{0.5}{32.16}}$$

T is 0.74 seconds, corresponding to 81 complete swings per minute. If there were no friction at the bearing points and the screen were set in motion it would swing of its own accord at this rate.

Greater Vertical Strains

Making a new diagram, Fig. 2, in which the pendulum is assumed at six inches, while the stroke or double amplitude is retained at 4½ in., we obtain as the effective component due to gravity 7680 lb.

Applying the two pendulum lengths to actual working conditions in having one screen with suspension rods 7 ft. long and a second with 6-in. rods or links, test instruments will show a power consumption of 15 to 25 hp. for the first when running at 110 r.p.m., and passing 250 tons per hour over a screen 72 in. wide and separating the coal into four sizes. For the second screen, running under similar conditions, the instruments record a power consumption of *six* horsepower.

A further examination of the diagram reveals an almost straight line, as the path of any point in the screen

*Assoc. Eng. Co., Louisville, Ky.

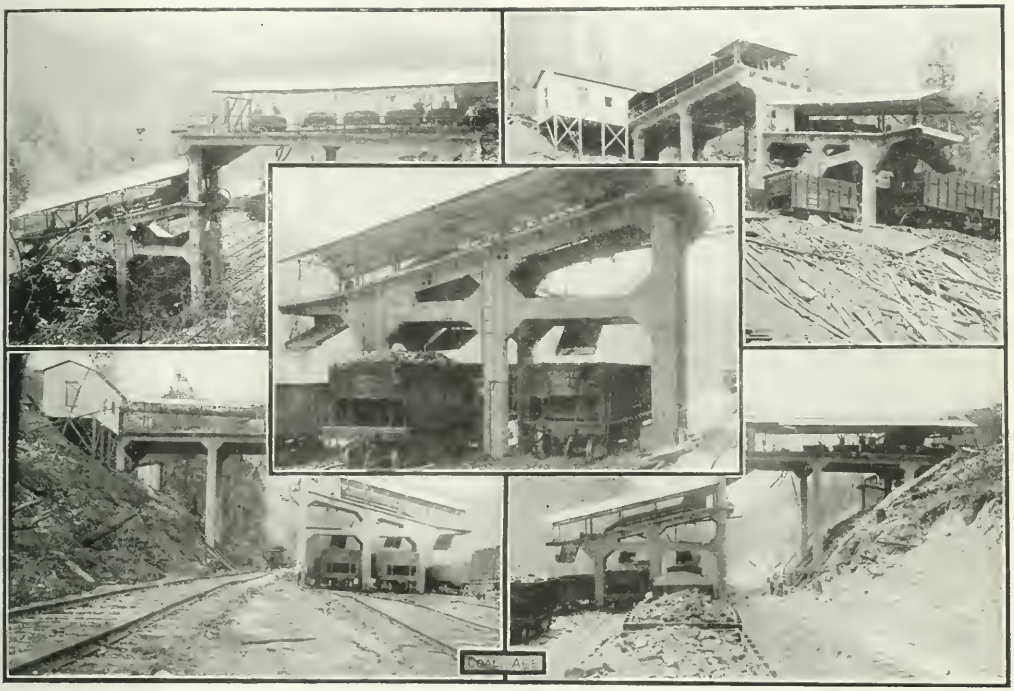
with 7-ft. rods, while the screen with 6-in. rods shows a vertical movement of almost ½ in. for the assumed stroke of 4½ in.

This vertical movement considered in connection with the path traversed by the coal on the screen, which is approximately that described by a six inch pendulum, and with the fact that the coal would therefore have a natural period of 81 per minute, while the screen is made to run at 110, shows why the screens keep themselves so clean. The screen plates actually drop away from the coal. This tends to displace the long-pointed pieces that persistantly remain in the holes of screens of the usual type and that can only be removed by the use of a punching bar.

The plant illustrated is provided with columns 2 ft. square. The beams, both shaker frame and tipple floor, are 2 ft. deep and 1 ft. thick. At all junction points braces are introduced, being 2 ft. on a side and 1 ft. thick. The tipple floor is 4 in. thick.

Shaker-frame beams are reinforced for concentrated loading. Tipple floor beams are reinforced for general loading.

Columns generally have six ¾-in. square steel bars and ⅜ in. hoop steel. The two 42-ft. columns supporting the shaker frame and the tipple floor and also transmitting the shaker strains to the tipple-floor anchorage have nine ¾-in. vertical bars. The floors have ½-in bars placed on 6-in. centers and passing from beam to



Some Views of the Tipple of the Stearns Coal & Lumber Co., Stearns, Ky.

Design of Concrete Frame

Passing to the design of the concrete frame, a review of the column and beam dimensions reveals figures far above those used for bridge and building construction. In concrete we have the means to provide, at a reasonable cost, ample mass to withstand and counteract the strains set up by the periodic screen motion.

In addition to this structural advantage are those of freedom from fire, rust, decay and vibration and, as a consequence, no burden of insurance, paint and repair bills.

In getting ready for design, a thorough examination is made of the foundation material. For rock the columns are run to bottom with no change in their cross-section. For anything other than rock, a spread foundation is utilized, the area of this being determined by the nature of the material encountered.

beam. Longitudinal temperature bars are also used. The tracks are fastened to steel stirrups, that are cast into the concrete floor. A smooth surface is presented by eliminating ties.

At the dump, where two Philips kick-back dumps are used, the beams are 30 in. deep and the shock of the return of the dump is absorbed on a 6x6-in. white-oak beam 6 ft. long. The oak beam is removable for renewal. This effectively prevents the hammer blow of the dump affecting the concrete. Quick weighing scales are introduced on the load track. All loads come over one track, are diverted to one or the other dump, and when empty automatically seek their respective empty track.

Style of Screens

The screens have screening plates ¼ in. thick and by means of valves and delivery chutes can be set to give

any of the following sizes: 1-in. slack, 2-in. slack, 1- to 2-in. slack, 1- to 2-in. nut, 1- to 3-in., 2- to 3-in., any size round coal up to 6 in., any size block from 3 in. up, or run-of-mine with or without slack.

The suspension links are made in halves for ease in erection, and are provided with steel bushings. In these 3/8-in. steel rollers 4 in. long rest on steel pins 2 in. in diameter, that act as the stationary supports.

Connecting or pitman rods are made of hickory. A flexible point is obtained by reducing the cross-section of the rods to 1x6 in. at a point 12 in. back from the screen. No springs are used, as there is no shock at the end of the stroke.

It is obvious that the design lends itself to adaptation for drift, slope and shaft mining.

J. E. Butler, general manager of the Stearns Coal & Lumber Co., is to be congratulated in having the courage to face down the adverse criticism thrown at the structure during the construction period. Both he and the owners have since felt amply repaid for taking such a radical step.

The Associated Engineering Co., of Louisville and Somerset, Ky., control the rights under which reinforced-concrete shaker buildings, tipples and headframes and also short suspension shaker screens are manufactured.

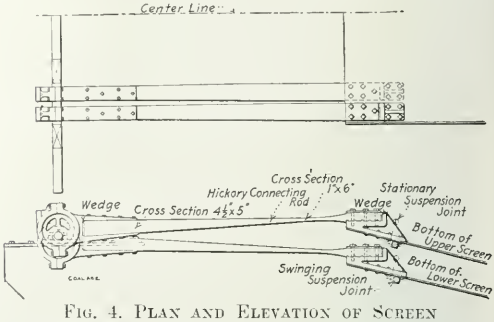


FIG. 4. PLAN AND ELEVATION OF SCREEN

They designed and built the plant illustrated in January and February, 1912, it being at that time, the first of its kind.

A New Mine-Rescue Telephone

SYNOPSIS—In mine-rescue work following a disaster there exists a strong need for a means of instant communication between the helmet party and the outside. This article describes a successful telephone equipment that does not in any way interfere with the oxygen apparatus.

The problem of devising ways and means for the protection of human life in mines is probably the most important question confronting the mining industry of today. The laws of practically every state in which mining operations are conducted, call for periodic inspections and contain many safety regulations, not the least of which in a number of states is a section making compulsory the installation of telephones underground.

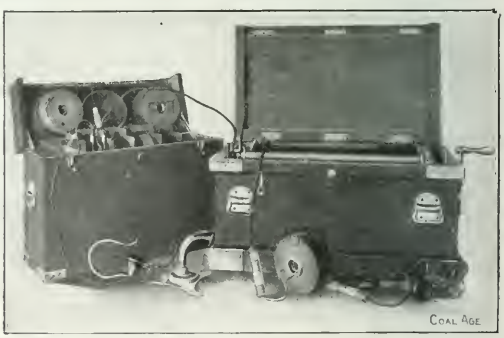
THE MANUFACTURERS KNEW THE CONDITIONS

During the past few years several thousand telephones have been sold and installed for use below the surface. The makers of these instruments were thus brought into intimate association with those interested in mine-safety work, and their attention was directed to the urgent need of some means of instant and continuous communication between an advance or rescue party equipped with its oxygen helmets and the rear party or that outside the mine. In the past, members of rescue parties have lost their lives where such loss could have been prevented by a quick and reliable means of summoning aid.

The demand for an equipment of this kind has been met by the Western Electric Co. in the production of light, serviceable and extremely simple telephone instruments for use in rescue work. In developing this apparatus the Bureau of Mines was frequently consulted, in order that every requirement for this severe service might be fully covered.

It is immediately obvious that a man wearing an oxygen helmet which effectually covers his mouth, cannot use the ordinary type of telephone transmitter. A special type, known as the throat transmitter, has been developed to meet this unusual condition. This instrument is light and compact and provided with a soft-rubber cup to adapt it to the curves of the throat.

This device has been found, by actual test, to transmit speech practically as well as the standard Bell instrument. Both receiver and transmitter are held firmly in position in such a manner that they will not interfere



COMPLETE SET OF INSTRUMENTS, INCLUDING REEL AND APPARATUS BOXES

with any type of oxygen apparatus now on the market. The telephone equipment used by the man at the outside or directing end of the line, is a standard switchboard operator's set, consisting of a chest-type transmitter and head-band receiver.

THE REARWARD CONNECTION

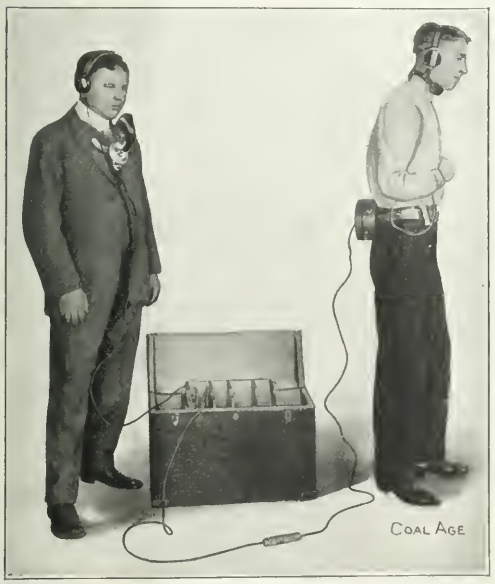
The rescue party is connected with the rear by means of a small wire cable, consisting of two copper conductors insulated with black enamel and two servings of silk, all of which is covered with a stout linen braid im-

pregnated with a moisture-resisting compound. This wire is in 500-ft. coils and is carried in a leather case fastened to the helmetman's belt, paying out as he advances.

As the coils are light, weighing less than 3 lb. each, several of them can be carried and as one is run out, another can be connected by means of a plug and jack combination. The wire is so wound that it cannot become tangled and will pay out in whatever position the rescuer may be obliged to assume. The total weight of telephone equipment carried by the helmetman, including one coil of wire, is only slightly over 5 lb.

One end of the coil is equipped with an aluminum-incased plug, which connects with the head receiver and throat transmitter by means of a similarly covered jack. The other end is equipped with a like jack connecting with a plug and cord running to a battery and apparatus box.

This box is an essential part of the equipment and



APPARATUS IN POSITION. NOTE THROAT TRANSMITTER

must be located at the point from which the rescue party is being directed. It contains eight dry batteries mounted in a Patterson screw-type battery holder, together with a key, two jacks and a battery gage, placed in a removable compartment. The operator's telephone set is connected to the apparatus and battery box by means of a cord, plug and jack. The key operates in two directions and has three positions, neutral, right and left. In the neutral position the batteries are in circuit; when operated one way the batteries are disconnected to save current when the apparatus is not in use, while in the other position the gage is connected across the battery terminals, so that the condition of the cells may be determined. It would be a serious matter after the rescue party had entered the mine to discover that the batteries were too weak for service.

HEAVY CABLE PROVIDED FOR SHAFTS

In many cases it may be found desirable to use cable for carrying the talking circuit down a shaft or into a slope or drift up to the edge of the danger zone. For this purpose a large box, including a cable reel, is furnished. This box is made of ash, heavily reinforced and provided with metal corners. It carries an aluminum reel holding 1300 ft. of specially strong and flexible twisted pair cable, having 30 per cent. pure para rubber insulation, the highest grade obtainable.

A heavy ratchet and pawl are provided to prevent the reel from turning, after enough cable has been paid out. Connections with the apparatus box and the coil carried by the helmet man are effected by means of an aluminum-incased jack and plug, while electrical contact with the inside end of the reeled cable is made through collector rings and commutator brushes connected to a jack.

This entire outfit has been designed and constructed with a view to providing practical and serviceable telephone equipment for mine-rescue parties. Service tests have proved that this object has been attained. This equipment should, therefore, be of incalculable benefit to those engaged in this work, which is at best hazardous.

Coal Trade at Marseille

Consul General A. Ganlin reports from Marseille, France, in the Consular Reports under date of May 28 concerning the coal trade at that point as follows:

The coal, coke and patent-fuel imports at Marseille during 1912 amounted to 1,470,158 metric tons, being practically equal to those of the preceding year. England furnished 1,101,816 tons, Germany 213,104 tons, and the United States 33,334 tons. The imports of American coal consisted of 15,911 tons of coke purchased by the aluminum factories of the Savoie district, 11,353 tons of steam coal, and 6070 tons of gas coal for the Marseille Gas Co.

An excellent market appears to exist here for American coke, although German competition is very keen in this line. The imports of gas coal have also given entire satisfaction and the inadequate transportation facilities and usually excessive freight rates are the chief obstacles to be overcome in order to secure transactions on a steady and profitable basis. There is always a limited demand for American steam coal in Marseille, but it is chiefly dependent upon industrial conditions in the British coal fields. Coal suitable for the manufacture of briquettes could also be sold in large quantities in this district. French coal is unsatisfactory in this respect, and certain grades of American coal could, in the opinion of competent authorities, replace most advantageously the products now used for this purpose.

The statement is made, in the Journal of the Chemical, Metallurgical and Mining Society of South Africa, that frozen dynamite or gelatin is very susceptible to fire and easily burnt. It no doubt often happens that the detonator, though failing to explode the frozen sticks of gelatin in the hole, will set them alight, thus causing a burnt-out hole, with the accompanying gases, bad heads and general discomfort to the workmen. A frozen stick of gelatin may also be the cause of a misfire accident, by remaining in the bottom of the hole unexploded, in its frozen state; but thawing out by the aid of the natural rock temperatures, and later being roughly disturbed by an auger when another hole is being drilled, it is fired and an unexpected explosion takes place.

Mine Inspectors' Institute, U. S. A.

By J. T. Beard

SYNOPSIS—The annual meeting of the Mine Inspectors' Institute of the United States of America was held at Birmingham, Ala. No papers were presented. The cordial reception of the citizens of the Iron City of the South contrasted strongly with the chilliness of the weather, which was phenomenal for the sunny South in June.

The Mine Inspector's Institute of the United States of America held its annual meeting, this year, at the Hillman Hotel, Birmingham, Ala., June 10-13. C. H. Nesbitt, chief inspector of Alabama, occupied the chair, and called on Culpepper Exum to make the opening address in which he welcomed the visitors to Alabama. To complete the expression of welcome, W. P. G. Harding, of the Chamber of Commerce, delivered an address on behalf of the city. .

Pres. Thomas K. Adams then delivered his address, an abstract of which follows:

The President's Address

This is the fifth annual convention of our Institute and we meet today under auspicious circumstances. We are, in common with all other classes of American citizens, enjoying the fruits of a prosperity never exceeded before in the history of our country, for which we should be thankful. We should feel proud of the fact, too, that in the rapidity of the accumulation of wealth no other nation has excelled us. Few nations can equal us in our enormous territorial holdings, which contain a practically inexhaustible supply of valuable minerals, capable of increasing to fabulous proportions our already acquired $119,000,000,000 of national wealth.

The coal-mining industry has kept step with the marvelous progress and development attained along all other lines of human endeavor. Sixty-three years ago there were produced 7,000,000 short tons of coal in this country, which increased to nearly 550,000,000 in 1912, and in the production of this enormous tonnage 750,000 persons found employment. While the product of the coal-mining industry is not of such large volume and value as compared with that of agriculture which amounts to nine and one-half billions of dollars, nor of the annual output of manufacturers, worth fifteen billions of dollars, yet, as mining men, we are justified in the belief that coal is king and that it is the most important pillar in the structure of the industrial life of this nation. When we realize that our country's industrial greatness has been rendered possible by the ingenuity, industry and organizing genius of our people, we have great reason for rejoicing with all other patriotic Americans.

The Mining Fatality Rates

Our industrial position, however, has been won at a great sacrifice of human life. In the year 1912, 2360 persons lost their lives in and about the mines of this country, or there were 3.15 deaths to every one thousand persons employed, which is 4.29 deaths to every one million tons of coal produced, which means that one person is killed for every 233,000 tons of coal produced. This is the best record we have had since the disastrous year of 1907, in which 690 persons lost their lives by mine explosions. While this record is better than it has been for the past six years it is still entirely too high.

We realize that the miner is engaged in a hazardous occupation, but we are equally agreed that many of the lives lost are an unnecessary sacrifice and not warranted by the hazard of the miner's occupation.

We, as mine inspectors, have greater opportunities for acquiring experience and an intimate knowledge of varied mining conditions and of the best means to eliminate the dangers incident to mine operations, than any other body of men. Furthermore, it is our duty as members of this institute, both in our individual and organized capacity, to blaze the way which will lead to the adoption of such precautionary and remedial measures as shall render the mines safer in the future than they have been in the past.

The people of this country have reason to expect that an organization of this character, composed as it is of experienced and intelligent mining men, will take the initative in securing such uniform and necessary legislation as will safeguard life.

This organization has power to accomplish much good if it has learned how to use that power effectively. If we have not been as potential or as effective in realizing the real purposes of our association, the failure is ours. By well directed efforts, earnest, united and enthusiastic work, we can make this institute a powerful agency for good or we can by our indifference make it a monumental failure. The Institute gives us a medium through which we can talk to the people of this country with a power not possible as individuals. We are also in a much better position to reach the governmental powers and obtain the enactment of reasonable and necessary laws. But these alone will avail us nothing, unless those concerned in the operation of the mines are forcibly required to obey them.

Possible Reductions in the Death Rate

Whenever the mining people of this country sincerely endeavor to eliminate 50 per cent. of the mine accidents they have the power and the knowledge to do so. This much desired result will surely come whenever the captains of the coal-mining industry find that the preservation of human life is a more valuable asset than large dividends; and, when the mine workers themselves have learned the lesson of obedience and found that their lives are more important than the acquisition of a high rate of wages. When this time comes the disastrous problems having such baneful results, will, in a large measure, be solved and eliminated.

We feel that we have good reason for encouragement because, with all our shortcomings, at no time in the history of the coal industry have greater efforts been put forth for the betterment of mining conditions in general with more laws enacted, and better enforcement of the same, than now. The dangerous elements incident to the mining of coal never were better understood; a better knowledge of mining was never so universally diffused and the mines have never been so intelligently managed

as at the present time, yet unnecessary accidents happen, many of which are of great magnitude.

Along with our wonderful progress and development in mining many more dangers have arisen. This is largely due to the introduction of a multiplicity of machinery together with dangerous powers, into the mines, and the inordinate desire to obtain big things by concentration of productive units, thus effecting greater economies. In addition to this there is the great haste of the working men striving to secure a larger tonnage and greater efficiency; this attempt, with the large numbers of unintelligent and unskilled men now employed in the mines of the country accounts for the disastrous results that have followed. In view of such facts much work remains to be done by the mining classes and especially by the mine inspectors before conditions can be secured in the mines that will better safeguard life and reduce the death rate to the proper minimum.

Those of us who had not the experience in the mines of this country before effective mining legislation was enacted can hardly imagine the great improvements in the sanitary conditions of the mines. In fact, we have been creditably informed that such conditions in the large, well regulated mines of this country are unexcelled by those in any other country. While it may be regarded in some quarters that human life is held very cheaply, especially that employed in the mines, yet, were all the adverse conditions with which we have to contend well understood, our death rate would bear a much more favorable comparison with other countries.

Responsibility of the Inspector

Institutions of this character are an absolute necessity in this country. It is the opinion of nearly all intelligent men now, that in order to accomplish the best results in any enterprise, whether of a political, social or industrial nature, success can be attained only through organized effort. We live in an age of organization.

If organization is necessary along political lines and indispensable to secure the general social uplift of society, it is certainly as necessary to the accomplishment of industrial freedom and the betterment of the working conditions. Hence good results will be accomplished through our unified, independent, unrestrained and well directed efforts.

You as mine inspectors deserve well of your state governments. No men in the service have proved themselves to be more efficient or more faithful to public duties; duties well and intelligently performed and done under adverse conditions. Your compensation for the kind of services you render, the hazards taken, and the uncertainty of employment, with no provision made by the state for your future, all show the recompense is shamefully inadequate. The great services you have rendered the state in the past, done silently and unostentatiously, putting into motion with missionary zeal forces having in view the common good of the mine workers, have had splendid effects. These may not have been done in such a demonstrative and spectacular manner as is often the case, yet we know of no single agency in the government service or otherwise that has accomplished more for the real betterment of mining conditions in general than has been done by the organized and unorganized efforts of the humble mine inspectors of this country.

Sessions and Entertainment

It was decided at the meeting that in future the papers about to be read before the Institute be published in pamphlet form before that body convenes so that the discussion will be less extempore than would otherwise be the case.

In the afternoon, in addition to a session for discussion, automobile rides were arranged for the visitors by their hosts. The trip led them to the Highlands, over Mountain Terrace, Cliff Road, and across town to Norwood and then to Fairfield.

In the evening a smoker was given at the Hotel Hillman, while the lady visitors were entertained at the theaters. The weather was ideal for automobiling and the visitors coming mostly from the North and West found the sunny South all that could be desired.

Thursday was wholly devoted to a most enjoyable and instructive trip, which consisted of a 40-mile junket around Docena, Ensley, Edgewater and Bay View. During this trip the members of the Institute and their friends were the guests of the Alabama Coal Operators' Association and the Tennessee Coal, Iron & Railroad Co. The mines and steel mills of the company were visited, and the members were further entertained and refreshed by a barbecue in the woods skirting the lake, and a baseball game between the company team and that of the Jefferson Powder Company.

The T. C., I. & R.R. Co. is to be sincerely congratulated on the success of their efforts to establish and maintain the goodwill and coöperation of all their employees. This has been accomplished, in a remarkable degree, by the untiring efforts and a generous expenditure of funds by the company, in order to give to its employees every advantage of education, physical culture and entertainment. All the camps visited displayed to a marked degree the determination of the company to leave no stone unturned that would assist in maintaining pleasant and profitable relations between employer and employed.

The Institute held a session the same evening, at which time the important question of the use of mixed lights in gassy mines was discussed. The annual election of officers then took place, which resulted in the choice of the following: David J. Roderick (Penn.), president; John Dunlop (Ill.), first vice-president; J. B. McDermott (Mont.), second vice-president; Thomas Morrison (Ohio), third vice-president; J. W. Paul (Penn.), secretary; R. S. Wheatley (Ohio), assistant secretary; R. Y. Muir (W. Va.), treasurer; and J. T. Beard (New York), editor-in-chief.

A brief session was held Friday morning, at which time the following resolution, among others, was adopted:

RESOLUTION

Following an interesting and prolonged discussion of the methods employed in different states, for the selection of mine inspectors, the Mine Inspectors' Institute, U. S. A., in session June 11, 1913, at Birmingham, Ala., unanimously adopted the following:

Resolved—That in view of the nature of the duties imposed by law upon all state mine inspectors, requiring him to act as agent for the state; and because the upright and conscientious performance of those duties often calls for the fearless, unprejudiced and unhampered exercise of an inspector's best judgment and convictions, in the face of threatening opposition of either operators or miners or both: Therefore be it

Resolved—That it is the sense and deliberate opinion of the members of this Institute, that the incumbent of the office of state mine inspector should be, as far as possible,

removed from any influence that would tend to warp his judgment, or embarrass his conclusions, or in any manner delay his action in the interest of safety and security of mining operations under his direct supervision; and further,

Resolved—That, in securing this end, it is the unqualified opinion of this body that the elective system as applied to the selection of state mine inspectors should be condemned unreservedly and abolished. In conclusion be it further,

Resolved—That due publicity be given this action by wide-spread notice in the public press and mining journals, so as to bring it prominently before state legislators and governors, in the hope that such laws may be wiped from the statute books where they exist in any state, or may be killed if contemplated.

By vote of the members present, the next annual meeting of the Institute will be held at Pittsburgh, Penn. It is the purpose of the mine inspectors of Pennsylvania to make this meeting a memorable one in the history of the Institute

Among those who attended the convention were: Charles H. Nesbitt, David Kelso, Frank Hillman, Thomas Roscoe and Mr. Hillhouse, all of Alabama; Thomas K. Adams, Thos. D. Williams, D. J. Roderick and P. G. Moore, all of Pennsylvania; James Martin, L. D. Vaughn, L. B. Holliday, Frank E. Parsons, Arthur Mitchell, R. Y. Muir and H. H. Pinkney, all of West Virginia; George E. Sylvester and John Rose, of Tennessee; F. I. Pearce, of Indiana; Hector McAllister, John Dunlop, Oscar Cartlidge, Thomas Little, W. S. Burris, Thomas P. Back, Martin Bolt and Thomas Moses, all of Illinois; J. D. McDermott, of Montana; J. W. Paul and E. R. Sutton, Federal Bureau of Mines; R. H. Beddow, of New Mexico, and J. T. Beard, senior associate editor, "Coal Age," New York.

Messrs. Bolt, Moses, Burris, Martin, Mitchell, Parsons and Vaughn were accompanied by their wives.

A New Mining Lamp

Ever since the introduction of the incandescent bulb upon a successful commercial scale, it has been the desire of many mining men to utilize this means of illumination in the miner's cap lamp.

Despite the fact that the old oil lamp is both reasonably cheap in first cost and operation, it leaves, nevertheless, much that is to be desired in the quality and steadiness of its illumination. Many experiments and trials have been conducted, therefore, in the attempt to produce a satisfactory and successful electric cap lamp.

Heretofore, practically all of the electric devices of this kind which have been placed upon the market have been of the storage-battery variety which require several hours each day to charge.

After years of experimentation and development, the Maxivolt Primary Battery Co., of 200 Fifth Ave., New York City, will shortly place upon the market their new electric mining lamp, known as the "Bulldog." This is claimed to be the lightest, most compact and most convenient apparatus of this kind ever placed before the mining industry.

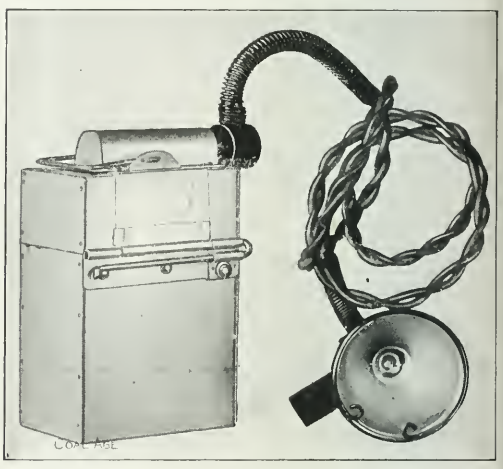
This device is a rather radical innovation in the electric mining-lamp field. It consists of an aluminum-incased primary battery which is carried on the belt. This battery requires a small amount of liquid electrolyte and a small zinc bar about the size of a lead pencil for each day's work. When thus charged, it will deliver a current of 10 amp. at 1.6 volts for 10 hr., producing a steady, clear, unflickering light of 2 cp. throughout the entire period.

The cap lamp proper is a small incandescent bulb carried in a concave reflector which is attached to the miner's cap in the ordinary manner. A carefully insulated double cable leads from the lamp back over the cap and down to the battery upon the miner's belt. At the point where this cable is subjected to the greatest flexure, it is protected by an open coil spiral spring for a distance of approximately 6 in. This prevents the cable from kinking or doubling short with consequent injury to the insulation.

By removing the cable and inserting the lamp reflector direct into the socket of the battery an extremely simple and efficient hand lamp is produced.

This device possesses many advantages which may not be immediately apparent upon a casual inspection. The battery case being made of cast aluminum is light, durable and strong. All connections are efficient but exceedingly simple. No skilled labor is required for recharging the batteries and no generating machinery is necessary at the mine where these lamps are employed.

According to the specifications of the Bureau of Mines, a battery attached to a lamp should not have a short-circuit current of more than 50 amp. at 2½ volts. The maximum short-circuit output of this battery is 18 amp. at 1.6 volts. Assuming that 50 amp. at 2½ volts is just sufficient to produce a gas-igniting spark, it may be clearly seen how remote is the possibility of such an occurrence with a battery of the current strength described above.



Car Lamp and Aluminum-Incased Primary Battery

The electrolyte used in this battery is harmless and inexpensive and cannot be spilled from the container under ordinary conditions. Both this and the necessary zinc electrodes may be purchased in quantities at small cost. Experiment has proved that this device will give a continuous light of 2 cp. for 10 hr. with an expense not exceeding four cents.

Don't ever cause anyone to receive an electric shock.

Don't think that it is smart to get an electric shock. Every time a man gets a shock it shows lack of care and knowledge.

Don't be ashamed to be careful. You owe this not only to yourself, but to others who may follow your example.

Don't handle wires or electrical apparatus of any kind unless you are told to do so.

Don't get off or on trips from the trolley-wire side.

Don't carry tools on your shoulder when crossing under the trolley wire, or when traveling in the same entry with it.

EDITORIALS

The Danger of Banked Fires

At many mining plants, particularly those of small operations, it is a common practice to bank the fires over night or during periods of light load. This may or may not be a dangerous custom, depending upon the manipulation of doors, dampers and drain pipes.

When green coal is first placed upon the fire, it passes through a process of distillation, the volatile combustible matter being driven off by the heat from below. If the gases thus evolved are not burned upon formation and are not swept away by a circulation through the furnace, they may form with the air present an explosive mixture, which only requires a tiny tongue of flame or a spark to ignite.

The violence of the explosion following an ignition of this kind, or the damage which may result therefrom, depends not only upon the proportion of the gas-and-air mixture, but also upon how thoroughly this mixture is confined within the setting walls. It is seldom that such an occurrence wrecks the brickwork, but it may be, and frequently is, sufficiently forcible to be dangerous, or even fatal to the firemen or other attendants who may be in the proximity of the doors when they are blown open.

When a fire is banked, and doors and damper are closed, the water-column drain or any other steam or hot-water pipe leading into the ashpit should never be opened. Such a procedure forces air through the grate bars and fire bed with more or less violence, and, with the proper mixture of air and gas in the passages and combustion chamber of the boiler is almost certain to result in an explosion of this kind.

It is the part of wisdom, therefore, to never blow down water columns of gage glasses (presupposing that these drains terminate in the ashpit) when the fire is banked. It is better still to make it an infallible rule never to bank the fire when the chimney damper is entirely closed.

The Financial Outlook

An unmistakable and uniform depression in securities has developed possibilities which are too potent to be ignored. As in the famous panic of 1907, the slump is due essentially to an over-straining of the world's financial reserves, but the cases are not parallel because the present depression has been anticipated to a greater or less degree. Close students of conditions have noted for some time that the investment markets have been congested to such an extent that even old-line standard securities of the most reputable kind could be sold only with difficulty. A notable example of this was the recent flotation of 27 million dollars worth of eight-months' notes, by the state of New York, on an interest basis of about 4.87 per cent. These issues are regarded among the most conservative investments obtainable and heretofore have commanded a substantial premium on an interest basis of 4 per cent.

In the coal industry itself, the money stringency has had the effect of bringing about a rigid restriction in new development. For more than a year it has been well known that some of the most powerful companies in the country have been hard pressed for funds, especially those contemplating extensive new work. While this has naturally caused some temporary embarrassment to those affected, it has perhaps been beneficial to the permanent interests of the trade since it has discouraged the increase of our already excessive capacity.

Apparently, the effect of the tight-money situation has not yet reached the coal markets. Whether it ultimately will do so is a question yet to be solved, and is, of course, dependent on the duration of the present conditions; although, as a fact, the coal trade has seldom been in such a strong position at this season of the year. Shipments in all the principal mining regions are exceedingly heavy and limited only by the labor supply, while prices are unusually buoyant and display a strong rising tendency. The consumption is large and well distributed among the various branches of industrial activity, so that a recession in any one department (as now seems to be impending in steel) should not have any serious effect on the trade as a whole.

Returning again to the money situation, it is interesting to review some of the causes that have led up to the present conditions. The trouble, no doubt, originated with the European wars, although these alone could not have developed such an acute situation as now prevails. Following this came the uncertainty, in this country, because of the tariff revision, and more recently the appointing of receivers for the defunct St. Louis & San Francisco R.R. At about this same time an abnormally heavy flotation of government, state, municipal and corporation securities appeared, which congested the markets and made it clear that credits were over-strained. Notably among these was the announcement of an impending issue of 56 million dollars of German and Prussian government bonds. Since it is mandatory on the German bankers to subscribe for government securities, the necessity of providing the required funds resulted in a heavy liquidation of American issues and was probably the cause for the recent spectacular slump in the Canadian Pacific stock.

Thus it appears that the trouble is due to a combination of untoward and unforseen conditions. The result has been to cause a general retrenchment and establish business on a more equable and sound basis. It has also brought a renewed feeling of confidence, because of the strong resistance offered to a series of conditions that would, on other occasions, have resulted much more seriously. Secretary McAdoo's announcement that the government is prepared to make loans to the extent of 500 million dollars, under provisions of the Aldrich-Vreeland act, had an immediately stimulating effect upon all securities. This removes any possibility of a tight money market when the crop movement starts and has materially relieved the situation generally.

The Sherman Act

We imagine that everyone was grieved to learn that some over-zealous government official was endeavoring to apply the Sherman Act to remedy the evils in the Paint and Cabin Creek districts. The most unfortunate feature is that there is only too much hope that the prosecution may be successful. The public is not in sympathy with any attempt to restrain the formation of unions in places where wages are not equal to those in other industries or even in other centers of the same industry. It will be thought peculiarly reprehensible that such an attempt has been made in West Virginia.

We are not sanguine that any great increase of wages will result from any action of the United Mine Workers of America, still less from the violence of the irresponsible Industrial Workers of the World, but we believe that an attempt to penalize the formation of a union will result solely in the passage of an amendment removing labor organizations and agricultural associations from the operation of such organic law.

The country needs this weapon of defense against attempts like those made abroad to tie up the labor market for purely political reasons, to obtain class legislation or to reinstate some union man whose discharge is dictated by the welfare and safety of the public. This defense is not to be used to victimize men who only seek to procure equal rates of pay with those customary elsewhere.

If any charges are to be made, let them be that the union has promoted violent attacks on the majesty of the law. We do not know whether such charges could be proved, but if they cannot, the courts should not be asked to convict men whose acts could not be proved unlawful and contrary to public advantage.

We are inclined to believe the Union is not in bad hands. Perhaps our judgment is in error, but we are disposed to feel that even in the anthracite region, the will to break contracts is more marked among certain irresponsible miners and inferior organizers than among those who are the head and front of the organization. Certainly the Union is only impatiently tolerating the evil and not encouraging it.

We cannot believe that if both labor representatives and capitalists are proved to have conspired to unionize and raise wages that the public will be disposed to condemn either for that action. Only those whose consummate blindness to public opinion has caused the present trouble could be bewildered enough to overlook the fact that the whole United States is in a league of sympathy with the Union in the present attempt to secure recognition. Whether the miners are getting a living wage or are paying too much for their necessaries of life, whether the mine guards did or did not violate the laws of the state or of common humanity, are points far more debatable.

But while we believe the operators should permit and not attempt in any way to restrain the formation of a union, we do not feel disposed to put the blame upon them of having caused the declaration of martial law. It was not unreasonable for Mr. Glasscock, who was then governor, to advise a recognition of the Union, as we are now doing, but it is distinctly unfair to blame the operators for all these troubles if the only crime they have committed is that of failing to acknowledge the Union. Recognition is not obligatory by law or by moral considerations, but we confess the right to form a Union is a fundamental property of all men and should not be abridged until the powers thus acquired are arbitrarily exercised to the disadvantage of the commonwealth or to the peril of the public.

In 1834, a group of men, known since as the "Six Men of Dorset," were sentenced to seven years' penal servitude for asking unitedly for an increase in wages of one English shilling a week. Fifty thousand men marched to demand their release. In 1912, a monument was raised to these early martyrs of industrial oppression. We thought the matter settled years and years gone by, and that the prison ship "Success" sailed into New York harbor this summer, to hail the fact that such crimes had long ceased. But the proof has all to be demonstrated again that the Caucasian race does not consider it to be a conspiracy to seek with others or for others an increase in pay.

Mark the Piping

Around mining power plants it is not common to find the various piping systems marked or designated in any way. Aside from the circumstances that the live steam pipes are frequently covered with asbestos or magnesia, and that water-supply pipes are sometimes made of cast iron, the person unfamiliar with the intricacies of the piping system is at an utter loss to know which conductor carries steam, water or air.

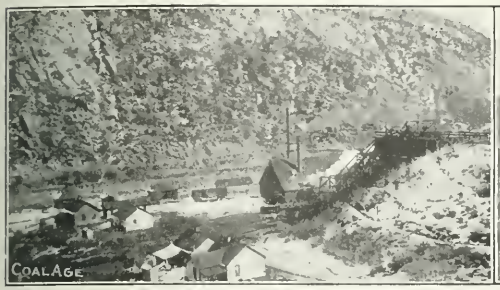
In time of excitement, emergency or accident, even the best of engineers and firemen are liable to become confused; but on such occasions the "greenest man" about the place should not be obliged to hunt around and trace out the logical course of the steam in order to ascertain which valve to close or open to relieve the situation or, perhaps, prevent loss of life.

Various color schemes have been tried and adopted at different plants, any of which are better than no designation whatever, but each leaving much to be desired. Not only are the various colors employed unintelligible to the novice, but they utterly fail to show the direction in which the fluid carried normally flows.

By stenciling upon each pipe at suitable intervals legends stating both the contents and its direction of travel, there need be no confusion as to which particular pipe carries steam and which carries water or air. Such a system of stencils could be easily designed and cut from paper or tin either in the company's drafting room or in the power plant itself. The main steam header as it leaves the boiler room might well be marked "Live (or high-pressure) Steam to Power Plant" followed by an arrow pointing the direction of flow. The same pipe entering the engine room would be marked "Live Steam from Boiler Plant" again followed by the index arrow.

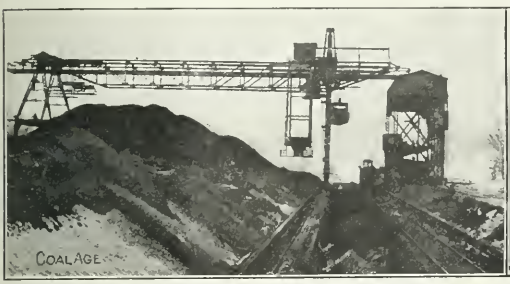
It is, of course, possible that under the ordinary conditions of everyday operation, such a system as above described would have comparatively little utility. But in times of emergency, disaster or danger, the most easily comprehended layout of piping ever devised, if unmarked, can be readily misunderstood and mismanipulated. It frequently happens, also, when human life depends upon the prompt closing or opening of a certain valve, that he who blunders, blunders but once.

SNAP SHOTS IN COAL MINING

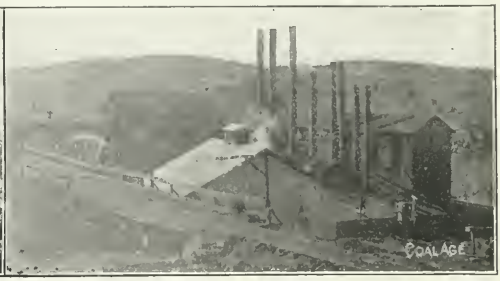


Houses, Power Plant and Tipple
The South Cañon Coal Co., South Cañon, Colo.

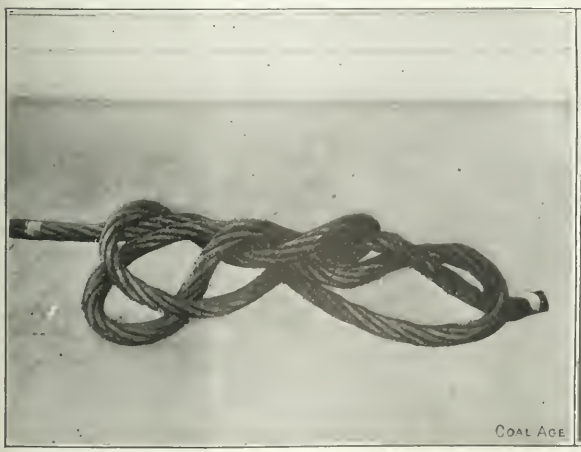
Rescue Team Ready for Service



Electric Car Dumper and Crane at Dedier-Masch Coke Plant of Bethlehem Steel Co.



Tipple and Boiler House at Weaver Mine, Victor American Fuel Co.



Rope Which Tied Itself into a Knot on Breaking and Falling Down Shaft

Breaker and Culm Dump at Packer, No. 4, Lehigh Valley Coal Co.

EXAMINATION QUESTIONS

Miscellaneous Questions

(*Answered by request*)

Ques.—(a) How many gallons of water will be contained in a sump 8 ft. wide, 90 ft. long, and 10 ft. deep? (b) How long will it take a pump discharging 80 gal. of water per minute to empty this sump?

Ans.—(a) The cubical contents of this sump is $8 \times 90 \times 10 = 7200$ cu.ft. Its capacity is, therefore,

$$\frac{7200 \times 1728}{231} = 53{,}860 \textit{ gal., nearly}$$

Approximately the same result is found by multiplying the cubical contents by 7.48, since 1 cu.ft. contains 7.48 gal. of water. Thus, $7200 \times 7.48 = 53{,}856$ gal.

Ques.—An engine developed 60 hp., as shown by an indicator card taken when the engine was pulling a load of 3 tons up a shaft 148.5 ft. in depth, in 30 sec. Neglecting the friction of the load or hoist, what is the efficiency of this engine?

Ans.—Disregarding friction, the work performed in each hoist is $3 \times 2000 \times 148.5 = 891{,}000$ ft.-lb. Since this work is performed in 30 sec., or ½ min., the work performed per minute is double this amount, or 1,782,000 ft.-lb. The effective horsepower is then, $1{,}782{,}000 \div 33{,}000 = 54$ hp. The efficiency of the engine, in this case, is

$$K = \frac{54 \times 100}{60} = 90 \textit{ per cent.}$$

Ques.—Find the safe working load of a ¾-in. extra-strong, cast-steel hoisting rope, having six strands and nineteen wires in each strand.

Ans.—The breaking load of a 1-in. extra-strong, cast-steel hoisting rope of six strands and nineteen wires is 39 tons. Then, since the load a rope will carry varies as the square of the diameter of the rope and using a factor of safety of 5, the safe working load for a ¾-in. rope of this kind is

$$L = \frac{39\,d^2}{5} = \frac{39 \times 0.75^2}{5} = 4.39 \textit{ tons}$$

Ques.—The belt wheel on a dynamo is 2 ft. in diameter and should be run at a speed of 600 r.p.m.; the belt wheel on the engine is 14.5 ft. in diameter. At what speed must the engine run to produce the required speed in the dynamo?

Ans.—The speed of two belt-connected wheels, disregarding any slip of the belt, varies inversely as their diameters. In other words, the speed ratio is equal to the inverse diameter ratio. In this case, calling the required speed x

$$\frac{x}{600} = \frac{2}{14.5}$$

$$x = \frac{600 \times 2}{14.5} = 82.75 \textit{ r.p.m.}$$

Ques.—What precautions are necessary in the installation, use and operation of electricity in mines, to safeguard the employees and preserve the property?

Ans.—The bituminous-mine law (Art. 11), specifies clearly and in detail the requirements in regard to the installation of electricity in mines. When electricity is to be installed in a mine, the work should be in charge of an electrician who is competent and familiar with the requirements of the law. The principal precautions to be taken relate to the size and power of the electrical apparatus, the insulation of the wires, the limitations of voltage to be used for different purposes, the proper grounding of metallic coverings, frames and bedplates of generators, transformers and motors, and the proper arrangement of switchboards and other necessary apparatus, and the safeguarding, by suitable means, of all places where men or animals are liable to come in contact with live wires. As far as practicable, power lines should not be installed on traveling ways and suitable danger signals should always be placed at points where these wires are exposed. The wiring should be such as to avoid, as far as possible, the risk of the ignition of gas by sparking, or the ignition of timber or other combustible material, by the short-circuiting of wires.

Ques.—How many horsepower will it take to pull a trip of 20 loaded cars up an incline 400 ft. long, in one min.; the weight of coal in each car being 3000 lb., and the weight of each empty car 900 lb.; the resistance of the rope and pulley being 13 per cent. and the grade 7 per cent.?

Ans.—The weight of the loaded trip is 20 (3000 + 900) = 78,000 lb. The inclination being small, the pull on the rope, due to the weight of the loaded trip on the incline, is found by multiplying the weight of the loaded trip by the percentage of grade; thus $78{,}000 \times 0.07 = 5460$ lb. To this must be added 13 per cent. to cover the resistance of the rope and pulleys; thus, $5460 \times 0.13 = 709.8$, say, 710 lb. This makes the total pull on the rope, due to the weight of the loaded trip on the incline and the resistance of the rope and pulleys, $5460 + 710 = 6170$ lb. Since this pull is exerted through a distance of 400 ft. in one min., the work performed is $6170 \times 400 = 2{,}468{,}000$ ft.-lb. per min. The effective horsepower is, therefore $2{,}468{,}000 \div 33{,}000 = 74.8$, say 75 horsepower.

Ques.—The anemometer makes 120 r.p.m., in an airway that measures 8 ft. 6 in. at the top, 10 ft. 6 in. at the bottom, and is 7 ft. high; what is the quantity of air passing per minute?

Ans.—The section of this airway is a trapezoid. Its average width is one-half of the sum of the widths at the top and bottom of the airway, respectively; or 9 ft. 6 in. = 9.5 ft. The area is then $9.5 \times 7 = 66.5$ sq.ft. The anemometer is calibrated so that one revolution of the vane corresponds to 1 ft. of air-travel, and 120 r.p.m. indicates a velocity of 120 ft. per min., in the air current. In ordinary mining practice, it is not customary to make any correction of the anemometer reading; but this is taken to indicate the actual movement of the air, in feet. Assuming this is an average velocity of the air current, the quantity of air passing in this airway is $66.5 \times 120 = 7980$, say 8000 cu.ft. per min.

DISCUSSION BY READERS

Textbooks in Mining Examinations

Having read a few of the interesting and instructive letters that recently appeared in COAL AGE, in regard to education in coal mining, I want to say that I do not favor allowing candidates the use of textbooks in any examination held for the purpose of determining their proficiency to act as mine foreman or fireboss.

I have two good reasons for my opinion:

First, if a person is anxious to pass the examination and to obtain a certificate making him eligible for appointment as mine foreman or fireboss, he should be willing to give a part of his time to learn the most common formulas relating to haulage, drainage and ventilation.

Second, if textbooks were allowed candidates in examinations, the man who had a fairly good college education and knew nothing about mining practically would have a better chance to pass the examination than the practical mining man who had only a fair education but understood mining from a practical standpoint.

It is claimed by those who advocate the use of textbooks that many good mining men fail to pass the examination because they are unable to memorize the formulas required. I believe all mine foremen should be able to memorize the simple and common formulas used in mining problems. Only such questions as are considered thoroughly practical should be given.

In order to illustrate what in my opinion is not a practical question, I will quote the following question, which was given at a mine foreman's examination a few days ago.

A lever 15 ft. long is used to lift a wagon of three tons' weight. The force exerted on the end of the lever is 200 lb. Find the position of the fulcrum, neglecting the weight of the lever.

I consider this not a practical question, because not a mine foreman in existence would take the trouble to figure out the position of the fulcrum in such a case, but would proceed at once to lift the car on the track as easily as possible. The position of the fulcrum would be governed by the available power and other conditions close at hand.

B. F. STRALIN.

Seanor, Penn.

Conditions re Cincinnati Mine

I have read with interest the article* by John Verner, referring to conditions in the Cincinnati mine.

Mr. Verner refers there to the increased circulation provided later in this mine, as contributing directly or indirectly to cause the explosion. A new fan had been later installed at the Cincinnati mine, and the volume of the air current was thereby increased to 120,000 cu. ft. per min. According to his statement, Mr. Verner believes that this increase of air had a tendency to cause the explosion. I note also that Mr. Hutchinson, referred to in the same article, is quoted as saying that the slowing down of the fan when exhausting had the effect of increasing the pressure throughout the mine and this increased pressure checked the inflow of gas for a time.

My experience has always been the reverse of what is here claimed; namely, when the fan was slowed down, more gas was released and found its way into the mine. My maxim has always been "Keep a good circulation going and conduct the air right to the working face. If anything goes wrong with the fan, withdraw the men at once."

Referring to mine operators and owners, permit me to say that I believe they have done and are doing all that lies in their power to eliminate accidents in and about the mines. The remainder is up to the mine foremen, firebosses and other assistants. These men know the law and should see that it is fully carried out. If this is done, great results may be expected. Impress upon every mine worker the importance of living up to the law, and I believe this will have a great tendency to reduce mine accidents. I wish COAL AGE good luck in the work it has undertaken.

THOMAS STOCKDALE,
Vivian, W. Va. Fireboss.

[In order to avoid confusion of ideas and unnecessary questions and explanations, we would draw attention to the fact that if the fan is exhausting air from the mine, the mine is ventilated under a pressure below that of the atmosphere, and when the fan is slowed down, the mine pressure is increased to that of the atmosphere, which would cause the outflow of gas into the mine to diminish.

On the other hand, if the fan is blowing air into the mine, the mine is ventilated under a pressure above that of the atmosphere. In this case, if the fan is slowed down, the mine pressure falls and the outflow of gas from the strata into the mine is increased. The statement in regard to the outflow of gas from the strata, therefore, depends on whether the fan is exhausting or blowing.—ED.]

Conditions Then and Now

I was much interested in reading the article, COAL AGE, May 31, p. 855, relating to the conditions 10 years ago as they existed in bituminous mines. At that time, most, if not all, of the bituminous mines in Pennsylvania were at or above the drainage level, and, in most cases, extended only a few hundred feet from the outcrop, with a small amount of cover. When pillars were drawn, the overlying strata naturally broke to the surface, permitting the free escape of any gas from the strata. Mines worked under these conditions naturally require the circulation of less air under a low water gage.

At the present time, many of the mines have penetrated the hills to a great distance; and, in some cases, the workings lie far below the drainage level. The worked-out and abandoned areas have also greatly increased in size. As a consequence, a larger amount of gas is given off in both the old and new workings, and pockets of gas

*Coal Age, May 31, p. 855.

are liable to be tapped by the live workings. A larger number of men are employed and a greater amount of explosives used in blasting the coal. These conditions require a larger amount of air to be circulated in the mine. To maintain the circulation of a larger air volume through longer airways requires a greater ventilating pressure than was formerly necessary.

The mining machines so largely used in mines of the present day produce more fine dust than was formerly made in pick mining. The improvements in mining to which I have referred have therefore added at least three dangers that did not formerly exist to the same extent; namely, the high velocity and pressure of the ventilating current, and the fine coal dust produced in machine mining. I believe, as has been pointed out, that the explosion of gas, or a blownout shot, causes a greater disturbance of the air under a high ventilating pressure, and more dust is thrown into the air current and carried further because of the high velocity of the air.

In my opinion, all mines where explosive gas is liable to be encountered should be worked exclusively with approved locked safety lamps and the miners thoroughly instructed in the use of same. Only permitted explosives should be used for blasting and all places should be examined before a shot is fired.

BENJAMIN HARTILL.

Johnstown, Penn.

Explanation

My attention has been attracted to an article on "Calculating Electrical Currents," COAL AGE, May 31, p. 857. Inasmuch as this inquiry comes from Michel, B. C., and is signed "Electrician," it might be taken as emanating from me, since I am the electrician in charge of the electrical plant of the Crow's Nest Pass Coal Co., at this point. I desire to state that the question submitted to you was not sent by me.

A. R. STACEY, Electrician-in-Charge,
Crow's Nest Pass Coal Co.

Michel, B. C., Canada.

[The inquiry referred to above came from one of our subscribers at Michel, who is interested in the study of electricity and, as the sender did not wish his name to appear, we signed the inquiry "Electrician," as is commonly done in such cases. A simple, clear answer was given to the question, as it relates to direct current, which the comparatively low voltage would warrant us in assuming. We think our present correspondent should give himself no uneasiness, owing to the simple nature of the question; as one capable of assuming charge of an electrical plant would not naturally ask for such information, and the term "electrician," as here used, refers only to one interested in electrical matters. We are glad, however, to give space to the above explanation.—ED.]

Study Course in Coal Mining

BY J. T. BEARD

The Coal Age Pocket Book

FLOW THROUGH CONDUITS

The flow of fluids (air, water, etc.) through conduits of any kind is governed by the same laws as the flow through orifices, previously explained. The flow is caused by a certain head or pressure, which overcomes the resistance due to friction in the conduit and creates the velocity of the flow.

Bernouilli Theorem—The law established by Bernouilli applies alike to the flow of all fluids. The principle of this law may be briefly stated as follows: In the flow of all fluids, the algebraic sum of the gravity or pressure head, the resistance head and the velocity head is zero.

The gravity or pressure head always acts to produce the flow and is therefore positive (+), while the other two heads, the resistance and velocity heads, each acts to oppose the flow and these are therefore negative(—). Hence, the law that governs the flow of fluids may be stated simply as follows: The sum of the friction head and the velocity head is always equal to the gravity head.

Formulas Expressing Flow—The following formulas are necessary to express the flow in pipe conduits. It is important in combining formulas to reduce the elements to the same denomination. Let

H = total head producing flow (ft.);
h_v = velocity head (ft.);
h_f = friction head (ft.).

Then
$$H = h_v + h_f \qquad (1)$$

Formula for Velocity Head—The formula expressing the portion of the head absorbed in producing a given velocity is developed as follows: Let

g = value of gravity (ft. per sec.);
v = velocity of flow (ft. per sec.),
Q = quantity of flow (cu.ft. per min.);
G = discharge from pipe (gal. per min.);
d = diameter of pipe (in.);
a = area of pipe (sq.ft.).

Velocity due to head h,
$$v = \sqrt{2gh} \quad ft.\ per\ sec. \qquad (2)$$

Head producing velocity v,
$$h = \frac{v^2}{2g} \quad ft. \qquad (3)$$

Quantity of flow,
$$Q = 60\,av \quad cu.ft.\ per\ min. \qquad (4)$$

Area of pipe,
$$a = \frac{0.7854\,d^2}{144} \quad sq.ft. \qquad (5)$$

Discharge of pipe,
$$G = \frac{1728\,Q}{231} \quad gal.\ per\ min. \qquad (6)$$

Combining these equations gives the following:

Velocity head,
$$h_v = 0.0026\frac{G^2}{d^4}\,ft. \qquad (7)$$

Example—What portion of the head will be absorbed in producing the velocity only, when a 3-in. pipe is discharging 200 gal. of water per minute?

Solution—
$$h_v = 0.0026\frac{200 \times 200}{3 \times 3 \times 3 \times 3} = 1.28\,ft.$$

The Coal Age Pocket Book

Friction in Conduits—The frictional resistance of conduits is due to the rubbing of the fluid on the inner surface of the conduit, which is called the "rubbing surface." The amount of friction developed depends on three factors: the extent of rubbing surface (s); the velocity of the current (v); and the coefficient of friction (f), as expressed by the formula
$$R = fsv^2$$

Pressure Equals Resistance—The pressure producing flow in a pipe conduit is the total pressure (pa) exerted on the entire sectional area of the pipe, and is always equal to the resistance it overcomes; or R = pa, and therefore,
$$pa = fsv^2$$
and
$$p = \frac{fsv^2}{a}$$

Formula for Friction Head—If the length of the pipe is l, in feet, and its diameter d, in inches.
$$\frac{s}{a} = \frac{l\pi\left(\frac{d}{12}\right)}{\frac{\pi}{4}\left(\frac{d}{12}\right)^2} = \frac{48\,l}{d}$$

But, the head corresponding to a given pressure is found by dividing that pressure in pounds per square foot, by the weight (w) of 1 cu.ft. of the flowing medium (water = 62.5 lb.). Making these substitutions in the above formula for pressure, and reducing gives finally for the pressure or friction head (assume f = 0.01)
$$h_f = \frac{flG^2}{8\,d^5} = \frac{lG^2}{800\,d^5}$$

Discharge of Pipe Line—In a pipe line, the quantity of water discharged depends on the gravity head (h) and the length (l) and diameter (d) of the pipe. Since the gravity head is always equal to the sum of the velocity head and the friction head; or $h = h_v + h_f$, we write
$$H = 0.0026\frac{G^2}{d^4} + \frac{lG^2}{800\,d^5} = \frac{G^2}{d^4}\left(\frac{2.08\,d + l}{800\,d}\right)$$
$$G = d^2\sqrt{\frac{800\,dh}{2.08\,d + l}}$$

When the diameter of the pipe in inches does not exceed its length in hundreds of feet the velocity head may be disregarded, with an error not exceeding 1 per cent.; and the formula then becomes
$$G = d^2\sqrt{\frac{800\,dh}{l}} = 28.28\,d^2\sqrt{\frac{dh}{l}}$$

The quantity of water discharged (Q), in cubic feet per minute, is likewise given by the formula
$$Q = 3.78\,d^2\sqrt{\frac{dh}{l}}$$

SOCIOLOGICAL DEPARTMENT

H. C. Frick Welfare Plans

Special Correspondence

Sanitary drinking fountains, both underground and on the surface, are an innovation at the H. C. Frick Coke Co.'s plants. The first of these was installed at the Lambert plant, near Uniontown. The drinking bowl consists of a reducing coupling, 8 in. in diameter, such as can be found about any plant. It is supported by a 3-in. pipe, inside of which a smaller pipe is placed which carries the water supply. The space between the standard and the supply pipe serves as a drain.

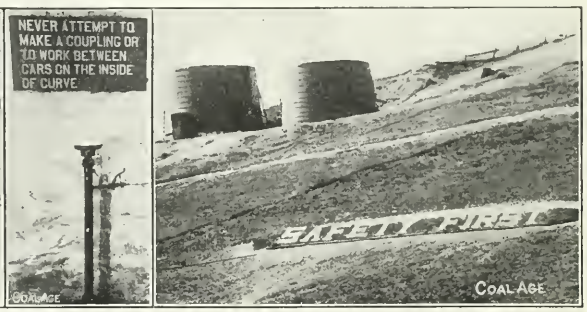
The fountain could be arranged to flow continually, but in those now in use whistle valves inverted and worked with a foot pedal start the water flowing. All mines of the H. C. Frick Coke Co. will, in a short time, be equipped with similar devices. They furnish the men an opportunity to drink during working hours without putting their lips to cups which have been contaminated by the lips of others.

The same company is preparing to inaugurate a visiting-nurse system at its various plants. The experiment has only been tried, so far, at Lambert and Hecla; but it has been so successful, that it is probable that the experiment will be tried elsewhere, and the practice may be extended to all the mines of this company. The nurses will work in conjunction with the company's physicians and will be under their direction. They will make daily reports of all cases under their care to the superintendents of the various plants.

The value of this system to the workers and their families can hardly be estimated by one who is not familiar with the class of people who are employed in the coke region. They are mostly foreigners who are unacquainted with the health needs of their families. It is the intention that these nurses shall not only take care of the sick, but also shall instruct the employees in personal cleanliness and hygiene.

Superintendent H. W. Boyd, of the Lambert plant, has erected the immense "Safety First" sign shown in the illustration. It is built on a hillside and is on a raised mound. The letters are of brick 20 ft. high and whitewashed.

Sanitary Drinking Fountain Underground



A 20-Ft. "Safety First" Brick Sign

Welfare Work in Coal Mining

By W. H. Droll

The Alabama Mine Operators' Association has banded together to study the sociological question and the sanitation of mine camps and the Tennessee Coal, Iron and Railroad Co. is a leader in promoting every form of mine betterment. Where other institutes and mine operators' associations have made the technology or the profits of the industry their aim, the Alabama organization has laid all stress on the advantage to the employer, of a due recognition of his social obligation.

All the Northern cities are planning playgrounds and we are as active to introduce them into our villages. We have our civic centers, with churches, schools, public dance pavilions, uptodate commissaries, sanitary closets, electric-lighted houses, and it won't be long before our mining camps will have a central heating plant. Nearly all of them have their own "first-aid teams," which meet to compete once a year, for prizes given by the company.

These companies are not doing this work for purely charitable purposes. The miner is independent and is willing to pay for what he gets and does not seek charity. These model mining camps, these first-aid teams and awards for proficiency, these competitions between tenants and prizes for the cleanest house and the best garden are not instituted for charity, but as a business proposition. Keeping the miners healthy increases the production and reduces to a minimum what are termed overhead charges and fixed expenses. The companies figure that the employees who are to mine 25 to 30 millions of tons of coal a year must be healthy men and must be kept in the best possible condition.

No. Sanitation is not charity; it is a business proposition. Do you think it pays?

COAL AND COKE NEWS

Washington, D. C.

Since the departure of the Senate committe charged with the duty of investigating the West Virginia coal strike situation there has been a renewal of the attempt to jockey with this investigation, making capital out of the subject and preparing to use the developments in speeches and discussions on the floor of the Senate. There has been little surprise here over the news that has come back from the place where the inquiry is proceeding as the information has been expected to run in substantially the way that has actually been the case.

The legal experts in congress are now taking the view as was expected that there is really nothing that can be done by the Senate no matter what may be ascertained in this inquiry and that, therefore, the sooner it ends the better. A good many senators now think that it was a great mistake to go into it at all. The same issue had to be met at the time of the Lawrence textile strike and was then decided adversely to Congressional interference. The present action it is conceded sets a bad precedent and is likely to result in dragging congress into many local squabbles.

The situation in the West Virginia case has however tended to concentrate attention upon the plan for extending the operation of the Erdman Act which was drafted by the national civic federation and was this week brought to Washington by Seth Low. The plan follows the lines made familiar a year ago, but is not likely to get much attention this session of Congress.

Recent Coal-Rate Decisions

In the Connellsville Coke Producers Association case against the B. & O. and other railroads reductions from 4 to 10 per cent. on coke in the present rates were last week ordered to take effect on Aug. 1 to Youngstown, Canton, Cleveland and Toledo, Ohio, North Cornwall, Robeson, Reading and Philadelphia, Penn., Baltimore, Md. and Newark, N. J. The decision, written by Chairman Clark, held to be reasonable the present relationship of rates as between the Connellsville district and the Fairmount district in West Virginia. The roads were ordered to maintain this relationship between the rates. Furthermore, the commission held that participation by the roads in through rates of the West Virginia and Tennessee fields which yield lower earnings per ton-mile than their rates from the Connellsville field is, under the conditions of competition between carriers which the defendant roads cannot control, neither unduly discriminatory nor unduly preferential.

In the case of the Youngstown Sheet & Tube Co. and others against the Pittsburgh and Lake Erie R.R. the commission ordered the rate of $1.35 per net ton on coke from the Connellsville district to points in the Mahoning Valley of Ohio reduced to $1.20. The new rate is to take effect Aug. 1.

In the cases of the Wisconsin Steel Co. against the Pennsylvania R.R. and other roads and the Inland Steel Co. against the Pittsburgh & Lake Erie and other roads the commission sanctioned the present rate of $2.50 per ton from the Connellsville region to Chicago.

The Interstate Commerce Commission has handed down an opinion in the investigation and suspension of rates on coal to Milwaukee and other Wisconsin points as follows:

Soft coal originating on the lines of certain of the defendant carriers and destined to points beyond Milwaukee, Manitowoc and Kewaunee, Wis., has, for 10 or more years, moved over the across-lake routes to those points at the Chicago rates. By the tariffs under suspension the carriers undertook to close certain of the routes and cancel the rates applicable to them because of a failure to arrive at agreements following a demand on the part of thhe delivering carrier for an increase in its division; Held, That the suspended tariffs must be withdrawn and the present routes kept open. An advance of 10c. per ton in the rates is permitted.

HARRISBURG, PENN.

A bill which empowers all municipalities in the anthracite region to enact ordinances, by-laws or rules prescribing all needful regulations for the mining of coal beneath such municipalities has passed both houses. It also allows councils to create bureaus of mine inspection, to consist of one practical mining engineer and whatever assistant he shall need, to be fixed by councils and approved by the chief executive. The latter has the power to appoint the mining engineer, and his assistants, the salaries of all to be fixed by the councils. Members of the bureaus are given the right to enter all mines which have workings beneath their respective municipalities. All mine owners or operators are required, within three months of the passage and approval of the ordinance to furnish to the bureaus accurate maps and plans of all their workings beneath such municipalities They must also every three months, furnish to the bureaus new maps showing all the extensions of their workings beneath the municipalities since the last map was furnished.

Operators must not remove coal, rock or earth from beneath any street, avenue, thoroughfare, court alley or highway without having first constructed sufficient adequate permanent artificial support to maintain the surface of such highways, etc

Violaters of any of the provisions of this act are subject to a fine of $1000 or imprisonment for one year or both at the discretion of the court.

The provisions of the bill are made severable and, in the event that one of them may be declared unconstitutional such a decision will not affect the validity of the remaining provisions.

PENNSYLVANIA

Anthracite

Pittston—The Henry colliery of the Lehigh Valley Coal Co at Plains resumed work June 9, after an idleness of a week. The shutdown was due to a strike caused by the invasion of the Industrial Workers of the World in this neighborhood and the consequent desertion from the ranks of the United Mine Workers. It is said, however, that the 900 men have now taken up their tools with the expectation that the difficulty will be adjusted speedily. The opposition to the Industrial Union is still bitter, and the resumption of work does not necessarily mean a cessation of hostilities.

The preliminary meeting of many of the first-aid teams of the South Pittston district of the Pennsylvania Coal Co. to choose a team to represent the district at the interdistrict meet at Valley View Park, in the fall, was held in the Y. M. C. A. at Pittston. A total of thirteen teams participated in the contest. The judges were John Huntley, of the North Pittston district, and Moses Ballentine, of the Old Forge district, and the timekeepers were Isaac Benjamin and William Coplan.

Philadelphia—The Central Labor Union of this city has voted against the state-wide strike proposed by President Morrow, of the State Federation of Labor. It is also understood that delegates to the Central Labor Union convention at Harrisburg, coming from the northeastern part of the state, will also vote against the state-wide cessation of work.

Sugar Notch—It is expected that the Hadleigh colliery of the Pittston Coal Co., which was closed down last fall to allow of the construction of a new breaker, will reopen during this month. This colliery employs about 300 men and boys.

Wilkes-Barre—The South Wilkes-Barre colliery of the Lehigh & Wilkes-Barre Coal Co., recently lost one day as the result of an unofficial strike, which affected about 1200 employees. This strike is probably the first unintentional strike that ever occurred in this region. According to the union officials, the men remained away from work under the impression that the local with which they are connected had called a "button" strike. This was not the case.

At the last pay day, a committee of five men took their position at the head of a shaft where they were to collect back dues from about 100 miners, who would then receive buttons. A number of workmen on their way into the mine were encountered by the officials with the buttons, and when asked to show their due books, came to the conclusion that a button strike was being called. Going back to the entrance to the colliery they informed the incoming men of their idea of conditions, with the consequence that the workmen did not report for work.

There was a button strike at the South Wilkes-Barre colliery on Nov. 1 last, when all of the employees were officially called out, and the colliery was tied up for some time.

Bituminous

Johnstown—The business section of the mining town of Bens Creek was entirely wiped out by a fire June 11. The damage is estimated at from 150,000 to $200,000. The town is the center of large coal operations; among the largest are the Pennsylvania Coal & Coke Co., Juniata Coal & Coke Co., and the Lilly Coke Co.

WEST VIRGINIA

Wheeling—A strike has been declared at the Pursglove mine at St. Clairsville as a result of a dismissal of an employee. Subdistrict officials of the United Mine Workers ordered the men to return to work, but they refused. About 250 are out.

Huntington—The Band mill, owned by the United States Coal & Oil Co., at Holden, W. Va., was destroyed June 10 by fire. The total loss is $30,000.

Terra Alta—As the result of the mysterious destruction of the Righter Coal & Coke Co.'s blacksmith and machine shop, at its plant on Long Creek, Sheriff R. F. Stout has stationed a posse of deputies at that point to prevent any further increase of 15c. a car for digging coal. This is the first strike trouble in this section for many years.

Charleston—General Chas. D. Elliott, of West Virginia, who was in supreme command of the military in the strike zone, was called as a witness by the United States Senatorial Committee, which is investigating the coal miners' strike in this region. General Elliott declares that martial law was heard by the strikers themselves and the United Mine Workers' officials; while the coal operators protested both to him and the governor against the issuing of such a proclamation.

MARYLAND

Cumberland—An attempt was made June 7 to organize the miners of the Georges Creek region at a big labor meeting in the public square at Cumberland. The meeting was addressed by John P. White, president of the United Mine Workers of America, and other labor leaders. The miners in this region are said to number over six thousand.

OHIO

Alliance—A consignment of powder exploded June 16 at the Jefferson mine No. 2 at Fineyfork, fatally injuring four men; eight others were seriously injured. The Jefferson Coal Co., of Cleveland, Ohio.

Steubenville—Three miners were killed June 14 by a serious fall of slate in the Dunglen mine.

ILLINOIS

Springfield—Fire at the Royal Colliery Co.'s mines near Verden caused a loss which is estimated at more than $100,000. The upper works, washery and shaft timber-works were destroyed.

Marion—Fire is sweeping the underground works of the Carterville district mine. The loss is estimated at $100,000.

Herrin—The engine and boiler houses of the St. Louis Carterville Coal Co., which were recently destroyed by fire, are to be replaced at once. Arrangements will be made so that the Burlington will be enabled to get its track in at this mine, which was impossible before on account of the location of the engine room.

Royalton—After several months' strike at the south mine, the miners have returned to work. They contended that the new company should pay them the wages that the old bankrupt company owed them, and the matter has been settled, but details were not made public.

Marion—The Illinois Hocking mine, which caught fire on May 22, has been sealed up, inasmuch as the fire got beyond the control of the men. The question of flooding the mine has been discussed.

Desato—The mine of the Kreikemeier Coal Co. has suspended operations indefinitely. This company is involved to a considerable extent with the Mississippi Valley Fuel Co., of St. Louis, for which a petition in bankruptcy was recently filed.

ALABAMA

Birmingham—Rumors are prevalent that the coal miners in the Birmingham district are likely to strike this summer. A statement was made at the headquarters of the United Mine Workers of America, Alabama District No. 20, that no strike has been ordered, and so far as the organization was concerned, nothing of the kind was under consideration. It is not denied, however, that efforts are being made to bring about a general reorganization of the coal miners.

TRADE CATALOGS

Electric Service Supplies Co., Philadelphia, Chicago and New York. Catalog on Protected Rail Bonds and Appliances. 1913 Edition.

This is a handsome book of 72 pages, and covers the subject of rail bonding in its every phase. It is beautifully illustrated and besides showing every practical type of Rail Bond, it illustrates clearly the value of proper installation, the importance of accurate testing apparatus, and the use of bond compressors.

To the users of rail bonds this book is more than simply a catalog, it is a treatise on rail bonding in general and will prove a wonderful aid to operating men in selecting from the hundreds of different types of bonds one that will exactly suit any special requirement.

The section of this catalog describing and illustrating proper methods of installing Rail Bonds enters into the subject in detail and shows graphically the importance of assuring a perfect, moisture-proof contact with the rail.

From cover to cover this book will prove of interest to the 3000 operating men to whom it is being sent.

PERSONALS

Edward H. Coxe, of Birmingham, Ala., former general superintendent of coal mines and coke ovens for the Tennessee Coal Iron & R.R. Co., has been appointed general superintendent of the LaFollette Coal Iron & Ry. Co., with headquarters at LaFollette, Tenn., effective June 12, 1913.

Harry Sharp, formerly superintendent of the Barton mine of the Youghiogheny & Ohio Coal Co., has resigned to accept a position with the Davis Coal & Coke Co., at Thomas, W. Va. This company owns more than 100,000 acres of coal and operates 29 mines.

Chas. B. McNaught, of Reed, Shaw & McNaught, has been appointed president of the Sterling Coal Co., Ltd., and also president of the Conger Lehigh Coal Co., Ltd. In the first instance Mr. McNaught takes the place of W. F. Tye, who will still remain a director of the company. In the second case, he takes then place of R. E. Gibson, who has become vice-president.

CONSTRUCTION NEWS

Lansford, Penn.—The Lehigh Coal and Navigation Co. is planning to erect a breaker at No. 11 near Lansford.

Albia, Ia.—Harris Brothers have leased 1000 acres of land south of Albia and will open a new coal mine between Albia and Moravia.

Wilkes-Barre, Penn.—Excavations were commenced recently for an engine house to be built at the Maderia Hill Colliery near the new slope on Scotch Hill.

Ashland, Penn.—Work on the new Lehigh washery to be erected on the site of the old Bowman breaker has been commenced. Wheeler and Reilly, of Luzerne, have the contract for the work.

Punxsutawney, Penn—Another coal mine will be opened soon in Furnace Run, along the Allegheny River, where over 500 miners will be employed. There are at present about 500 miners employed in the other coal mine at Furnace Run.

Birmingham, Ala.—The new steel tipple and concrete washer at the Banner mines of the Pratt Consolidated Coal Co. will be soon finished and put into use. It will permit of an increase in production to at least 1200 to 1500 tons daily.

Williamson, W. Va.—Mingo County is on the verge of the biggest coal and gas boom in the history of the county. Over 50,000 acres of coal and gas land on both sides of county are being prepared for opening within the next six months.

Lexington, Ky.—It is said that the Baltimore & Ohio Railroad Co. proposes to construct another coal railroad in Kentucky and has acquired the charter rights of the Long Fork Railroad Co., which owns the location on the left fort of Beaver Creek.

Whitesburg, Ky.—The Consolidation Coal Co., of Lexing-

ton, Ky., has started to build a large hospital, which will take the place of the temporary hospital built a year ago. This will be the largest in eastern Kentucky, and will cost in the neighborhood of $30,000.

Pomeroy, Ohio—Two new coal tipples are to be constructed this summer on the line of the Middleport & Northwestern Ry. The Stalter & Essex Coal Co. will erect a tipple on the Kers place, and the Sherman-Essex Coal Co, will construct a tipple on the O. L. Bradford farm.

Birmingham, Ala.—Announcement was made of the opening of a new coal mine, at Pierceville, Jackson County, with a proposed daily capacity of 1000 tons. The new mine is to represent working of 23,000 acres. Grading work on nine miles of narrow gage track is now under way.

Bristol, Va.—It is understood that Chas. H. Hagen will buy the Hagen property comprising 30,000 acres of coal land in Scott county for immediate development. Mr. Hagen controls water power which will be developed to transmit electricity for mining more than 2,000,000 tons of coal annually.

Mauch Chunk, Penn.—It is understood that the new electric plant of the Lehigh Coal & Navigation Co., which is now under consideration at Hauto, will not be completed in July as originally expected. Various delays will make it impossible for the contractors to complete the work until probably late in October.

Vincennes, Ind.—The American Coal and Mining Co., organized at Brazil some time ago and which purchased a large acreage of coal land in Knox County near Bicknell, is preparing to sink two mines on the land at once. W. H. Zellar, as president, W. J. Snyder, secretary-treasurer; Hal R. McClelland of Clinton, vice-president.

Pomeroy, Penn.—The Calvin-Essex Co., of the Hocking Valley proposes to open a large mine near the Avenue Bridge, on Thomas Fork, which will be connected with the K. & M. R.R. by a spur up the creek from Bradbury. J. M. Lama, of the Hocking Valley, has leased the Elba Mine, below Middleport, and will increase its output.

Canonsburg, Penn.—Development of virgin coal tracts east of Canonsburg is to follow in the wake of the construction of the Montour and Chartiers Southern railroads. Pittsburgh Coal company will open four large mines as soon as the new roads are completed. Another mine will be located on the Park farm near McPhersons Mill, north of Chartiers Creek and the Chartiers railway.

Indianapolis, Ind.—Contracts have been let by the Big Four Coal Co., with the Roberts & Schaeffer Co., of Chicago, for the construction of five coal plants to be situated at Anderson and Lynn, Ind., Paris and Lilly, Ill., and Dayton, O. The contract price is said to be $50,000. The same company has a contract for the erection of a reinforced concrete coaling station at Chicago, for the Indiana Harbor Belt R.R.

Punxsutawney, Penn.—The Buckingham Coal Co. has recently awarded to the Andrew Lumber Co., of New Bethlehem, a contract for the erection of 20 miners' houses along the J. F. & D. R.R., near Strattonville and Somerville. Five of these dwellings will be erected in Somerville, five about one mile from that town and ten near Strattonville. Work will be started at once and the houses will be rushed to completion.

Connellsville, Penn.—With a view to reducing the cost of living for its employees, the H. C. Frick Coke Co. is making arrangements to establish dairy farms near its coking plant and coal mines. The company will supply its workmen with dairy products at the same price the farmers receive from the wholesale dealers. Similar establishments are being operated by the Pennsylvania-Maryland Coal Co., and the Ebensburg Coal Co

Des Moines, Iowa—It is understood that a $1,000,000 coal development will soon be started on the new line of the Chicago, Rock Island & Pacific R.R., between Des Moines and Charlton Four thousand acres of coal rights have been taken up in Lucas County. The deal includes the purchase of the Island Coal Co property, a mine located close to Charlton. The entire field has been prospected and much of it contains valuable deposits. In addition to investments in coal rights, it is planned to spend $200,000 in shaft sinking

Denver, Colo.—It is reported that a combination of Belgium and Paris capitalists is planning to take over 30,000 acres of valuable coal land on Routt County. A railroad will be built from Hayden, Colo, to Casper, Wyo. Plans of the combination call for the immediate expenditure of $22,000,000 in these two states. It is understood that Denver will be the source of supplies. The company has already been formed and will be known as the Yampa Fuel & Iron Co. It is said that the new railroad will be known as the Colorado Northern Railway Co.

Whitesburg, Ky.—In pursuance of its announced plans to develop its recently-acquired holdings as rapidly as possible the Elkhorn Fuel Co. has several hundred men at work in the Boone's Fork section. They are employed in making surveys, laying out towns, building temporary offices, doing grade work, and the like, the whole on a larger scale than anything before done in Eastern Kentucky. The company announces that it has let a contract for the erection of 300 buildings, including offices, stores, churches, schools, machine shops, supply houses, hotels, Y. M. C. A. buildings, hospitals and residences.

The first town to be built is to be in Potter's Fork, one mile from the main-line of the Lexington & Eastern, and will be reached by a branch from that road. Two others will be built at once, both directly on the Lexington & Eastern, one on Wright's Fork and one on Main Boone's Fork. In order that this work may be pushed as rapidly as possible, the present forces will be increased by a thousand men within a short time.

An order has been placed for several million feet of lumber to start the work, pending the installation of two big band-saw mills which will be installed on the ground and manufacture the native timber into the necessary lumber. At the outset the industrial cities of the company will be supplied with electric current from the big power plant of the Consolidation Coal Co., at Jenkins, Ky., ten miles distant. Ultimately, however, the Elkhorn Company will build its own power plant.

NEW INCORPORATIONS

Akron, Ohio—The General Hocking Fuel Co.; capital stock, $50,000; mining coal. Promoter, N. J. Odell.

Boston, Mass.—The Atlantic Coal Co.; capital stock, $500,000. Incorporators: J. B. Sullivan, Jr., and P. D. Dean.

Wilmington, Del.—The Castle-Craig Coal Co.; capital stock, $1,000,000. Incorporators: S. H. Hossecker, T. J. Bohn, Jr., and A. McGarvey.

Anchor, Ohio—The B. C. Tway Mining Co.; capital stock, $10,000; fuel business. Directors: G. A. Linton, H. G. Williamson, W. L. Morris, J. G. Long.

Buffalo, N. Y.—James Ash of Buffalo; coal, coke, ice, lumber; capital stock, $15,000. Incorporators: John G. Cloak, Charles F. Houck, Daniel C. Shearer.

Newport, Ohio—The Licking Coal and Towboat Co.; capital stock, $15,000. Incorporators: Frederick A. Laidley, George P. Qniggin and Walie E. Quiggin.

Camden, N. J.—The Twin Rocks Coal Co.; capital stock, $100,000; to deal in coal, charcoal, etc. Incorporators: A. M. Garrison, J. H. Brooker, and D. C. Mann.

Fairmont, W. Va.—Fairmont & Cleveland Coal Co.; capital stock, $100,000. Incorporators: W. N. Engle, E. L. Henderson, R. Walls, Anthony Cowen and J. R. Burns.

Charleston, W. Va.—The Co-Operative Coal Co.; capital stock, $15,000; to deal in coal lands. Incorporators: T. C. Davis, F. W. Johnson, C. E. McCoy, and R. V. Ramsey.

Camden, N. J.—The Twin Rock Coal Co.; to acquire, purchase, mine and sell coal; capital stock, $100,000. Incorporators: A. M. Garrison, Joseph H. Brooker, C. B. Mason.

Wellsburg, W. Va.—The Ohio River Coal Co.; capital stock, $1000; to mine and deal in coal and other products. Incorporators: H. C. Cochrane, Elmer Haugh, Robert Wheeler, J. K. Capulias and H. A. Stengle.

Wellston, Ohio—The Morrow Prospecting Co.; capital stock, $10,000; drilling and prospecting coal and mineral lands. Incorporators: H. C. Morrow, W. F. Schadel, Jerry Morrow, F. C. Morrow and M. E. Martin.

Charleston, W. Va.—The Miners' Light & Power Co.; capital stock, $250,000; to produce electricity and operate coal mines. Incorporators, J. H. Gaines, A. B. Moontz, G. D. Todd, F. R. Hurlbutt, and R. K. Morton.

Birmingham, Ala.—The Esson Company has filed articles of incorporation for $2000. The concern will mine, buy and sell coal, J. F. Leary is president and treasurer and R. B. Leary is vice-president and secretary.

Sergent, Ky.—The Ross-Petroy Coal Co. is being organized at Hazzard in Perry County, on the new extension of the Lexington & Eastern R.R. The promoters are Alex Ross and

Lois E. Petroy. It is planned to develop the Curt Combs coal land tract.

Huntington, W. Va.—It is reported that a gigantic coal company has been organized to develop coal and timber land in southeastern Kentucky by C C Mayo and a number of his associates. The name of the company has not as yet been announced, nor has any details as to its future policy been given out. It is stated that the operation of the new company will be confined to Kentucky and West Virginia.

INDUSTRIAL NEWS

Beltona, Ala.—The new mine of the American Coal Corporation, at Beltona, has begun operation and it is expected that they will reach a large tonnage in a short while.

Prescott, In.—On June 4 cap rock was struck in the prospect hole which was started several months ago, in the hopes of finding a seam of coal. It is estimated that the seam will be 20 in. thick.

Windber, Penn.—John Lochrie has purchased from Berwind-White their large No. 41 mine and has taken over the operation of the plant. Mr. Lochrie owns a 300-acre tract in th area tapped by the mine.

Washington, Penn.—A. W. Pry, of Hickory, has sold his coal and surface to the Chartiers Mining Co. Mr. Pry purchased this farm only a few years ago for about $7000 and received in the neighborhood of $15,000.

Johnstown, Penn.—The Pennsylvania Coal & Coke Corporation has taken over the old Wigton mine near Carrolltown This mine has been closed down for 12 years. The company will attempt its operation in the near future.

Greensburg, Penn.—Former Senator J. M. Jamison has purchased from the Sunshine Coal and Coke Co., three tracts of coal land in Hempfield Township. The consideration is said to have been $72,500, which averages $1000 an acre.

Wilmington, Del.—The Nortonville Coal & Coke Co., a Delaware corporation doing business at Nortonville, Ky., has filed a petition in voluntary bankruptcy in the United States District Court. The position sets forth liabilities of $476,920, with assets of $1638.

Martins Ferry, Ohio—The Glenns Run Coal Co., will employ the stripping method of mining coal from a seam, which comes close to the surface six miles north of this city. This company will remove the surface earth with steam shovels and use the same shovels later for taking out the coal The seam is from 10 to 30 ft. under ground.

Brazil, Ind.—Crawford & McCrimmon Co., builders of mine machinery, hoisting engines, fans and mine pumps are starting construction of an entire new plant on a nine-acre tract. The buildings will be of the most modern steel fire proof construction. Considerable new machinery equipment is being installed. Practically all contracts have been let.

Torrington, Wyo.—It is known that there is a seam of coal on Horse Creek, and a number of the ranchmen in that locality have a pump and steam engine on the ground, and have dug out considerable coal. This coal is about 18 miles from Torrington and if the quality of the coal and top rock is good, it will probably be developed in the near future.

Ironton, Ohio—The Hecla Coal & Mining Co. has been dissolved in the Court of Common Pleas, June 7, as a result of a suit for dissolution brought by Chas. Campbell and Albert Campbell, both interested in the company. The Hecla Co. was incorporated at $100,000 and owns about 7000 acres in fee simple. Besides this the company has purchased some mineral rights on about 3000 acres more.

Columbus, Ohio—The affairs of the Detroit, Toledo & Ironton R.R. are nearing adjustment. Announcement of a plan looking forward to the reorganization of the Northern & Southern Divisions, after their formal sale on June 26 is made to the New York Trust Co. The latter company is acting in behalf of the holders of the $4,243,000, 4 per cent. general mortgage and divisional first mortgage bonds

Logan, Ohio—The Vinton-Jackson Coal & Mining Co., whose property lies five miles southeast of McArthur, has decided to test the Elk Fork Valley for oil and gas. A J Martindill, their representative, recently signed a contract with the Corts & Botkins Drilling Co. of Lancaster Ohio. to drill several wells into the deep sand a depth of 3,000 feet.

St. Louis, Mo.—The New England National Bank, of Kansas City, has asked that a receiver be appointed for the Farmers Coal Co., a Missouri corporation which owns coal mines in Lafayette County. The petition states that notes by the company amounting to $30,000 are due and unpaid. Furthermore, it is stated that there are first mortgage bonds on the company's property outstanding, aggregating $77,000.

Johnstown, Penn.—J. Blair Kennerly takes over the possession of the Seward Coal Company and the Seward Brick Company, both bankrupt corporations. As a result the creditors of the two concerns will receive about 85 per cent. of their claims. The interests of both properties will be merged under the name of the Nineveh Coal Company, the acquirement of which will cost Mr. Kennerly in excess of $100,000.

Fayetteville, W. Va.—The New River Coal Co., the largest corporation operating in the New River district, held its annual meeting of stockholders at the offices of the company at MacDonald, June 5, and elected a new board of directors. Robert H Gross was reëlected president and Colonel M. Scott has been reëlected general manager. A number of improvements are contemplated in the different operations, including the acquisition of additional production.

Johnstown, Penn.—Railroad men are greatly interested in the fight in which the Pennsylvania Railroad and the New York Central lines are at present engaged to obtain the right of draining large coal fields in Blair and Cambria Counties, which will be opened within a year or two. The land lies between Dongherty and Dysart, and contains, according to the estimates of mining engineers, 475,000,000 gross tons of coal, or enough to keep 19,000 miners busy for over 10 years. The project is to be financed by eastern capitalists.

Connellsville, Penn.—Efforts to obtain only picked men for work in the Charleroi mine, of the Carnegie Steel Co., will be made when operations are resumed in the summer. All applicants for work, either outside or inside, must convince the management of their sobriety. When ready for operation about 800 men will be employed and the mine will be one of the best equipped along the Monongahela river. It is understood that Geo. W. Wilkies, of Charleroi, will be named mine foreman. As yet, the superintendent has not been chosen.

Birmingham, Ala.—It is understood that the Pratt Consolidated Coal Co. is negotiating for the purchase of the property of the Sayre Mining & Manufacturing Co., which is located in the extreme western part of the county. Two mines are in operation, as well as a large battery of coke ovens. The properties belonging to the Sayre estate are considered among the best in the state. There are several thousands of acres involved and it is said to be valued at $1,000,000. The coal mined by the Sayre Mining & Manufacturing Co. is in steady demand for its coking qualities. It is largely used by the Birmingham Railway Light & Power Co.

Philadelphia, Penn.—The Electric Service Supplies Co. of Philadelphia and Chicago, has placed on the market a trolley ear adapter known as the type RB. This adapter has been very popular in mining work for use in supporting grooved trolley wires after the groove has been badly worn, or the wire twisted due to the fact that the wire is used a number of times and its location frequently changed.

These adapters are used in connection with standard 3 screw, 5-in. clamp ears, and are also used by railway companies for emergency work. They are made for grooved trolley wire of all sizes and for any standard screw clamp ear.

Winchester, Ky.—John, C. M. and Floyd Day, have transferred to a New York syndicate all of their holdings of coal land in eastern Kentucky, for a consideration involving over a million dollars. The property carries with it the Mountain Central R.R., a narrow-gage line 13 miles in length which runs from Campton Junction to Campton. The deal includes a number of stores, mills and other improvements. Considerable of the property, coal and timber lands, is located on the Lexington & Eastern. The Messrs. Day will retain an interest in the new company which will be organized to handle the property, and will have the management of it on the ground.

Whitesburg, Ky.—An Eastern syndicate has just purchased 5000 acres of rich coal lands along Lower Carrs Fork Creek, on the Knott-Letcher border, and is planning the early development of the property, which will necessitate the building of a branch line of railroad out from the Lexington & Eastern seven miles in length. The consideration paid is not known, although it is said to have reached a very large sum, running into several million dollars. The tract in question is almost the last of the large bodies of coal land not taken up, practically all of the known coal territory now being in the hands of companies which intend to develop it.

COAL TRADE REVIEWS

GENERAL REVIEW

The dominant feature of the coal market throughout the entire country is firmness. Generally speaking, there is an active call for practically all grades of coal, with just about enough production to supply the demand and replenish depleted stock in some localities.

Throughout New England some apprehension is felt for Southern coals, and the output is expected to be seriously curtailed within the next three months. Loading at Hampton Roads is slow, due to heavy takings by the Government. All-rail shipments to New England are not as firm as those sent by water.

Anthracite is still slower in shipment than last week, with indications of a good market during July and August. In New York the demand for anthracite is slightly easing up. The mines, however, are operating full force. Some price shading has been done by individuals but not by the larger companies, and the quotations remain unchanged.

Bituminous is a little easier, with no change in price. The better qualities may be had promptly and the lower grades do not appear to be coming to this market. Contract coal is firm, with gas coal active and slack easier.

Throughout eastern Pennsylvania the local demand for anthracite has fallen off, due to the warm weather, but the demand from Tidewater is insistent, and has thus far been but little affected. There is a lively traffic in bituminous and the market is strong. This branch of the industry looks more promising than formerly.

Throughout the Pittsburgh region some small strikes have been experienced, but these are of comparatively little importance. The Lake traffic is heavy, and there exists a congestion of cars en route to Lake Erie, and a car shortage is feared later. The manufacturing demand for coal has fallen off slightly, while coke prices are receding, and many furnaces are not inclined to pay over $2 per ton. In Baltimore, there is a rumor that some operators are storing coal in anticipation of a heavy demand this fall, and the trade continues strong, due to inadequate car and labor supply.

Heavy exportations are taking place from Hampton Roads, and there is less fuel on hand now than for some months. To all appearances this situation will not change unless labor conditions become better.

Throughout the Southern iron-producing districts conditions are about normal. The maximum number of furnaces have been in blast during the year, which has increased the consumption. Throughout Ohio, Michigan and the upper Mississippi Valley generally, the demand for coal is strong for this season of the year. Prices are, however, as a general thing, unchanged. Coke at Detroit is rather dull, and some of the local furnaces have been shut down. At Chicago there exists a good demand for domestic coke, which, to a measure at least, offsets the dullness in the requirements of iron and steel industry.

One of the most important, and perhaps the greatest, stabilizing factor in the present situation is the great amount of coal which is being shipped by way of the Great Lakes. The demand for fuel by the Northwest seems to be remarkably strong, and the coal-producing states lying south and east of these inland waterways are securing the benefit of a stable market at a time of the year when the demand for all grades of coal, particularly that used for domestic purposes, usually experiences a decline.

BOSTON

Bituminous—In some quarters much apprehension is felt over the situation in the coal mining districts in West Virginia. Operators in the Pocahontas and New River fields are advising their factors to go slow on sales, and all apparently expect the output to be subject to material decrease during the next three months. The government is making heavy drafts on the supply at Hampton Roads, and the loading of coastwise tonnage is consequently slow.

Some of the agencies have withdrawn all quotations, even that of $2.85 f.o.b. These conditions have seldom been effective so early in the season, and are usually construed as indicative of strained situations during the balance of the year.

Georges Creek grades are firm with a strong demand for all that comes to tide. Although cars are fairly plentiful, a labor shortage is being seriously felt in this field, and coal is not being mined up to the usual tonnage. Throughout Pennsylvania generally there seems to be a stringency. The better known coals are all practically sold up, that is, as far as the operators care to commit themselves, and there is an increasing tendency to decline orders.

The effect in New England is marked. Already some fair sized purchases have been made of coal from Somerset, Cambria and Clearfield Counties, that will net the mines from 10c. to 15c. more than was the case in April. The plain fact is that good coal is hard to get and prices are harding accordingly.

The present status of all-rail shipments is not quite as firm as for tidewater delivery. It is expected, however, that when inland buyers find their cargoes are not arriving with accustomed regularity there will be a similar bracing up in all-rail shipments.

Current wholesale prices on Bituminous are about as follows: Clearfield coal, $1.05@1.45; Cambria and Somerset, $1.30@1.60. Georges Creek, $1.67@1.77. All the above, f.o.b. mines. Pocahontas and New River coal is firm at Hampton Roads at $2.85. The same grades at Providence bring $3.78@3.83 f.o.b. cars, while at Boston, the price is $3.83@4.

Anthracite—If there is any change in the anthracite market it is in the direction of still slower shipment. Dealers are finding orders for certain kinds and prices rejected for June, and the demand for all grades continues steady. An active market for anthracite is unusual at this time of the year, and the outlook is good for a strong demand in July and August. Such a condition is something new in the hard-coal trade, strike years alone excepted, and some anxiety is felt over the shortage of broken and stove grades. These sizes are much in demand, and the proportion in any one cargo is being held down to the minimum.

PITTSBURGH

Bituminous—Several small strikes have occurred in the Monongahela valley, directed principally against the enforcement of the safety lamp and permissible explosive regulations. These have not amounted to much, however, and labor conditions are fairly satisfactory, as is the car supply. There is considerable congestion of cars enroute to Lake Erie, apparently due to a lack of motive power, and a serious car shortage later in the season is feared by some operators. Manufacturing demand for coal is slightly reduced, in anticipation of inventories, midsummer closings, etc., but on the whole demand continues good. Lake shipments are heavy.

Prompt lots of mine-run and screened coal occasionally bring premiums, while slack is going at 60@70c. for prompt; otherwise regular prices rule as follows: Slack, 90c.; nut and slack, $1.05; nut, $1.25; mine-run, $1.30; ¾-in., $1.45; 1¼-in. steam, $1.50; 1¼-in., domestic, $1.55, per ton f.o.b. mine, Pittsburgh district.

Connellsville Coke—Operators who were committed mentally to the $2.50 price on second-half furnace-coke contracts claim that this is still the asking price, but it is a fact that definite quotations have been made both by such operators and by outside sellers for $2.25, without leading to sales. The furnaces seem now to expect to secure $2 or less, or buy from time to time during the second half. Prompt furnace coke has weakened slightly, the few sales made being usually at $2.10. Foundry coke is off slightly, with only a moderate turnover. We now quote: Prompt furnace, $2.10; contract (asking), $2.25; prompt foundry, $2.85@3; contract foundry, $2.75@3, per ton at ovens.

NEW YORK

As we get further into the summer, the demand for anthracite is easing up, and the larger companies are making prompter shipment on orders than they have at any time since March. However, orders are still to be had and unfilled ones taken care of, so that the production is going along at an almost record rate.

The mines are all working, and it looks as if, even though last June's production was over 6,000,000 tons, this month's output would equal it. As mining was naturally brisk last June, after two months' suspension, this indicates the healthy condition of the market at the present time.

While we understand that some of the individual operators are shading prices on some of the prepared sizes, the larger companies seem to have a market for all they can produce, at full circular, and have not yet found it necessary to stock

prepared sizes, although some pea and buckwheat is being accumulated.

Taking it all in all the market is in a healthy condition, and while it may naturally become a little dull during July and August, the outlook is for a heavy demand for all sizes in the fall.

Prices generally remain unchanged at:

	Circular	Individual	
		Lehigh	Scranton
Broken	$4 70	$4.45@4.65	$4.50@4.70
Egg	4.95	4.90	4.95
Stove	4.95	4.90	4.95
Chestnut	5.15	5.15	5.20
Pea	3.50	3.30@3.45	3.35@3.50
Buckwheat	2 75	2 15@2.45	2 50@2.75
Rice	2 25	1.70@1.95	2 25
Barley	1 75	1.35@1.70	1.60@1.75

Bituminous—The bituminous coal situation appears to be a little easier at this writing than for the last month or six weeks. There has been little or no change in prices for spot delivery, but where it was impossible to secure some of the higher grades of coal with any degree of dispatch, it is now possible to get reasonable amounts of almost any of the higher grades promptly and at a reasonable price.

The lower qualities do not appear to be coming to this market except on orders, and prices are holding fairly firm on these grades. Operators appear to be holding their coal at the mines and are only shipping when they have orders actually in hand. As a result odd lots usually standing at the piers for sale are rather limited in quantity.

Contract prices are still held upon a firm basis, most operators having higher grades of coal being sold out on their full product for the year. Contract inquiries from consumers are rather numerous, but in most cases buyers find plenty of bids on the poorer grades with but few on the better qualities.

Gas coal is still active on Western shipment, very little being available for shipment East. Slack has become a little easier in price and shipments.

PHILADELPHIA

Unusually warm weather has caused a marked falling off in the demand for anthracite. As yet, however, the tidewater tonnage has been little affected. It is understood that the demand from the East still continues good, and with the coal that is going to the lake shipping ports, all the mines are operating to their fullest extent. As a matter of fact, the trade is holding itself together much better than was expected, judging from conditions at the beginning of the present season. All the operators claim that they do not expect there will be any cessation of mining just at present, but do not hold any views as to what conditions are likely to be during July and August.

There are distinct indications that the prediction of a few months ago that the summer would see a lively traffic in bituminous coal will be fulfilled. Car shortage, an immense demand from the Northwest, and an inability to secure sufficient miners, has had a tendency to make the market much stronger, and as the summer advances this condition of affairs is not likely to improve. The demand seems to be on the increase, and should there be any acute car shortage prices would likely take a substantial upward trend. The bituminous trade is in a better condition than it has been for some time, and the indications for the future are propitious.

BUFFALO, N. Y.

The bituminous market is as firm as ever. Dealers report that it is not easy to get a supply of Pittsburgh or Youghiogheny, as these are in such demand for shipment to the lakes. For the same reason the car supply in the Allegheny Valley is deficient. If the cars are needed for loading in the lake trade they are taken, no matter what other needs may happen to be. In a good many cases the mine owner has sold all his present output on contract and is not in the market; this also appears to be the case with the Allegheny Valley and Clearfield situation. At least operators in those districts who live in Buffalo report very much less coal for present sale than used to be the case. Jobbers are not at all anxious to sell slack for 90c. at the mine for any future time as they believe that it will go to $1 and then to $1.50 before next spring. They are, nevertheless, giving instructions to salesmen, to make some 90c. contracts when they have the opportunity. This firm feeling prevails all through this market and is shown by the absence of salesmen in the bituminous trade; a few come in but just to keep in touch with the market. There is not one of them who is anxious to make sales as the consumer comes after them. It looks, moreover, as if such would be the case all the year, unless the crops fail or congress manages to do the wrong thing.

The scarcity of men is becoming more acute so that any increase of output is not to be expected. Some operators do not care to sell another pound of coal until July and others are asking what is to be done when crops are to be moved in the fall or snow comes in winter. Nothing can avert a shortage of bituminous coal but a decided falling off in consumption. There is no difference of opinion here as to that and as a result the asking price is very stiff. If any coal is selling at reduced prices it is poor grade.

The bituminous demand is much more uniform than it often is, which is a good indication that the industries of all sorts are active and hopeful. Buffalo has a strike of teamsters on hand, but it has not caused much trouble. As a rule it is conceded that the men ought to have more pay and many settlements have been made. Bituminous prices are strong, based on $2.80 for Pittsburgh lump, $2.55 for three-quarter, $2.55 for mine-run and $2.15 for slack, with Allegheny Valley about 25c. lower. There is no stir in coke, prices being rather weak on the basis of $4.75 for best Connellsville foundry.

The anthracite trade is slack, with the exception of shipments to the lakes, which is chiefly a matter of moving the coal before winter, whether it is sold or not. Even the rail-line movement is light and local sales are small. Lake shipments for the week were 138,000 tons.

HAMPTON ROADS, VA.

The movement from the Hampton Roads piers has been good, export shipments having been particularly heavy, and the end of the week sees little coal remaining in the railway yards. There is less fuel on hand than there has been for some months, and the prospects are that this shortage will continue unless there is some improvement shortly in the labor situation in the Pocahontas-New River District. Some sales have been made during the week at $2.85 and $2.90, but only for small quantities, as the situation is such that suppliers having coal on hand prefer to hold it for contract business.

The Brazilian warship "Minas Geraes" has taken during the week 2500 tons of bunker coal from barges. This is the largest shipment of bunker coal which has been put into a foreign warship at this port for some time. The coal was from Sewalls Point.

BALTIMORE, MD.

There was no let-up in the heavy demand in the local market during the week; if anything, it was greater than during the previous week. This was particularly true on spot business, quotations in the line trade continuing to show a further stiffening. There is a purchaser for every ton of coal available and even the low grades are readily disposed of at 95c.@$1 per ton.

The heavy demand is still attributed to the restricted production caused by the shortage of labor in the mining region and the scarcity of coal equipment for loading. The shortage of cars in the Eastern markets is ascribed to the heavy shipments in the Lake trade and the slow return of the empties from the loading ports. There are rumors to the effect that some companies are putting considerable coal into storage, in the belief that the heavy demand this fall will place the producer in a position to obtain any price he asks.

The unusually cold weather over the first half of the current month stimulated the hard coal consumption to a slight extent. The coke trade shows little change with the better grades quoted around $2.60 and the supply relatively limited. Dumping of coal at the Baltimore piers has been comparatively active.

COLUMBUS, OHIO

Activity has characterized the coal trade during the past week. Increased demand is reported for lake tonnage, for steam requirements and also for domestic grades. These factors tend to strengthen the trade in every respect and in fact the entire price list is well maintained.

The domestic movement is earlier than usual which is accounted for by the depletion of domestic stocks by the recent flood. At any rate orders are coming in from dealers in all sections, showing their desire to be in a position to take care of consumers earlier than usual. Some of the dealers are placing larger orders for delivery in the months of July and August. The plan on the part of jobbers and operators is to take orders for July shipment at 5c. and for August shipment at 10c over the present circular.

Steam business is also increasing in volume. Factories generally are demanding more fuel to run their plants and there is some disposition to stock up to guard against a car shortage, which many traffic men predict. At present the situation in this respect is fair although the mines in Eastern Ohio have been crippled to a certain extent by lack of cars. Another trouble in several mining districts is the scarcity of labor.

The lake trade is still booming and no let up is in sight. The Northwest is demanding a large tonnage which the Ohio producers are making every effort to supply. All fields are rushing large shipments to the lakes. The congestion at the upper lake ports is over and there is scarcely any drawback to a free movement of coal from the mines to the docks.

Production in Ohio mines has been larger than formerly. In the Hocking Valley the output has been materially increased and the same is true of the Pomeroy Bend field. In Eastern Ohio, car and labor shortage have combined to keep down the output. In the strictly domestic fields there is a good increase in the tonnage mined.

Reports from the Hocking Valley docks at Toledo for the week ending June 13 shows that 117,000 tons were handled as compared with 108,000 tons for the previous week. Since the opening of navigation the docks have handled 830,000 tons.

Quotations in the Ohio fields are as follows:

	Hocking	Pittsburgh	Pomeroy	Kanawha
Domestic lump	$1.50		$1.50	$1.50
2 inch	1.35	$1.25	1.35	1.30
Nut	1.20		1.25	
Mine-run	1.15	1.10	1.15	1.10
Nut, pea and slack	0.60		0.60	0.60
Coarse slack	0.50	0.55	0.50	0.50

BIRMINGHAM, ALA.

Normal conditions obtain in the coal market in this district and in the coast towns supplied by Alabama mines. One feature which has strengthened the local steam market is the fact that a maximum number of blast furnaces have been in operation during the entire year, thereby consuming heavy tonnages of coal for coking purposes.

The car shortage continues, and much uneasiness is felt that no relief is in sight, especially in view of the fact that there is a rate fight on between the state of Alabama and some of the local railroads.

General reports indicate that, but for the car situation, local operators are well pleased with the coal conditions at the present time.

LOUISVILLE, KY.

Conditions in the local market are satisfactory and about normal. Both production and demand are good. Dealers are stocking up, as are also consumers who are beginning to lay in their winter supply.

The weakest branch of the trade at the present time is the steam coal. Shipments of this grade are heavy, particularly from the western Kentucky field, and the demand is not sufficient to absorb all of the arrivals. This is due to the same condition in effect several weeks ago. The strong domestic demand has also resulted in a surplus of nut and slack, so that these grades are not as active as they might be.

There is a heavy demand for eastern Kentucky coal from Chicago and other Northwestern markets, it being stated from authoritative sources that the demand from these points would be 50 per cent. greater than during last season. Judging from current shipments, however, indications are that these will exceed the estimate by nearly double. Operators are hoping that they will be able to hold these markets permanently.

The demand for coal for stocking is becoming steadily stronger especially north of the Ohio river, where there are rush shipments. In eastern Kentucky the Louisville & Nashville R.R. and several other lines have recently restricted their orders, but it is stated on good authority that this is only a temporary condition and that their tonnage requirements will be back to normal in July. Many of the operators in this latter field are practically sold up and out of the market for several months to come. In general, all indications point to an unusual prosperity in the industry for some time to come.

The market is not quotably changed from our previous report, but operators state that an advance of about 10c. per ton will go into effect the first of next month. Shipments to the Southern market will probably cease at about this same time. Operators are favoring the Northern consumer because of the more consistent and year-around demand.

INDIANAPOLIS

Local operators state that while the usual summer quietness prevails, they regard the outlook as good. The crop situation has been interesting them and they find a good wheat yield in prospect, which is the most vital factor among the grains.

Coal men can find no real pessimism among their big customers. The emergency currency order by Secretary McAdoo relieved any money stringency that threatened and the Frisco receivership is looked on as a good thing for the road. Already orders have been given to repair and get in shape the 6000 coal cars of the Chicago & Eastern Illinois, and the road to the coal fields is to be newly ballasted. This is only part of the improvements ordered. Coal men say that when railroads are thus getting ready for business, it is no time for others to be idle.

Some Indiana mines that have been idle are being operated again. On account of the light demand for domestic grades, mines have no trouble to sell screenings, the output of which is mostly under contract. In the open market it is difficult to get anything at 90c., and the price ranges up to $1. Washed coal, which is slowly finding friends, is quoted at $1.25. From the retail yards anthracite and smokeless is moving rapidly into cellars. Coal users, both big and little, are aware that the wheat harvest is on and they are thinking more or less about a probable car shortage. Prices are unchanged at the mines and in the retail yards.

DETROIT, MICH.

Bituminous—The market on certain grades is much stronger than in previous weeks, and indications are that most of the coal is well sold up into August; it looks now as if business for this last month would be considerably ahead of that for either of the two preceding months. Generally speaking, there have been good advances in prices on all grades in this market, and it is now believed that the coming fall will see the maximum quotations ever experienced locally. The movement on contract is heavy, and on domestic grades is in excess of requirements, with the result that these are rather dull. This, however, is usual at this time of the year and has not caused any uneasiness.

The local market is quotable about on the following basis:

	W. Va. Splint	Gas	Hocking	Cambridge	No. 8 Ohio	Pocahontas	Jackson Hill
Domestic lump	$1.40	....	....	....	....	$2.25	$2.00
Egg	1.40	....	....	....	....	2.25	2.00
Steam lump	1.25	....	....	....	....	....	....
¾-in. lump	1.10	$1.10	$1.10	$1.10	$1.10	....	....
Mine-run	0.90	0.90	0.90	0.90	0.90	1.50	....
Slack	0.85	0.35	0.30	0.60	0.60	Open	....

Coke—The local coke market is dull, with the result that some ovens in this vicinity have been compelled to suspend operations for the time being. Connellsville is quoted at $2.75; Semet Solvay, $3; gas house, $2.60; all f.o.b. ovens.

Anthracite—The demand for hard coal is strong, everybody apparently trying to stock up to their utmost capacity; operators are sold ahead for about two months, and premiums are being demanded on both sizes.

CHICAGO

The Chicago market is in a comparatively prosperous condition considering the fact that the usual dull time of the year is supposed to have arrived. Although buying in the spot market is light, the amount of shipments of coal indicates a fair condition of affairs. The light spot market is attributed to the fact that many retail dealers who could have been depended upon to take a large supply of coal for storage did an unusually large amount of buying in April and May, and now have in stock the same amount usually on hand in the latter part of July. Active buying recently in smokeless lump and egg has led to the fixing of the price of that coal for June at $1.90, with producers asking $2.25 for spot shipment. Quite heavy demands for steam coal in spot shipments are being made, and prices range from 80c. for small-sized low-grade screenings coming in at the low freight rate, to 90@95c. for large-sized high-grade screenings coming in on a high freight rate. Contract shipments on steam lump and mine run offsets the inactivity of this coal on the spot market now prevailing. A fairly active domestic coke trade offsets somewhat dull conditions in the iron and steel trade market.

Prevailing prices are:

	Springfield	Franklin Co.	Clinton	W. Va.
Domestic lump	$1.97@2.07		$2.27	
Egg		$2.30@2.40		$4.20
Steam lump	1.82@1.87	2.30@2.40	2.07	3.94
Mine-run	1.77@1.82	2.20@2.30	1.87	3.30
Screenings	1.62@1.67	1.95	1.62@1.67	

Coke—Connellsville and Wise County, $525@5.50; by-product egg and stove, $4.85; by-product nut, $4.55@4.75; gas house, $4.50@4.60.

ST. LOUIS, MO.

A forerunner of what may be expected is seen now in the Standard field in the way of contract prices for the coming season. A month ago operators were hungry for contract business, but they are not so anxious now and are

asking a price that is considered just a trifle unreasonable. The market still continues dull, with the exception of Carterville coal, which is commencing to pick up a little. There is not any great tonnage moving, but a better price is being asked and received, none of this grade being sold for less than $1.10 on the screened sizes. On the other hand, Standard coal is still below the cost of production as 6-in. lump is selling for 80c. and 2-in. lump for 75c.

It is amusing to note in the daily papers about the wonderful advantages that the Keokuk Electric Power Co. will bring to St. Louis. They forget that the Keokuk Power Dam will displace several million tons annually of screenings in the St. Louis market. A few years ago these same screenings were hauled away from the mines as ballast for the railroad companies, and the same thing will likely happen again. This means that the cost of screenings must be added to the screened sizes, and the public will have to foot the bill, so that aside from the business houses of St. Louis the Keokuk Power Dam will increase the fuel bills instead of lessening them.

Anthracite is moving fairly well and so is coke, and on account of the high prices asked for smokeless it is likely that this will lose the hold in St. Louis that it acquired last season.

The prevailing circular is:

	Carterville and Franklin Co.	Big Muddy	Mt. Olive	Standard
2-in. lump				$0.80@0 85
3-in. lump			$1.20	
6-in. lump	$1.15 @ 1.25		1 25	0 85@0.90
Lump and egg		$2.00	1 20	
No. 1 nut	1.10 @ 1 20			
Screenings	0.80 @ 0 85			0.75@0 80
Mine-run	1.00 @ 1 10			0 75@0.80
No. 1 washed nut	1 40			
No. 2 washed nut	1 25			
No. 3 washed nut	1 25			
No. 4 washed nut	1.20			
No. 5 washed nut	1 05			

St. Louis prices on May anthracite are: Chestnut, $7.15; stove and egg, $6.90; grate, $6.55. Smokeless lump and egg is $4.65 and mine-run $4. Byproduct coke is $5.10 and gas house $4.85.

PORTLAND, OREGON

Dealers report the coal business dull with little prospect of any heavy movement here for a few weeks. Although the strike in the British Columbia mines affected the market on Puget Sound, to some extent, it has not been felt here in a material way. It is reported, however, that coal is now being brought to the coast from Japan for bunker purposes. Two cargoes are said to be on the way, and others will probably follow unless conditions change soon.

PRODUCTION AND TRANSPORTATION STATISTICS

NORFOLK & WESTERN RY.

The following is a statement of tonnages shipped over this road from mines in West Virginia and the commercial and company coal, for the month of May, in short tons:

Field	Shipped	Tipple	Total	Commercial	Company
Pocahontas	1,257,150	16,941	1,274,091	1,292,130	98,546
Tug River	227,792	2,323	230,115	193,001	37,114
Thacker	258,659	18,350	277,009	186,438	90,571
Kenova	82,496	..	82,496	76,232	6,264
Clinch Valley	..	..	..	137,931	13,518
	1,826,097	37,614	1,863,711	1,885,732	246,013

Shipments of coke entirely from the Pocahontas field, were 105,737.

CHESAPEAKE & OHIO RY.

The following is a comparative statement of the coal and coke traffic over the lines of the C. & O. Ry., for April, and the ten months ending Apr. 30, 1912-13, in short tons:

	March				Nine Months	
Destination	1913	1912	1913	%	1912	%
Tidewater	273,623	533,226	2,993,615	23	3,625,675	24
East	169,265	189,712	2,201,364	17	1,860,988	13
West	435,898	875,602	7,245,245	55	9,137,493	61
Total	878,786	1,598,540	12,440,251		14,624,156	
Coke	28,471	19,992	256,021		190,540	
From connections						
Bituminous	41,571	10,514	536,270	4	184,464	1
Anthracite	2,176	3,215	11,314	1	33,191	1
Grand total	951,004	1,632,261	13,243,859	100	15,032,351	100

IMPORTS AND EXPORTS

The following is a comparative statement of imports and exports in the United States for April, 1912-13, and for the ten months ending April, 1911-12-13, in long tons:

	10 Months			April	
Imports from:	1911	1912	1913	1912	1913
United Kingdom	13,067	6,091	8,550	180	1,099
Canada	1,310,485	850,351	1,181,216	120,767	119,805
Japan	14,200	12,935	66,497	50	23,840
Australia & Tasmania	246,711	162,867	129,985	3,147	12,827
Other countries	4,817	1,944	3,257	443	..
Total	1,589,280	1,034,188	1,389,505	124,587	157,571
Exports:					
Anthracite	2,424,258	2,659,114	3,701,441	80,654	318,315
Bituminous,					
Canada	6,615,285	8,565,064	9,092,740	577,827	797,126
Panama	432,664	389,643	393,449	59,210	53,190
Mexico	553,505	266,536	350,201	31,043	85,664
Cuba	761,554	918,747	1,035,110	114,653	119,221
West Indies	426,033	577,545	502,891	71,776	46,878
Other countries	517,172	1,145,609	911,299	371,293	169,702
Total	9,306,213	11,863,144	12,285,690	1,225,802	1,271,781
Bunker coal	5,302,750	5,832,031	5,936,461	707,848	559,386

LAKE SHIPMENTS

Anthracite Shipments through the Sault canals for the current year to June 1 were 636,159 tons as compared with 17,848 tons for the same period last year.

Bituminous Shipments for the same periods were: 2,890,789 for the current year as compared with 1,653,922 in 1912 making gross of 3,526,948 for 1913 and 1,670,870 in 1912.

COAL SECURITIES

The following table gives the range of various active coal securities and dividends paid during the week ending June 14:

	Week's Range			Year's Range	
Stocks	High	Low	Last	High	Low
American Coal Products	87	87	87	87	87
Americao Coal Products Pref	109¼	109¼	109¼	109¼	109¼
Colorado Fuel & Iron	27¼	24½	26¼	41½	24½
Colorado Fuel & Iron Pref	..	..	155	155	150
Consolidation Coal of Maryland	102½	102½	102½	102½	102½
Lehigh Valley Coal Sales	200	180	190	..	..
Island Creek Coal Com	45½	44½	45½	..	..
Island Creek Coal Pref	80½	79½	80½	..	..
Pittsburgh Coal	16	14½	15¼	24½	14½
Pittsburgh Coal Pref	76½	73	76½	95	73
Pond Creek	18¼	15	17½	23¼	15
Reading	157½	151½	157½	168¼	151½
Reading 1st Pref	86	86	86	92½	86
Reading 2nd Pref	86	84	86	95	84
Virginia Iron, Coal & Coke	40	37¼	40	54	37½

	Closing		Week's Range		Year's
Bonds	Bid	Asked	or Last Sale		Range
Colo. F. & I. gen. s.f.g. 5s	93½	97	97	May '13	95 99½
Colo. F. & I. gen. 6s	..	..	107½	June '12	
Col. Ind. 1st & coll. 5s. gu	77	81	77½	78	77½ 85
Cons. Ind. Coal Mc. 1st 5s	..	..	85	June '11	..
Cons. Coal 1st and ref 5s	..	94	93	Oct. '12	.. ..
Gr. Riv. Coal & C. 1st g 6s	..	100	102½	April '06	.. ..
K. & H. C. & C. 1st s f g 5s	..	96	98	Jan. '13	98 98
Pocah. Con. Coll. 1st s f 5s	..	87½	86	June '13	86 87½
St. L. Rky. Mt. & Pac. 1st 5s	70	76	76	76	76 80
Tenn. Coal gen. 5s	..	100	100	May '13	100 103
Birm. Div. 1st consol. 6s	100½	103½	101	April '13	101 103
Tenn. Div. 1st g 6s	..	102	102	Feb. '13	102 102
Cah. C. M. Co. 1st g 6s	..	104	110	Jan. '09	.. ..
Utah Fuel 1st g 5s	..	..	..	..	.. ..
Victor Fuel 1st s f 5s	..	80	80	May '13	79½ 80
Va. I. Coal & Coke 1st g 5s	92	97	92	92	92 98

DIVIDENDS

Ashland Coal & Iron Ry.—Regular quarterly dividend of 1% payable June 20.

Mahoning Coal R.R.—Dividend of $5 payable Aug. 1 to holders of record July 15 on the common stock and $1.25 payable July 1 to holders of record June 20 on the preferred stock.

American Coal Products Co.—Regular quarterly dividend on the common of 1¾% payable July 1 to holders of record June 25. Also regular quarterly on preferred stock of 1¾% payable July 15 to holders of record July 2.

Colorado Fuel & Iron Co.—Dividend of 4% on the preferred payable July 1 to holders of record June 10. Also an additional dividend of 4% payable Jan. 1, 1914, to holders of record June 10, 1913.

Eastern Light & Fuel Co.—Regular quarterly dividend of 2% payable July 1 to holders of record June 19.

FINANCIAL DEPARTMENT

Island Creek Coal Co.

President Holden, of the Island Creek Coal Co., reports for the year of 1912, as follows:

The earnings of all companies for the year have been as follows:

Net earnings from coal and miscellaneous operations, including net profit on sales of lumber			$811,048
Deduct administrative and general expenses			57,252
Total net			753,795
Add interest received on bank deposits, etc			18,693
Total			772,489
The above profits have been appropriated as follows:			
Reserve funds for extinguishment and depreciation of coal properties, transportation plants, river and railroad equip. etc		$95,356	
Dividends declared:			
Four dividends on pfd	$298,659		
Two dividends on com	102,552		
Extra dividend of $3 per share on com.	298,728	699,939	795,295
Balance charged against surplus			22,806

The properties have been operated continuously during the year, and produced 2,039,837 tons. Net capital expenditures for the year amounted to $534,522, which have been especially required in the construction of 126 houses and the completion of 38 houses in course of construction on Jan. 1, 1912; the construction of a new hospital and its equipment; new store buildings at mines 7 and 8; a Catholic church and parsonage; new mine equipment, including twelve 6-ton locomotives and two 15-ton locomotives, mining machines, mining cars, etc.; expenditures on account of docks in Superior, Wis.; and especially the construction and equipment of the new dock at Duluth, Minn.

During the year arrangements have been made with the Chesapeake & Ohio Ry. for the operation of our railroad, with the right to have other roads jointly use our railroad, if such joint use seems to us advisable.

On Aug. 1, 1912, was paid the first dividend upon the common stock at the rate of $2 per share per year, and also an extra dividend of $3 per share. At the same time an opportunity was given to the stockholders to reinvest the $3 thus paid in the common stock at $50 per share. In this manner the cash capital of the company was not reduced, but stockholders not desiring thus to reinvest were permitted to receive a portion of the surplus which has already accumulated and for the distribution of which they had so patiently waited.

Consolidated balance sheet for last two years compares as follows:

Assets:	1912	1911
Property account	$5,001,858	$4,467,335
Current assets	1,651,548	1,759,546
Deferred chgs. to operation	22,383	14,831
Total	6,675,789	6,241,714
Liabilities:		
Capital stock	4,779,350	4,480,650
U. S. Coal stock	15,950	17,100
Current liabilities	373,050	247,698
Depreciation and reserves	455,061	420,550
Undiv. surplus subsid. cos	3,556	4,087
Surplus	1,048,821	1,071,627

⁂

Pond Creek Coal Co.

President A. T. Holden reports for the year ending Dec. 31, 1912, as follows:

Properties—Your company was organized in November, 1911, and has purchased approximately 31,000 acres of coal lands. The surface rights were purchased only when such rights appeared a necessity; the company owns some 5000 acres of surface. We have approximately 26,000 acres of demonstrated coal, a seam of from 5 to 7 ft. in thickness having been shown by openings and drillings throughout a very large percentage of the territory.

On Mar. 11, 1912, the first mine opening was begun and we now have seven mines, the highest present capacity of any one being approximately 200 tons per day, with a prospective ultimate capacity of 1000 tons per day for each. The properties, situated in Pike County, Ky., lie about 10 miles from Williamson, W. Va., a town on the Norfolk & Western R.R. The N. & W. R.R. began in May, 1912, the construction of a railroad from Williamson to our various mines and reached the first mine Nov. 1, 1912, the first shipment of coal being made on that date. At present this branch has a total constructed mileage of about 16 miles. In addition your company has built sidetracks at the various mines.

There had also been constructed on Dec. 31, 310 dwelling houses and machine and blacksmith shops, and there have been purchased mining cars, mining machines, etc. A power plant is sufficiently far advanced so that the company is already operating to some extent by electric power.

Through the selling agency that developed the market for the Island Creek coal, a market has already been developed for the Pond Creek coal, calling for a supply in excess of your company's ability to produce. Many tests have shown that the coal is a valuable byproduct coal.

Shipments—During November your company shipped 11,902 tons of coal; in December, 24,119 tons; in January, 35,142 tons; in February, 28,313 tons. The coal thus shipped is the result of the development work and the mines are not yet, and will not be for some time, upon an operating basis.

Plan—Your directors believe that by property, the railroad facilities and the market all warrant the immediate raising of sufficient money to bring your property up to a 10,000 tons per day basis. The company, Dec. 31, 1912, had on hand $784,619, but most of this was or is immediately required for the equipment and construction already begun. The stockholders are therefore requested to authorize an increase in the capital stock to $3,500,000 by adding 150,000 new shares of $1 each (none of which is to be issued at this time) and $3,000,000 bonds secured by a mortgage, of which only $2,000,000 6% bonds will be issued at present, the remaining $1,000,000 bonds to be retained for future needs. The $2,000,000 bonds, convertible into stock at $25 per share (that is, each $1000 bond convertible into forty shares of capital stock), have been underwritten by Hayden, Stone & Co., subject to your approval, to net the company 94%; that is, $1,880,000. The bonds will be convertible into stock at any time within five years of their issuance and will be callable, upon proper notice, at option of company at 105%. The bonds thus underwritten will be offered to the stockholders at par in the ratio of one bond of $1000 for each 100 shares of capital stock now outstanding; the total outstanding issue of capital stock being 200,000 shares par value $10 each.

The proceeds should suffice to develop the property to a 10,000 tons per day basis and provide working capital, so that the company may much sooner be in a position to pay dividends than if the development were to be accomplished out of earnings.

BALANCE SHEET DEC. 31, 1912 (TOTAL EACH SIDE, $2,536,173).

Real estate	$1,002,182	Capital stock (par $10)	$2,000,000
Construction, etc.	632,518	Share premium account	250,000
Cash	784,619	Accounts payable	252,047
Accounts receivable	39,517	Accrued pay-roll	13,442
Inventories, etc.	77,337	Drafts in transit	18,036
		Funds and reserves	2,648

⁂

Delaware & Hudson Co.

Delaware & Hudson Co. in 1912 earned approximately 12% on $42,500,000 stock. Earnings in 1911 were 12.32% and in 1910 12.54%. Balance for dividends was between $5,000,000 and $5,100,000, against $5,237,680 in 1911 and $5,330,189 in 1910. Notwithstanding the anthracite strike in April and May, when net after taxes fell off more than $950,000, the year closed with only a slight loss in surplus for dividends.

Considering the losses through cessation of mining operation and the increase in maintenance expenditures of about $600,000, the year's record must prove gratifying to stockholders. The decrease in net after taxes amounted to $270,000 for the twelve months. Had the directors wished they could have wiped out the small decrease by checking maintenance work. Instead the company took advantage of the open winter and carried on full maintenance, both of way and equipment, to the end of December. The company expended $435,000 more on maintenance of way in 1912 than in 1911, and $168,000 more on equipment.

Operating revenue increased almost exactly $1,000,000, of which $935,000 was contributed by freight traffic and $45,000 by passenger.

⁂

FINANCIAL NOTES

Union Pacific Coal Co.—The Union Pacific R.R. Co. owns the entire $5,000,000 of the outstanding stock of its subsidiary, the Coal Company. Of the $5,500,000 first mortgage, 5% bonds of the Coal Company, the Railroad Company owns $3,354,000, the remaining $1,646,000 being held as a sinking fund by the Coal Company.

The Reading Co.—The surplus assets of this corporation on June 30, 1912, approached $50,000,000. As a potential factor in whatever financial development the Reading directors may undertake, this exceptionally strong financial position of the concern is of interest. Another feature of this is the fact that none of its obligations mature for a long time to come. Its demands upon its cash assets are more than met with each year's operations.

COAL AGE

Vol. 3 NEW YORK, JUNE 28, 1913 No. 26

The inventor of the cash register gave his invention its "try out" at a coal-mine commissary. The owner of the establishment was so astonished at the unlooked for results that he decided that these machines had a brilliant future and forthwith he abandoned the commissary and turned his attention to cash registers. He has been interested in selling them ever since.

There are plenty of managers and bosses willing to denounce you as a fool or a crank if you so much as hint at any possible crookedness around their "diggings," and yet the first complete systematic audit of any mining company's affairs rarely fails to uncover irregularities enough to keep every one from the superintendent down to the office boy busy making explanations and suggesting changes.

There is nothing remarkable about this when you realize the difficulty of keeping in close touch with every one at a large mining operation who is responsible for entering up time and tonnage; neither should it be construed as a slur on the personnel of the coal-mining business as compared with other large industries.

There are three well known systems of obtaining easy money from coal-mining companies, and, strange though it may seem, year after year they are set moving and generally are carried to successful terminations, from the standpoint of the dishonest:

1.—Tipple weigh bosses enter into collusion with some of the miners and then credit them with as much coal as can be added to the actual tonnage sheets without exciting suspicion. At mines where part of the coal goes to ovens and the balance is shipped in cars, it is often difficult to obtain a check on the weighman's figures and his additions may assume an amazing proportion of the whole, over long periods of time. If the weighman's weights are checked by total shipments, it is still possible for him to short-weigh some men and credit his "pals" with a corresponding amount.

2.—Commissary clerks arrange with some of the employees who trade at the commissary to handle company checks for them and then instead of canceling the checks as they are presented, they retain them and pass them back out for circulation.

3.—Bosses of all kinds from coke-oven foremen down to boss trackmen have been known to pad their labor rolls and divide the profits with those who are in a position to conceal the irregularities from the paymasters.

In some camps all three systems have been discovered in action at the same time, while at others they have followed singly but with almost dizzy regularity.

Are the guilty ones punished when overtaken? Rarely.

The ill-gotten gains slip through their fingers almost mechanically and there is little or no chance to recover losses. Furthermore, in many such cases, salaried lawyers are frequently able to successfully oppose company prosecutions.

And so the loss is hushed up and the next-door neighbor is not warned of his danger.

MORAL: Auditors and red-tape experts are still useful citizens around many mining operations.

Use of Purchased Powers in Coal Mines

By H. D. Jackson*

SYNOPSIS—This is a problem which does not now greatly vex the mining industry. The day is not far distant, however, when it is destined to assume a position of considerable prominence. This article discusses some of the salient features in its consideration.

Electricity is rapidly superseding all other methods of supplying power to coal operations, except possibly in those locations where, owing to the gaseous condition of the mine, it is unsafe to carry the current into the underground workings. Even in operations of this character, electricity is used to a large extent in all operations where feasible.

The early installations were all of the direct-current type, operating at either 250 or 500 volts, and were employed mainly for lighting and haulage work. Pumps, fans, hoists, etc., were, and are still to a certain extent, operated by steam largely because the owners considered reliability of the greatest importance; and owing to their knowledge of what steam could do, they would rather trust it than the more recently developed electric motors. In case of an accident to a locomotive, it was a comparatively easy matter to put the mules again into service; but in the case of a break-down of the electric fan-motor, it was an entirely different matter.

These Plants Are Still Operating

These plants having been built, they are, to a large extent, still in operation. The owners being conservative, and the mining work paying fairly well, the question of the cost of power was a secondary consideration. Today, however, things have changed, and the power-cost, including as it does a large item in labor and fuel is becoming more and more important.

There has been a vast increase in the number of mining developments, the modern ones of which are operating at a maximum of economy, with a consequent reduction in the cost of their product.

At the present time there is an element entering into existing conditions which is of interest to the mine owner. All through the coal regions wherever such schemes seem possible, there are being established central stations, the avowed purpose of which is the furnishing of power to the mines, at such a figure that by adopting this source of supply, those operations which are now finding it difficult to operate advantageously, will be enabled to successfully compete with the more modern plants which now make power for themselves.

The idea is that these generating stations by virtue of their size and location, and the fact that the peak loads on the different plants which they serve will probably not all come at the same time, can supply power cheaper than the mine plants can manufacture it themselves.

Fig. 1. A Typical Hydro-Electric Central Station, Viewed from Above the Dam

These new installations are carrying out an aggressive campaign to sell their product, and doubtless in many instances are securing business at a price that would warrant the investment. In other cases, however, it is seriously to be doubted if their power can compete with that furnished by the isolated plants. It must be remembered too, that the central station has to pay fixed charges on a high initial cost.

This is unavoidably the case since the installation consists not only of the generating apparatus, but also the transmission lines which are necessary for distributing the power to the various plants it supplies. It must also have a relay service in order to take care of any unit which may be shut down in case of an accident, so that the amount of its equipment is great, its load factor not good, and its fixed charges consequently high.

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In addition to this, the plant must have an organization for securing and carrying on the business, and a force to obtain necessary data for calculating and making out monthly bills.

All of these are excess items to be added to the ordinary expense of operation; so that, while it may be true that the purely manufacturing cost may be low in an installation of this character it does not necessarily follow that the total cost of power production, including all charges, is any less or even equal to that in many of the isolated plants.

Where the Central Station Has Its Greatest Advantage

It may be true, and doubtless is, that a central station can furnish current to one of the old type mining plants using electricity now solely for haulage purposes and supplying all its other power by means of steam engines located at more or less favorable points about the mine and at considerable distances from the boilers, but could it do so if this plant were rebuilt along modern lines?

This would not necessarily mean an entire reconstruc-

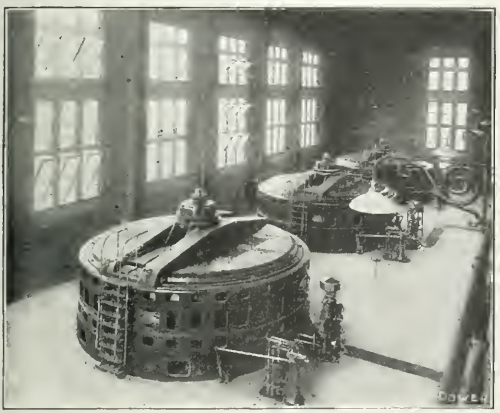

Fig. 2. Interior of a Power Plant, Showing Three Generator Units

tion of the plant, but in many cases might involve the replacing of the steam-driven pumps, hoists, etc., by electric ones. By doing this, practically all of the machinery requiring skilled attention would be centered in the power house, reducing largely the cost of attendance and also decreasing to a far greater extent the amount of coal required for operation, as fan engines, steam pumps, and steam-driven hoists are almost universally steam eaters.

It has long been known that steam engines operated at a distance from the boiler plant are exceedingly hard to keep in good running order, owing to the large amount of water, unavoidably condensed in long pipe lines. This condition requires engines of large clearance, which are uneconomical in the extreme.

The condensation alone represents a considerable loss, and the difficulty of keeping the long pipe lines tight is in itself a large item. Engines of the character necessary for use where attention is small must of necessity be of the simplest and most rugged type. This means that they must be practically free from all the refinements which make them economical in the use of steam, and it would be natural, if every effort were to be made to operate with the maximum of economy, that machines of this character would be abolished.

The same is true of pumps which take steam full stroke, as they are probably more wasteful thermodynamically than any other steam-operated apparatus.

Therefore, it is advisable for the owner or operator of a coal mine, when this matter of purchasing power is brought up, to consider not only what it may cost him to supply power as he is at present doing, but also what it will cost him to furnish it from his own plant if modernized; and then compare that figure with what it will cost him if purchased.

He must not lose sight of the fact that although the present equipment may not be economical when the cost of its power is compared with that as offered by the supply company, there yet remains the opportunity of calculating the price of current if the plant were put in the best possible condition. The relative advantages and disadvantages of either alternative will then be clearly perceptible and a wise decision can therefore be reached.

The Cost of Introducing Purchased Power

The price of the apparatus necessary in order to use purchased power is by no means a small item, and when one takes into consideration that the machinery in use at present must be scrapped, or practically so, the cost of its introduction runs up still more, unless it may be that the plant which is abandoned has been so long in service, and so handled financially, that it has reached a point of no value; when its discarding would represent no monetary loss.

If, however, no depreciation allowances have been made, or if the plant has not been in operation for any considerable length of time, it cannot be scrapped without a heavy financial sacrifice. The fixed charges on this loss should be added to the cost of power as purchased from the central station in order to make a correct comparison.

The cost of power from an existing plant is represented by the fixed charges on its valuation, plus the operating expense; if purchased, its price is composed of the fixed charges on the machinery required for its utilization, the operating expense, the price of current, and the fixed charges on the difference between the cost of the original plant and the amount for which it is sold.

In case power is generated after remodeling the station, its cost is represented by the fixed charges on the total value of both old and new equipment, plus the operating expense, depreciation, insurance and taxes in all cases being included in fixed charges. Whichever one of these proves the smaller is certainly the one to be chosen.

Before contracting for power, the fixed charges as well as the rate at which current can be secured should be scrutinized with care and calculations made over a considerable range of load. Under certain conditions it will probably be found quite advantageous to purchase power from an outside source. Under others it might be equally desirable to generate it at the mine plant.

Some Unreduced Death Rates in Illinois

By John Dunlop*

SYNOPSIS—The death rates from roof falls and falls of coal, and that from mine cars show no sign of reduction in Illinois, though the decrease is apparent in other parts of the United States. The author of the paper is of the opinion that shooting off the solid has not been shown to be a more important source of accident from falls than certain other methods of mining.

There is a part of the mining death rate in Illinois which legislation, inspection and the work of the federal Bureau of Mines has been unable to reduce. This part is that due to falls of roof, coal and drawslate and to the mishandling of cars.

In the last year of record between June 30, 1911, and the same date in 1912, the deaths from falling rock, coal and drawslate amounted to 54 per cent. of all fatal accidents in coal mines. Mine cars were the cause of 19 per cent. of the accidents.

The number of nonfatal accidents in the state from falls of rock, coal and drawslate were in the same period 45 per cent. of all accidents and from mine cars 26 per cent. It is surprising to learn that the loss of life from these causes per million tons mined has remained almost constant since 1901.

Longwall Workings Have More Accidents and Less Fatalities

The number of nonfatal accidents per thousand men employed is greater in the longwall workings than in the room-and-pillar mines, but it is a redeeming feature that there are less fatal accidents. This is due to the coal being thinner. A piece of loose coal or shale of sufficient weight to injure a miner working in low coal would in all probability kill him if it fell from the roof of a seam 5 ft. thick or over.

The state inspectors have been insistent in recommending that face bosses be employed, and the provision would, I am sure, save many lives. But there is a feeling against their employment. The miners believe that they would be arbitrary in performing their duties. A number of the larger companies have employed such men, and I learn that the results are not as favorable as might be expected.

The superintendent of a coal company operating two mines, and employing about thirteen hundred men, states that face bosses have been at work only a year in his mines and he cannot tell whether they have done any good. The men are taking advantage of the compensation act and are reporting injuries and seeking medical aid in cases so slight that they would not have reported the accident had it happened a year ago.

This is his statement:

TONS MINED PER ACCIDENT

	No. 1	No. 2
1912	3857	1378
1913	2364	1144

Apparently more men are injured than before the hiring of face bosses, but also the increase may be due to the concurrent effect of the compensation law.

At No. 1 of the same company, the number of accidents for the last three months shows a decided decrease over those reported in the first three months of the fiscal year.

QUARTERLY RETURN OF ACCIDENTS, NO. 1 MINE

July, August and September	1912	72
October, November and December	1912	46
January, February and March	1913	39

It is true that more powder is used where coal is being shot off the solid, and it is probable that the roof is affected by the heavy shooting, but a careful perusal of the reports of the state inspector of mines shows that 60 per cent. of the men killed by falling coal, roof and drawslate are struck down in mines where the coal is almost all undercut by machine. As these mines produce only about 52 per cent.* of the total output, it seems that they have an undue proportion of accidents, and it is not fair to ascribe the maintenance of rate or increase in accidents to shooting out of the solid.

Hence, it seems by these figures that the use of electric machines has a more detrimental effect than shooting off the solid. If props are set at a sufficient distance from the face to allow proper clearance for the working of a machine, the distance is too great for safety, especially where there is a bad roof. Under conditions of this sort, which are general through the central and southern part of the state, props should be placed before the coal is shot, and if face bosses are employed, it would be their duty to see that the place was properly timbered before any shots were fired. It must not be taken for granted that because the inspectors have strongly recommended that face bosses be employed for each 100 men in the mine, that the supervision of these men would avoid accidents.

The Car-Accident Problem

To prevent accidents to drivers is a problem more difficult to solve. This subject was earnestly discussed by the Mine Investigation Commission, and they listened attentively to suggestions of all kinds and considered the feasibility of having a law enacted to prohibit the driver from riding on the tail chain. It was agreed that such a law would not be practical in all cases. They did recommend that in mines opened after the passage of the act then prepared, all mine cars should be equipped with a bumper or bumpers on each end, which should project from the end of the car not less than 4 in. This was only palliative, and would not remedy the evil.

Not long ago, I had occasion to investigate a fatal accident which occurred to a driver. I found that he had not taken the proper care to protect himself. He attempted to come down a grade with a loaded trip and did not take time to put in sprags, but undertook to hold the trip by placing his back against the car and his feet on the rails, allowing the trip to push him down grade. His feet slipped off the rails, and as the trip was traveling rapidly, he fell in front of the car, which ran over his body injuring him, and causing his death a short time after. In this case, it was a matter of speed at the expense of safety. To prevent accidents to drivers, we must always urge "More caution and less speed."

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Abstract of paper entitled "Safety First from the Standpoint of the Mine Inspector," delivered at the mining conference held at the dedication of the Transportation Building and Locomotive and Mining Laboratories, University of Illinois, Urbana, Ill., May 8, 9 and 10.

*Although 44 per cent. of the coal in Illinois is machine-mined, these same mines produce 4,230,077 tons of hand-mined coal and 51.8 per cent. of the whole tonnage of the state.—Editor.

A Gas Ignition Controversy

By J. W. Powell*

SYNOPSIS—A reply to questions propounded by James Ashworth, in regard to ascertaining the most probable cause of the second explosion in the Bellevue mine, Dec. 9, 1910. An account of a careful and detailed investigation of the mine by Mr. Powell, Jan. 20 and 21, 1911, followed by his theory of the explosion and its cause. Experiences in heavy-roof caves in mines in Pennsylvania and elsewhere.

In answer to the request of James Ashworth, Coal Age, Mar. 1, p. 344, I will recount my theory of the second Bellevue mine explosion, Dec. 9, 1910. I was the superintendent of the mine at that time, having resigned my position as district mine inspector of Alberta, eight days previous to the disaster.

The verdict of the coroner's jury, based upon Mr. Ashworth's evidence as mining expert, stated that the disaster was caused by the percussion of air, due to the caving of rock over chutes Nos. 76 to 78. Feeling that the responsibility of reopening and operating this mine devolved upon me as superintendent, and not feeling satisfied that this verdict was in line with the facts, I was anxious to ascertain for myself the true cause of the disaster.

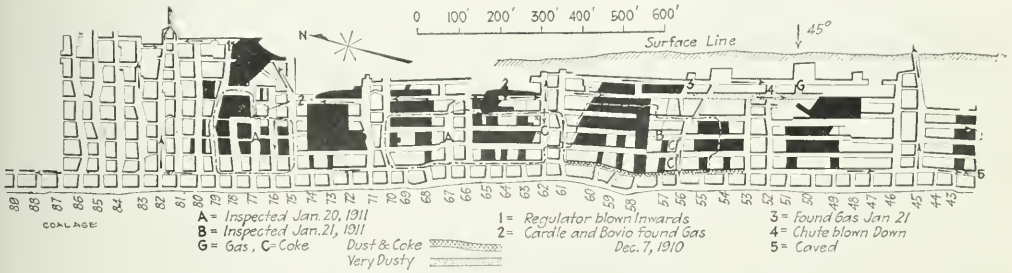
0 100' 200' 300' 400' 500' 600'
Surface Line
45°
N
COAL AGE
A = Inspected Jan. 20, 1911
B = Inspected Jan. 21, 1911
G = Gas, C = Coke
Dust & Coke Very Dusty
1 = Regulator blown Inwards
2 = Candle and Bovio found Gas Dec. 7, 1910
3 = found Gas Jan 21
4 = Chute blown Down
5 = Caved

Fig. 1. Plan of Part of Bellevue Mine, Showing Areas Inspected and Points of Interest

After some persuasion I prevailed upon the pit boss, J. Anderson, who had served in that capacity practically since the opening of the mine six years previous, to accompany me in making an inspection of the mine. Mr. Anderson claimed that the workings were liable to cave again and with more disastrous results than before, owing to the great accumulation of gas. In this prediction he was correct, as was proved by the third and more violent cave and explosion, which occurred five days after our inspection was completed.

Referring to Fig. 1, starting Jan. 20, we first examined all points on the counter entry from No. 45 chute outward to No. 43 chute, where this entry was caved tight. We found a large amount of dust on the timbers, ribs and floor of the entry. The force was outward as shown by the direction in which the timbers were blown. Inby, from chute No. 45 to No. 49, there were large quantities of dust but no signs of coking. I found the force was upward through chute No. 45 to the surface. Going down chute No. 45 to the main entry and along that entry to chute No. 58, we examined the counter entry and section above as far as chute No. 70, proceeding at some points nearly up to the fourth crosscut. This section was slightly caved at different points and there were large quantities of dust on the fallen rock and floor and evidences of a slight coking on the corners of some of the coal pillars.

Going back to the main entry, we entered chute No. 72 and examined the counter entry in this section as far as chute No. 80. From the center of the pillar between chutes Nos. 76 and 77 as far as chute No. 79, there was no cave of roof rock, as was previously supposed when this section was examined Dec. 13, which examination was hurriedly made. I went up chutes Nos. 75 to 78, inclusive, as high as the fourth cross-pitch, and found but a slight cave crossing chutes Nos. 75 and 76 and extending about 25 ft. above the first crosscut. There was some coking in evidence on the caved rocks in this section and a slight coking appeared on some of the posts in chute No. 76.

Proceeding along the counter entry to chute No. 85, I found a large quantity of dust deposited on the bottom of this entry and on the timbers, but no coking was visible. The force of the explosion in this section was inby, as indicated by the stoppings and the boards on the sides of the coal chutes. Going down chute No. 85 to the main entry, we traveled the main entry to the face at No. 129 and returned by that entry to the mouth of the mine.

The next day, Jan. 21, as indicated in Fig. 1, in company with J. Anderson, pit boss, and Frank Lewis, driver boss, I proceeded up No. 53 chute to the counter entry and along that entry to between chutes Nos. 60 and 61, where we found this entry blocked tight with coal that had been put there for a stopping to turn the air up over the workings above. This stopping had not been disturbed. There was a large amount of coking along the counter entry, between chutes Nos. 53 and 58, and a board nailed on one of the posts near chute No. 57 was charred, showing it had been subjected to a great heat. In this entry there were large globules of coked dust all along this section. You could pick up cakes of coked dust as large as your hand. Both Mr. Anderson and Mr. Lewis stated that this coking was the result of the second explosion, as they had traveled through this section many times after the first explosion and before the second oc-

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curred, and were certain that there were no signs of coking then at that place. At chute No. 54 a car was tilted up, which they claimed was caused by the second explosion.

The force evidently came down chutes Nos. 56 and 57 and passed outward along the counter entry as there were no signs of coking on the corners of the pillars at the mouths of these chutes. Going up chute No. 56 and returning down chute No. 54, I found little caving in this section. I then went up chute No. 52 to the fourth cross-pitch. After building a ladder I tried to go up to the fifth cross-pitch, but was prevented by a body of gas 8 or 10 ft. above the high side of the cross-pitch. Then going back through the fourth cross-pitch to No. 56 chute, I again tried to get up the angle chute to the fifth cross-pitch, but again encountered gas at about the same height as before. We then crossed over to a point between chutes No. 57 and 58, but could go no further, as the large excavation above this point made it unsafe to proceed, and we returned by the fourth cross-pitch to No. 52 chute and thence to the main entry and the mouth of the mine.

Roof Caves and Air Percussion

Now, in respect to air percussion due to heavy caving of roof in mines, I wish to recall an experience I had in the anthracite region of Pennsylvania, in the Whites vein seam, at Williamstown, Dauphin County. The mine was operated by the Summit Branch R.R. Co. The roof of the mine was a strong, tenacious conglomerate that would hold over a large area without caving, until, finally, as the work progressed, the roof would begin to weight and, for several days before the cave would take place, it would snap and crack, and there were loud reports similar to those of rifle shots. You could hear the cracking crossing through the roof over the solid pillars similar to the cracking of ice traveling across a large pond. This was warning for everyone to get away at a respectful distance as, when it caved, there was always a great rush of air to such an extent that the sheet iron lining the chutes would sometimes be lifted and carried before the blast and twisted around props in its path. I want to say that at such times I never experienced any heat in the rush of air, nor did anyone else. On the contrary, the air was cool like a cold wind.

In Carbonado, Wash., I experienced several large caves in mines, where explosive gas was present in the old workings, I recall one experience in No. 7 mine, which was very gaseous, when the mine foreman and myself, sitting on one of the counter entries, eating our lunch, felt a great concussion accompanied, a few seconds later, by a great rush of air. Thinking that there had been an explosion in some portion of the mine, we proceeded at once to make an investigation. Meeting some of the men we were told that heavy cave had occurred in some of the pillars. The nature of the rock in this mine differed from that in the Bellevue mine, as it did not emit sparks, and there was consequently no explosion.

In Coleman, Alberta, I experienced a number of large caves in No. 2 seam. Some of these were of larger proportions than the one at Bellevue mine on Dec. 9; but I never heard of anyone feeling any heat in the rush of air that always accompanied a cave of any extent. I am told further, by Mr. Anderson, that a very heavy cave once occurred at Bellevue mine, in a section around No. 29 chute, and, in comparison with this, the cave of Dec. 9, was but a drop in a bucket. The cave caused a great rush of air and a concussion that made many think an explosion had occurred; but there was no development of heat and no explosion. The question may be asked if the roof cave, Dec. 9, produced heat sufficient to ignite the gas, why did not the previous cave, which was much greater, also produce heat and ignite gas?

Reflecting on these facts, I came to the conclusion that this disaster (Dec. 9) was not caused by percussion of the air; but that it was due to gas ignited by sparks emitted from the roof rock while "weighting," just before caving took place; or from the striking of the rocks against each other as caving occurred. The dust blown into the air undoubtedly distilled carbon monoxide, which propagated the flame of the explosion. It is a well known fact among the miners at Bellevue that the roof rock is capable of emitting sparks when struck or when falling. It has also been proven, in a reliable way, that these sparks are capable of igniting firedamp. That there was also an ignition of dust is confirmed, in my mind, by the fact that, while leading the first rescue party not more than three-quarters of an hour after the explosion occurred, I encountered smoke at No. 76 chute. The smoke was the same dull-gray color given off by a newly made bituminous coal fire and had a similar smell. It was not the mist that sometimes accompanies explosions of gas. Andrew Matson stated, in his evidence at the inquest, that he recognized the smell of smoke "a little like gas from a stove," from chutes Nos. 107 to 90, and that this got stronger as they advanced to the outside. There was also a smell similar to that of burning coal coming from the air shaft at No. 82 chute, for several weeks after the explosion. In fact, at one time, we were afraid that there was a fire burning in the mine, and I went down through No. 82 air shaft, Dec. 23, to ascertain, if possible, whether this was true: but I could find no indication of fire burning. The smell gradually became weaker as the air current carried it out of the mine.

Where the Explosion Originated

In my opinion, gas was ignited by sparks emitted by the rock that caved at the surface pillar, in the neighborhood of No. 65 chute above the fourth cross-pitch. This was one of the points where gas was found by Cardle and Bovio, Dec. 7, two days previous to the explosion. These men stated, in their evidence, that they discovered gas in this place, by standing on the loose rock lying on the floor of the seam, and raising their safety lamps to the roof; but were unable to estimate the amount of gas, owing to the broken state of the roof and the large excavation in the surface pillar above. I have shown, in Fig. 2, what I think was practically the condition of the roof in this section, near the surface pillar. In my opinion, any weighting of the roof, which is always accompanied with a grinding action, would have emitted sparks sufficient to ignite the body of gas that undoubtedly was accumulated in this place when the cave occurred. According to their evidence, the roof in this place was in a dangerous condition, at the time these men made their examination, and made it unsafe for them to venture across to chute No. 74.

Inasmuch as the cave, if any occurred in chute No. 76, was small, and since the men working on pillars Nos. 80

and 81, close to that chute, reported no weighting of the roof that day when they came off shift, only four hours previous to the explosion, it is reasonable to suppose that the explosion originated in the section between chutes 65 and 74, where the heavy cave took place. It is worthy of mention that, owing to the peculiar nature of the roof here, it gives considerable warning before caving, and the men at work there would certainly have known if there had been any movement in the roof above them. On the other hand, the weighting of the roof, in the section above chute No. 65, could not have been heard, as this section is abandoned.

Path of the Explosion

The large winged arrows in Fig. 1 are intended to show, in a general way, the direction in which the force

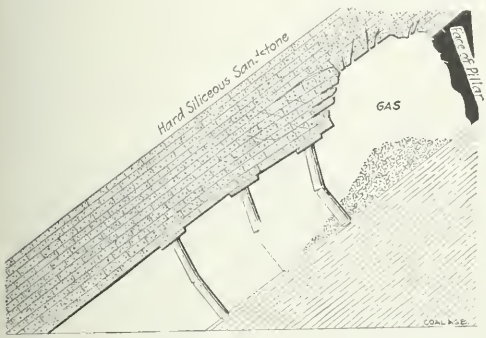


Fig. 2. Showing Condition of Roof, Where Explosion Is Assumed To Have Started

of the explosion traveled, from its point of origin above chute No. 65. Following the arrows the explosion traveled inby along the top of the workings, igniting any gas present at No. 74 chute, and blowing inward the regulator between chutes Nos. 79 and 80, and passing out through No. 82 air shaft, to the surface. Branching from this course, as shown by the arrows, some of the force of the explosion passed down through the robbed-out portion, to the counter and main entries, depositing coked dust on the rocks and the floor of the seam around chutes Nos. 75 and 76 and on some of the posts at this point. Passing along the counter entry, part of the force traveled up chutes Nos. 82 and 83 to the air shaft, while another portion continued inby along the counter entry.

Outby, the force of the explosion extended along the top of the workings, through the fourth and fifth cross-pitches. There was considerable force in evidence along the fourth cross-pitch from chute No. 57 to chute No. 49. Chutes and timber were blown out, and one of the men, who lost his life on the cross-pitch outside of chute No. 52, was buried under the débris so that it took several hours to find the body. At this point, an empty dump car was blown up on end. As shown by the arrows, the force split at chute No. 52, a part going down through this chute, tearing out the chute and manway in its path, to the counter entry. The other part traveled along the fourth cross-pitch and passed down through chute No. 49, to the counter entry; then passing outby along this entry to chute No. 13, where there was a cave completely blocking the entry. Much of the force of the blast here passed up chute No 45, to the surface. The force of the explosion also extended downward to the counter and main entries, at different points between chutes Nos. 65 and 53.

The fact that the bodies of men found on the fourth cross-pitch, just outside chute No. 52, showed signs of being subjected to great heat but no flame, indicates to my mind that the flame of the explosion was here extinguished by expansion in the large area of open workings. The men here were subjected to a rush of hot air and dust, as the blast extended outward along the fourth cross-pitch, and down through chute No. 49, which was the outlet, at the end of this cross-pitch, leading to the workings below. Men who were on the counter entry, at chute No 45, when the explosion occurred told me afterward that the rush of air and dust coming from the inside workings felt hot. It had evidently cooled off much before reaching this point.

Replying to Mr. Ashworth's Questions

My account thus far, and theory of the disaster, will practically cover points Nos. 1, 2, 11 and 15, submitted by Mr. Ashworth, Coal Age, Mar. 1, p. 344. I will endeavor now to answer briefly the remaining questions in regular order, as follows:

3. There was no evidence, as far as I remember, to show that there was any accumulation of gas at a point between the third and fourth cross-pitches, above No. 73 chute.

4. I found No. 73 chute slightly damaged.

5. This chute being but slightly damaged would not, in my opinion, indicate positively that no explosion occurred on top of this chute, 300 ft. up the pitch. That would depend on the direction of the force of the explosion.

6. Not having read the article by Stirling and Cadman, on this explosion, I cannot answer this question.

7. Yes. These pillars were all intact, with stoppings in all crosscuts except the top one, which was left open to allow the air current to pass through.

8. The pillars working on the day of the disaster were Nos. 76, 77, 78 and 79. These were the only pillars, to my knowledge, working in that section, at the time.

9. Cardle and Bovio stated that they found a small quantity of gas over chute No. 74.

10. As previously stated, I have not read the article to which you refer, but am of the opinion that the only gas that entered into this explosion was that which was accumulated in pockets above the fourth cross-pitch, and which was above the path of the ventilating current.

12. I plugged No. 81 charging station in order to turn more air into the inside charging station, where the miners were assembled who were later rescued. The charging station plugged was blown off at the T where it branched off the main line.

13. No. 53 chute was blown out completely and all the coal it contained was piled on the main entry. No. 52 chute was blown out from the fourth cross-pitch down to the counter entry. This chute was a network of timbers, sheet iron, etc. We found this chute completely blocked with débris just below the fourth cross-pitch. The coal drawn from the chute 24 or 26 hr. after the explosion occurred was very hot when drawn. The cross-pitch on the south side of No. 52 chute was strewn with timber and coal that was blown out from this chute. I

noticed no signs of great heat at this point, but the dust on the corner of No. 52 chute felt rough and cinderv to the touch; otherwise, there was no indication of heat or coking.

14. No. 52 chute was used for dumping coal from the fourth and fifth cross-pitches above. I have already described the condition of this chute from the counter entry to the fifth cross-pitch. The chute was not damaged below the counter entry, but was protected by the large amount of coal it contained.

16. Not having read the paper to which you refer, I cannot answer this question.

17. I was unable to get up to and examine the fifth cross-pitch, on account of the accumulation of gas. Chutes Nos. 45 to 52 were intact. Chutes Nos. 53, 54 and 55 were blown down, and a considerable amount of coal and timber was lying on the entry at the foot of these chutes. There was very little damage done from chutes Nos. 56 to 62, but all of these chutes were more or less ruptured and had to be repaired the night of the explosion, in order to enable us to convey the air current along the main entry to the inside workings. The chute that was driven off the rock tunnel at No. 62, and connected with the counter entry of No. 1 seam at this point, was blown down completely, the timbers and coal being piled up in the rock tunnel, at the foot of the chute, which demonstrated there was quite a force exerted downward at this point. We put a curtain across the rock tunnel outside this chute the night of the explosion, to prevent the air current short circuiting at this point.

I believe this answers all of Mr. Ashworth's questions.

A Safety Latch for Shaft Gates

On page 464 of our issue of Mar. 22, 1913, there appeared two photographs of a safety latch for mine gates as used by the H. C. Frick Coke Co. As some of our readers have made inquiry about this device, we deemed it advisable to describe it in greater detail.

The object of this safety latch is to prevent the gate at a shaft landing being opened, except when the cage is in the proper position. Fig. 1 shows a plan and side elevation of the assembled device.

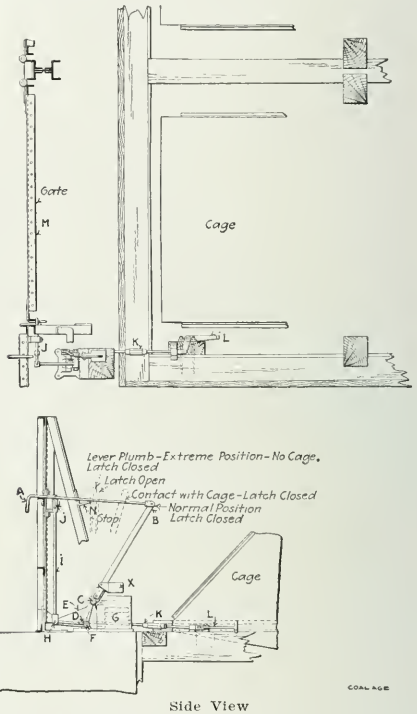
A is the hand grip or operating lever. This is connected to *B*, which is pivoted at *C* to the rocker *E*, while at its lower end it is connected at *D* to the adjustable rod *K*.

The rod *K* is connected to the bell crank *L*, which is pivoted to a stationary fulcrum on the framing or timbering of the shaft. The rocker *E* above referred to is pivoted at *F* to a stationary fulcrum attached to the landing. *E* is also heavily counterbalanced by the weights *G*, which, under ordinary circumstances, hold it in the position shown. At the point *H*, *E* is connected to the rod *I*, which, at its upper end, is pinned loosely to the latch *J*.

Suppose now that the hand grip *A* is pulled when the cage is not at the landing. The lever *B* is free to move forward as far as the stop *N*, the only effect being that the point *D* will be pushed backward, causing the rod *K* to revolve the bell crank *L* through a certain angle.

Suppose now that the cage is in the proper position at the landing. If the grip *A* is now pulled, the lever *B* will move forward and the bell crank *L* revolve until it comes in contact with a suitable plate placed upon the side of the cage. When this takes place, the bell crank *L* can move no further, and the lever *B*, instead of pivoting at the point *C*, now pivots at *D*. A further movement of *A* tilts the rocker *E* about the point *F*, raising the counterweights *G* and pulling down the point *H*, which, in turn, through the rod *I*, opens the latch of the gate, which can now be swung outward and cars or men admitted to the cage.

After a car, we will say, has been pushed upon the



Side View

MECHANISM OF THE SAFETY LATCH FOR SHAFT GATES

cage, the grip *A* is released, and the lever *B* allowed to swing backward. The counterweight *G* upon the rocker *E* now returns to its original position, closing the latch. The small counterweight *X* upon the lever *B* also pulls the latter to its original position, which rotates the bell crank *L* back from the cage and out of the way along the side of the shaft.

The cage can now be raised or lowered without interfering with any part of the latch mechanism, and the gate is closed and will remain closed until the cage is again brought to its proper level when pulling the rod *A* will again makes contact between the cage and the bell crank *L*.

A further refinement, and one which is not shown upon this drawing, is that of connecting the rocker *E* with a system of rods and levers, which can be made to actuate a pair of chocks located at a sufficient distance in front of the gate to allow the latter to swing open and which will hold a car until the cage is in position.

This device was invented by one of the employees of the H. C. Frick Coke Co., and a patent upon it has been applied for.

An Oklahoma Water-Hoist

By E. C. Reeder*

SYNOPSIS—A description of the means employed to remove water from an old mine that threatened to break into and flood a newer operation. The expense of handling this water by bailing was decidedly less than by the use of pumps.

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Oklahoma has several important coal fields, practically all of which are in the east central part of the state. Title to most of the coal lands is vested in the Indians, who receive substantial royalties from the mining companies.

One of the largest and most important of these coal fields is the McAlester, named after Col. McAlester, one of the pioneers of this region. The town of McAlester is also named after him and is the metropolis of this part of the state. It is located adjacent to several of the large mines and is served by both the Rock Island and Missouri, Kansas & Texas lines of railroad which give outlets north and south as well as east and west.

The largest of the mining companies in this region is the Osage Coal & Mining Co. who also operate several large mines in the Wilburton District to the east of McAlester.

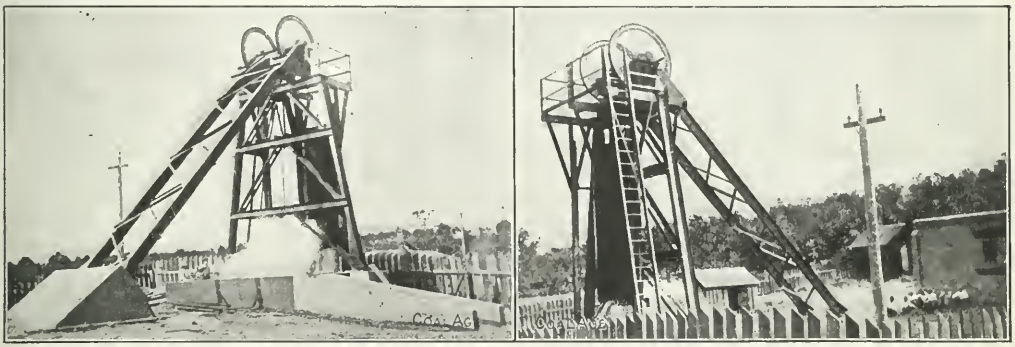
At McAlester the coal beds outcrop in a number of places and dip at a fairly uniform angle to the southwest. The angle of inclination varies only slightly but usually flattens with depth. There are several workable seams of coal, a distance of some hundreds of feet existing between the uppermost and lowest beds.

At the village of Krebs, some three miles from McAlester, the Osage company has several large mines mostly opened on the upper seam which here averages about five feet thick and dips to the southwest, the angle at the outcrop being about 15 deg., flattening to about 6 deg. at a vertical depth of 800 ft.

The Necessity for Water-Hoisting Apparatus

Cutting into the Osage company's acreage is the property of an older concern, the greater part of whose coal has been mined out and the workings abandoned and allowed to fill up with water. The Osage company is connected with the old workings at a point about 490 ft. vertically from the shaft mouth where an electric turbine pump was located which took care of the overflow from the old mine, pumping to the surface through a drill hole. As the workings of the new mine got deeper and approached these old workings below the water level, apprehension was felt that the entries might break through and be flooded, particularly as no reliable maps of the old mine were in existence.

The shafts and slopes of the old mine were in bad condition, being practically impassable and a great deal of work and expense would be entailed if the old mine were to be pumped out by the ordinary methods. It was finally decided, after much study, that the best plan was to sink a new vertical shaft, tapping the old workings at their lowest point and either install pumps or bailers to handle the water.



Front and Rear Views of Headframe with a Bailer Discharging in Each Case

A two-compartment shaft, 5 ft. by 9 ft. 9 in., inside the timbers was sunk through the shales overlying the coal at this point. It was estimated that the coal was down about 774 ft., and the shaft was stopped at a point approximately 736 ft. from the surface. The timbering was then completed, buntons put in, guides strung and the shaft finished so a cage could be run in either compartment.

About this time (November, 1910) the Osage company decided that it would install a hoist and handle the water with self-filling and self-emptying bailers, raising the same with an electric engine. This machinery was accordingly contracted for.

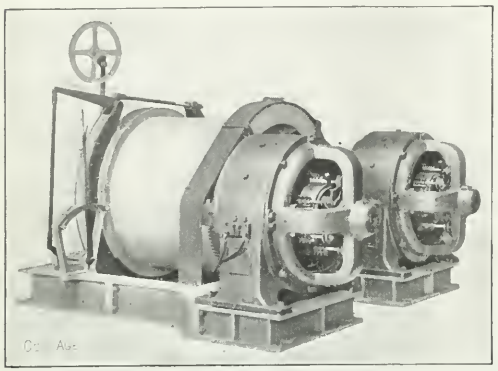
The work of finishing the shaft and tapping the water was then carried forward and completed. When the timbering was finished a churn drill was erected on the surface and a 12-in. hole drilled from the bottom of the shaft into the old mine workings. After drilling about 40 ft. the drill broke through and the water rose in the shaft to within 500 ft. of the collar.

The drill outfit was then removed and the bailing machinery erected and connected up. The bailers themselves are 3 ft. 10 in. in diameter and 12 ft. 3 in. long, built of $\frac{5}{16}$-in. plate and hold 1000 U.S. gallons. There are two

*Mining engineer, Chicago, Ill.

valves in the bottom about 14x18 in. in area, hinged on one side to open inward. One valve is connected by rods to the tripping mechanism which automatically opens it at the surface when the trip comes in contact with a guide runner placed for that purpose. The discharge of water is directed to the side by a spout attached to the bottom of the bailer.

The other valve is used for filling purposes only as both open automatically when the bucket enters the water. The bailers discharge as soon as the spout attached to the bottom clears the collar. A concrete wall surrounds the shaft and forms part of the receiving basin into which the water runs to be carried off finally by a ditch.



THE HOIST AND ITS TWO DRIVING MOTORS

A structural-steel head frame 25 ft. high, to the center of the sheaves surmounts the shaft. This carries the head sheaves and the tripping runners for emptying the bailers. The photos show the general construction of the head frame, also the bailers discharging.

HOIST DRIVEN BY DIRECT CURRENT

The hoist is arranged for operation with direct current at 600 volts, the railway circuit of the Choctaw Railway & Lighting Co. passing within a short distance of the plant. For several reasons it was decided to use two motors on the hoist with master control and magnetic contactors arrange for series-parallel operation.

One reason for using two motors was that it might be desirable to operate over indefinite periods at reduced speed, and another that in case of accident to one motor there would still remain the other for operation at either reduced speed or load.

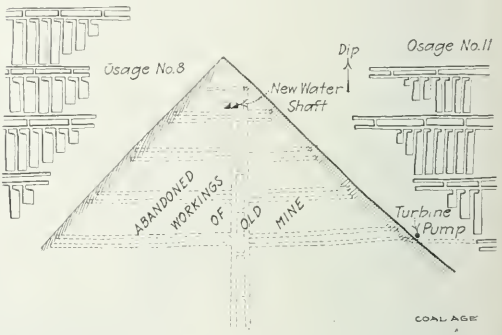
The motors are of the General Electric manufacture, 175 hp. rating, type CLC, 350 r.p.m., with commutating poles. They are geared direct to the drum shaft, the ratio of reduction being 6.1 to 1, giving a rope travel of approximately 1100 ft. per min. at full speed.

The ropes are both wound on a single drum 72 in. in diameter by 55-in. face, machine grooved for 1-in. rope, one part winding on as the other winds off. The drum gear is bolted to the drum at one end and on the opposite end is located the brake which is of the post type, operated by hand.

The operator stands on a platform at the rear of the hoist, where he commands a view of the bailers as they discharge as well as the hoist and motors. All the machinery, including the head frame, buckets and hoist, was built by the Lidgerwood Mfg. Co., of New York.

The plant was put in service in July, 1911, and has been worked continuously ever since. It has been found that operation for 10 hr. during the day is ample to keep the water level down to about 700 ft. from the surface, and the greater part of the time the hoist operates with the motors in series, running at approximately half speed and bringing up a bailer full of water about every 1½ min. On test at full speed they have hoisted a bailer every 50 sec. and kept it up for several hours, but when running at this rate would bail out the shaft in 3 or 4 hr.; hence it was found more economical to run at a slower rate.

When handling their water by means of the turbine



MAP SHOWING OLD WORKINGS AND POSITION OF PUMP AND WATER HOIST

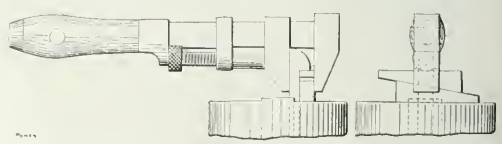
pump it cost the coal company about 4c. per 1000 gal., but since the installation of the water hoist this has been reduced to about 1¾c. per 1000 gal.

Several other mines in the district are preparing to handle their water by a method similar to that above described, and the operation of this plant has been closely watched by the parties interested in similar properties.

Removing Solidly Driven Keys

Those who have trouble in removing head keys from the valve-gears of Corliss engines and other places will find that all trouble may be avoided by adopting the following method of removing the keys, says John F. Hurst, in *Power* of June 10, 1913.

Place a monkeywrench over the key as shown and insert a compound wedge between the jaws of the wrench and under the head of the key. By applying a pressure



SHOWING USE OF WRENCH AND WEDGES FOR REMOVING KEYS

to the end of the wrench and at the same time driving the wedges, or cold chisels, whichever is used, the key will slowly but surely come out.

Coal Mining Institute of America Meeting

By R. Dawson Hall

SYNOPSIS—The courtesy of the Pittsburgh officials and the wealth of opportunity for study in that city made the meeting of the institute most profitable to all in attendance. The program, though improvised, was of great interest.

The change of place of session from Wilkes-Barre to Pittsburgh at the last minute could not fail to have its effect in reducing attendance and it was somewhat surprising that so many persons came to the meeting despite the fact that the program was hastily framed at the last moment and might be expected to show some evidences of that haste.

Everyone believed the change in venue was justified, not so much because the attendance would have been small as because the executive committee had no way of being assured of the number of persons who would probably be present. It is certain that several members had decided to attend who either did not want to avail themselves of the special train service from Pittsburgh or were too negligent to make reservations.

H. C. Frick Coke Co. Safety Exhibit

There was no program provided for a morning session, so the regular meeting did not commence till 2 o'clock in the afternoon of June 17, being held in the Assembly Hall of the Engineers' Society of Western Pennsylvania. Mr. Keller, of the H. C. Frick Coke Co., delivered the regular lecture which he is accustomed to make to the miners at the company's various plants, accompanying it with stereoptican slides illustrating different accidents and the means by which they may be prevented. The pictures show not only the right way, but also the wrong way of doing certain kinds of work and also the accidents resulting from following the wrong methods.

The result of the training seems to justify the company in its expenditure. Fatal accidents in the Frick mines are far less numerous per million tons produced than in England, Scotland or the United States, as was shown by some diagrams presented. The real merit of that fact was, however, not made plain. The H. C. Frick Coke Co. is mining the Pittsburgh bed almost exclusively and this seam is regarded as having an exceptionally dangerous roof. The remarkable record was made, therefore, despite adverse conditions.

Pennsylvania Possesses 5 per Cent. of the Coal and Mines One-Half

John W. Boileau then delivered his address on the "Pittsburgh Coal Field," illustrating it with a large map of the seam, showing its extensions in West Virginia and Ohio. He has measurements of the coal bed compiled from drillings throughout the field and perhaps no one knows better than he the characteristics and values of every portion of this coal territory. His address is abstracted as follows:

"The bituminous coal fields of Pennsylvania produce nearly 160,000,000 tons per annum. This constitutes one-third of all the coal produced in the United States. But this does not represent the whole coal output of the state for the anthracite production is about 90,000,000 tons.

"In the Pittsburgh district proper more than 60,000,000 tons are mined annually, but when the product of the Connellsville district, Fayette and Westmoreland Counties is added, the tonnage is 100,000,000, or approximately one-fifth of the entire tonnage of the United States. This includes coal sold as coal and coal made into coke. The coke region itself will produce 21,000,000 tons of coke each year, to manufacture which 32,000,000 tons of coal must be mined. The coke tonnage will probably increase 5 to 7 per cent. per annum.

"Pittsburgh and the manufactories in the Monongahela, Ohio and Allegheny Valleys within a short radius of that city form the greatest coal-consuming district in the world. While we consume in the Pittsburgh district proper 16,000,000 tons, we use enough in the form of coke to raise that figure to 25,000,000 tons.

"Pennsylvania has only about 5 per cent. of the coal area, but the state is producing nearly half the output of the entire United States. Consequently, the early exhaustion of the coal resources is to be expected, particularly of that part of the coal which is suited for coking or the manufacture of gas.

"Our great railroads are consuming immense quantities of coal and half the iron industry is located in Ohio and Pennsylvania so that the Pittsburgh bed will be rapidly exhausted. One large railroad alone uses six acres per day. The total acreage requirement of the United States is more than 325 acres daily. It is to be regretted that this exhaustion is not replaceable like that in agriculture; there is but one gleaning. If all the coal produced in Pennsylvania were drawn from one of our largest counties, like Greene or Washington, the coal in those areas would last only 8 or 10 years."

The Conditions Determining Coal Thickness

The discussion largely centered on the relation of coal thickness to the direction of the main basins and anticlines resulting from the Appalachian uplift. Mr. Boileau stated that the basins usually showed thicker coal than the anticlines and some were disposed to believe that this was an indication that the main uplift was in process of formation when the Pittsburgh bed was laid down, because the lower coal beds do not thicken in those synclines which have that particular direction. For instance, the basins which show thick coal in the Kittanings are those which run east and west and not northeast and southwest. Mr. Boileau declared that the thickness of the coal varies along the basins as well as across them and that the summits of the anticlines are sometimes eroded. The irregularity of the sulphur content was also discussed, but its presence could not be subjected to forecast, its occurrence being more irregular than that of the coal.

Visits to Points of Interest

The institute then adjourned to the offices of the weather bureau and H. Pennywitt, the local forecaster,

explained the methods by which the weather was predicted. The visitors climbed to the top of the Farmers' Bank Building, where the weather conditions are measured, the actual readings being taken in the offices below.

June 18 the members met at the Carnegie Museum and were shown through the exhibition rooms and the laboratories. As a rule, such a trip is wearisome in the extreme and not to be compared with an unconducted trip. However, with W. J. Holland, the curator, and D. Stewart, his assistant, as guides no such weariness was possible. Drs. Holland and Stewart have made the exhibit what it is, have traveled long distances to secure and excavate the specimens and are, moreover, brilliant conversationalists, their enthusiasm and extensive knowledge making every exhibit of interest.

Talking through Adam's Apple

In the afternoon a trip was made to the Bureau of Mines, where a lengthy program had been prepared. J. W. Paul demonstrated the use of rescue apparatus in the smoke room and showed how the telephone could be operated by attaching it to the throat of the rescuer. As this vibrates with the vocal chords, it is possible to use its motion to actuate the transmitter. The rescuer, therefore, speaks in the confines of his helmet and not directly in front of the diaphragm, but the instrument being attached to the throat receives and delivers the message nevertheless.

Mr. Paul also showed the action of a modern safety lamp in a mixture of air and 8.6 per cent. of explosive gas moving at a velocity of 2500 ft. per min. The flame left the wick and went up into the gauze. Then placing an unbonneted lamp in the same mixture, moving at 1500 ft. per min., he showed that it was extinguished. The Davy lamp in the same mixture exploded, though the velocity of the air current was reduced to 600 ft. per min. Passing one by one into a dark room, the visitors compared the cap of the naphtha-bonneted lamp with that of the Davy lamp in 2 per cent. of methane.

Simple Detonator Test

The nail test for determining the strength of detonators was then exhibited by C. Hall. The detonator is tied beneath a finishing nail and ignited through a fuse. The explosive bends the nail and the action measures the force of the detonator correctly. This is not true of the Trauzl block which has hitherto been the recognized method of measurement. The method invented by Mr. Hall has certainly the merit of simplicity. He exploded two detonators, one a No. 3 and the other a No. 6, and the difference in the angle to which the nail was bent was easily manifest. Weak detonators fail to produce the full strength of the powder to be detonated.

O. P. Hood described the experiments being made to determine how much of each kind of gas is exhausted by gasoline motors in every condition of working. A motor is being tested in the laboratory, but in the field the conditions of working are being ascertained so as to discover what effect the gasoline engine has on the atmosphere in a mine.

The bureau is testing carbon-dioxide recorders for determining the operating efficiency of boiler and other furnaces. The various types under test all showed the same record during the visit, but it is said that there is some lag in changing the record when the operating conditions change.

Portable Electric Lamps for Mine Use

H. H. Clark exhibited several portable electric-mining lamps, including the C. E. A. G. lamp, which has just been approved. He showed that a spark caused by a break in a current of 10 amp. at 15 volts made a large and brilliant spark. Despite the long period during which the flash was continued in the presence of gas, no explosion resulted. A smaller spark at a higher voltage ignited the gas as soon as discharged. Sparks of low voltage will not ignite methane unless the current is extremely high.

G. S. Rice announced that the state of Colorado had just passed a law requiring that oil safety lamps shall only be used for testing purposes after Jan. 1, 1914, and requiring the use of electric lamps for ordinary mining purposes. This law is to be of effect when the bureau shall determine the electric lamps which are safe for mine use.

A visit was made to the large testing machines of the Bureau of Standards. A test was being prepared of a large rock pillar, surrounded by concrete and bound by iron bands. The rock was piled loosely and filled with sand by flushing. The purpose is to ascertain the strength of the loose rock when it is confined and prevented from sliding sidewise under pressure. A yellow-pine prop about 8 in. in diameter was tested in another machine and failed under a total load of 77½ tons. The failure was wholly at the bottom and the prop was in such condition that it could be sawn off and used in a thinner bed or in a place when a shorter prop would serve. This sawing off and relocating of crushed props is effecting large economies for the Philadelphia & Reading Coal & Iron Co.

At the close of this exhibit, the meeting disbanded without further formalities.

Chilean Coal Importations

The quantity of coal imported into Chile has increased in the past few years, having doubled during the last decade; 1,577,000 tons were imported in 1912, practically all of it coming from England and Australia. At present the importation of coal from the United States is prevented by the lack of any line of ships running directly to this country. With the opening of the Panama Canal and the establishment of a fleet of ore-carrying steamers between Chile and Philadelphia, it is expected that there will be a better opportunity to sell American coal in that country, as, no doubt, the ships would take return cargoes at low rates.

Hirsch Electric Mine Lamp Approved

The Bureau of Mines has approved the safety electric miners' lamp, manufactured by the Hirsch Electric Mine Lamp Co., of 221-227 North Twenty-third St., Philadelphia, Penn. This is the first cap lamp approved by the Bureau. The battery is carried on a belt around the waist of the operator and the lamp is connected by a flexible pair cable passing over his back. The light is thus easily handled by the workman and does not interfere with his work.

Notes on the Groundhog Coal Field

By Amos Godfrey*

SYNOPSIS—The Groundhog coal field is situated in northern British Columbia and contains a large amount of high-grade coal that will come into competition with the Alaskan coals in the Pacific Coast markets. A few facts concerning it are given in this article.

The Groundhog coal field is in northern British Columbia, in the Cassiar district, and lies between 56 and 57 deg. north latitude, and about 128 deg. west longitude, covering an area about 30x45 miles in extent. The nearest town is Stewart, 90 miles away, as the crow flies, on the Portland Canal, but the town from which all supplies must be obtained is Hazelton, on the Skeena River, which is about 150 miles by trail from the coal fields. Supplies are taken up the Skeena on the ice in winter and on pack trains in the summer, both of these methods being expensive and uncertain.

In 1903, James McEvoy, formerly of the Canadian Geological Survey, took a party into the Groundhog country and staked 12 claims. In 1904, W. W. Leach went in with a party and staked four additional claims for the same company. F. A. Jackson was a member of both of these parties, his work being the hunting of caribou. On his hunting trips Mr. Jackson noticed other outcrops which the Western Development Co., for whom he had been working, did not take up. In 1909 he decided to stake his discovery. James Latham and Mr. Jackson went in during July with four horses, two pack and two saddle horses. They staked 11 claims, which were taken over by a syndicate calling itself the British Columbia Anthracite Syndicate, which was later merged into the B. C. Anthracite Coal, Ltd., claims having been added as prospects warranted until the company now owns 66 claims in all.

The next one to take an interest in the Groundhog region was Leon Benoit, of Winnipeg. In the fall of 1910, R. C. Campbell Johnson went in to examine Mr. Benoit's holdings and in 1911 took in a large party and did considerable work opening some fine anthracite coal. Since then many stakings have been made until now there are some 1500 square miles of territory staked out. No doubt much of this territory is barren.

In September last the B. C. Anthracite Coal, Ltd., had some thousand feet of tunneling driven in the several seams, the longest tunnel being 182 ft., one fault and one roll having been encountered, but in both instances the coal was normal on the other side. J. A. Challoner, writing in December last, reports upon one seam that there is 6 ft. of good, clean coal.

Character of the Coal

The geological age of this field has been classed by the Canadian Geological Survey as cretaceous, the exact position in that age not having been fully determined. The classifications of the coal by D. B. Dowling's method of split volatile ratio, are anthracite, semi-anthracite and anthracitic in character. In this connection George Watkins Evans states in a report: "From the above analysis we find that the coal field contains what can actually be classed as anthracite. It is claimed by men who have criticized the field that there is no anthracite present. I think the above partial summary should convince anyone that anthracite really does occur." The government reports upon the coal show that it is variable in the amount of fixed carbon that it contains, that constituent running from 10 to 85 per cent. and averaging around 60 per cent.

No. 4 "A" Trail Creek, Opposite Jackson Camp

Tunnel on Outcrop on Telfer Creek

Railroads into the Region

The Provincial Government has granted several railway charters. One proposed railway from Nasoga Gulf to the coal fields would be in the neighborhood of 200 miles long and traverse the Naas River valley, which has great agricultural possibilities. This road would be called the Naas & Skeena Rivers R.R. Another charter has been granted for a road to start in the town of Stewart on the Portland Canal, called the Canadian Great Eastern. This, too, would enter the upper reaches of the Naas River and possibly be laid along Currier Creek, the mouth of which is the center of the field. The length would be approximately 120 miles. Fourteen miles of this are already in operation up Fair River from Stew-

*Manager B. C. Anthracite Coal, Ltd., Groundhog P. O., B. C.

art. Another route would be a continuation of the Grand Trunk Pacific, which is in operation from Prince Rupert to Hazelton. This would follow the Skeena River from Hazelton to the coal field, the distance being approximately 200 miles and the grade would be in favor of loaded trains. The Naas & Skeena Rivers R.R. has one divide to cross, the Canadian Great Eastern has two, so, although the initial expense of the Grand Trunk Pacific would possibly be greater, it has the advantage that the actual cost of haulage would be less.

Market for the Coal

It has been thought that the opening of the Panama Canal would start a market for an immense amount of coal from this field. Moreover, the cities of the Pacific Coast are making great strides. In fact, there has been a shortage of coal in Vancouver recently, showing that a portion of the output of this field would find a market in the near-by cities along the coast. Moreover, the interior of the province is making rapid progress which will also take care of some of the output.

Coal Outcrops on Barney Creek

Alvo Mountain, Showing Basal Conglomerates

Some views are given which were taken in the Groundhog region, the first figure being a view of No. 4A Trail Creek, opposite the Jackson camp, where some prospecting has been done. This shows a drift in the bank along the creek on a coal outcrop. The second picture is of a drift which has been driven into the coal on Telfer Creek. In this the inclination of the strata can be seen dipping about 30 deg. N. E. Fig. 3 is of a stripping of the outcrop on Barney Creek, where some good anthracite coal was found. The character of the country can be seen from the background. Fig. 4 is a picture of Alva Mountain, and shows the basal conglomerates which underlie the region.

Mine Holidays

The numerous attempts which have been made to compile a list of mine workers' holidays in the anthracite coal region of Pennsylvania have so far been a complete failure. In view of the many recent "Button" and other strikes these frequent holidays are becoming an increasing source of loss and annoyance to the operators.

Capt. W. A. May, president of the Pennsylvania Coal Co., recently stated that he could never tell when a miners' holiday was coming or how many men it would involve. His company has no less than 29 nationalities on its payrolls and each has holidays peculiarly its own.

A recent compilation of the nationalities of the mine workers in the anthracite region gave them as follows: American, English, Welsh, Scotch, Irish, German, Slavonian, Italian, Polish, Hungarian, Austrian, Swedish, Russian, Belgian, Bohemian, French, Finnish, Canadian, Lithuanian, Greek, Tyrolean, Danish, Syrian, Montenegrin and Horwat. The workers classified as "American" include all of those born in this country even if their parents were foreign and did not speak a word of English, and several groups, like the Slavonians, are capable of still further subdivision.

The worst feature of these holidays is that, in many cases, the mine workers do not notify their foreman in advance, and to keep the numerous foreign holidays in his head, taking into account the changing nationalities of the shifting labor, a foreman would have to be a sort of human almanac. The celebration of most of the holidays also implies a second day off for those who have celebrated too well.

As long ago as 1906 the Lehigh Valley Coal Co. presented this difficulty as a matter for consideration to the Board of Conciliation, but the two grievances were withdrawn.

"Shooting off the Solid"

Advance sheets of his report for 1912 show that John Laing, chief of the Department of Mines, makes the proud boast that "shooting off the solid" has been nearly eliminated in West Virginia.

Government statistics show that more than 48 per cent. of deaths in coal mines are due to falls of roof. One of the causes of these falls is "shooting off the solid." A shot in the solid seam is also more likely to blow out the tamping so that the flames may set fire to coal dust or gas, thus causing an explosion that may wipe out scores of lives. In other words, reckless miners deliberately risk their own lives and the lives of others to save labor.

This dangerous practice has been discouraged in West Virginia by a vigilant system of inspection backed up by prosecutions of offenders. The 1911 report of the chief of the Department of Mines shows that 105 miners were fined an aggregate of $1303 for shooting off the solid in that year. This vigorous enforcement of the law evidently had its effect in 1912.

Our British Coal-Mining Letter

SYNOPSIS—The Rufford accident has called attention to the need for ladders and automatic hoisting control in shaft sinking. The tonnage of English mines per man employed has not decreased, despite the shortening of the hours of labor, and the increased remoteness of present operations from the shaft bottom. This uniformity of production is the result of the greater use of machinery. The utilization of the exhaust from steam engines in low-pressure turbines is an important source of the increased power in British collieries. Underground fires in Wales are found to occur frequently in the shales of the roof.

The hoisting accident at the Rufford shaft, related on p. 453 of COAL AGE, has aroused much question as to the need for ladders in shafts which are in process of sinking. It will be remembered that, owing to the fall of a water bucket, the scaffold beneath the workmen broke. They fell into the water and, probably, several of the 14 killed, perished by drowning.

Rope ladders have been suggested as furnishing the best mode of escape, but it was pointed out that if four ladders had been provided for 18 men, five or six, perhaps eight or ten, would have tried to reach one ladder, which could hardly serve as even a life line for them all. It was made apparent in the inquiry that an automatic controller should have been installed. This would have reduced the speed 42 ft. from the top of the shaft and have stopped the bucket on the surface. It was suggested that an emergency engine should have been provided so that the men could have been removed regardless of the disablement of the regular hoisting engine used for sinking purposes.

Mechanical Power in Mines

Taking as his subject the development of mechanical power in the mines of the northeastern coal field, R. Nelson, chief electrical inspector of mines, addressing the North of England branch of the Association of Mining Electrical Engineers, recalled the important part which mechanical power has played in enabling the coal-mining industry to meet the demands made upon it.

In 1911 there were in operation 511 collieries in Northumberland and Durham, and they produced 56,401,343 tons of coal, while the number of workmen employed was 216,733. Thus 260 tons were produced per person per annum. Comparing the figures for 1844, when the use of mechanical power was limited, with those for 1911, the number of workmen and the output had each been multiplied by about six, an indication of the extent to which the use of mechanical power had aided the development of coal mining, seeing that the output per man was almost maintained, although the daily hours of labor in coal mines had been reduced one-half ,and despite the fact that the more remote and less easily worked coal is now being mined. As regards the output per colliery, the figure for the year 1844, namely 77,600 tons, was increased to 110,000 tons by the year 1911.

Mr. Nelson then proceeded to say that the present century has so far witnessed nothing in mining comparable with the wide adoption of electricity. Motors totalling over 100,000 hp. are now at work in the mines of Northumberland and Durham. For the various operations of pumping, coal cutting and coal conveyance, electricity now stands preëminent, and a modern installation of electric motors may be made a thoroughly mechanical job, well able to withstand rough usage. Further, the apparatus may be so protected that if the current is rightly used, that is to say, only where the risk of accident arising therefrom is, so far as can be seen, negligible, the standard of safety is as high as that to be attained by any machinery in any situation.

Utilizing Steam Exhaust

The question of utilizing the power of exhaust steam is one which arises in the experience of most colliery managers, and as A. Benson reminded the Midland members of the National Association of Colliery Managers, in nearly every case the plant installed for this purpose necessarily includes a condenser. If electrical energy or compressed air is used at the mine, the most convenient way of dealing with the exhaust steam from the hoisting or other engines is to use it in a low-pressure turbine for driving electrical generators, or for actuating air compressors. Other circumstances might arise where more power is required from non-condensing engines such as the engine driving a fan, and in this case the difficulty might be met by installing a condenser of a suitable type. The advantage derived from the use of a condenser, as Mr. Benson stated are: A saving of steam of from 20 to 40 per cent, increased power of steam engine, economy of boiler plant and a supply of hot, pure feed water for the boilers.

Underground Fires

In a paper before the Scottish Institute of Mining Students, W. A. Taylor explained that apart from spontaneous ignition of the coal, fires may be caused underground by (1) ignition of timber resulting from the careless handling of naked lights; (2) badly constructed motor rooms, in which inflammable material is in too close proximity to starters, motors, cables, etc.; (3) the heating of timber or coal by steam pipes. The precautions to be taken where there is any danger of fire, suggested by the late Mr. Pickering, are recalled as follows: (a) Withdrawing as much timber from the waste as possible; (b) packing the waste as tightly as possible; (c) paying great attention to the building of side packs; (d) leaving as little coal standing as possible; (e) keeping the workings cool by means of an adequate amount of ventilation.

Blaes, a blue shale, is undoubtedly a primary cause of fires. During the past year the railway fill at Wellesley Colliery, near Methil, which is largely made up of blaes, caught fire in two places. Other embankments in the vicinity have also caught fire. A short time ago a fire took place at Rosie Colliery, belonging to the Wemyss Coal Co., in which the blaes overlying the Chemiss seam was found burning at the edge of an old pillar.

Hoisting Engineer's Eight-Hr. Day

British hoisting engineers now have their hours of employment regulated by law, the Home Secretary prescribing June 30, 1913, as the date after which a hoisting engineer may not be employed for more than eight hours in any one day, except as provided by general regulations.

Benham Coke Works, Wisconsin Steel Co.

By J. R. Foster*

SYNOPSIS—A small plant turning out a good product from beehive ovens. Two beds of coal are worked, the product of one being made into coke while that of the other goes to the market as a domestic fuel. Considerable attention is given to the sanitation of the town and the safety of the employees.

The coke works of the Wisconsin Steel Co. are situated on Big Looney Creek in Harlan County, Ky., 79 miles from Middlesboro on a branch of the Louisville & Nashville R.R. The plant proper is so located that it does not mar the beauty of the town and still is within short walking distance of all the laborers' homes.

The Geology of the Coal Beds

The region drained by the Poor Fork and Clover Fork of the Cumberland River includes the southern slope of the Pine Mountain and extends from the confluence of these two streams to Proctor Fork, a distance of about 38 miles, its extreme width being about 9 miles. Big Black Mountain, lying along the center of the region, is the most prominent feature of its topography, rising to a height of 4500 ft. above tidewater. This is the highest point in the state.

Except on the narrow flats of Poor Fork only the larger creeks have bottomlands wide enough for the economic location of coke ovens. The seams of coal in this field are divided into the upper and lower groups. Those of the lower productive group are locally designated as A, B, C and D, and are of varying section and value in the property.

Fig. 1 shows the relative distance between the seams. This group with associated rock is about 200 ft. thick. The bed A, or Harlan seam, is the lowest coal measure which has proven of any commercial value. The B seam is from 110 to 115 ft. above the A. The C, or Keokee bed, lies about 40 ft. above the B, while the D, or lower splint, is the highest of this group, lying about 75 ft. above the B.

An analysis of coal from the Keokee, or C seam, shows the following approximate results: Volatile matter 38 per cent., fixed carbon 58 per cent. and ash 2¼ per cent. The coke produced from this material contains about 1 per cent. volatile matter, 94 per cent. fixed carbon, one-half of one per cent. sulphur and a trace of phosphorus.

In many respects this coal bed resembles the Elk Horn seam of the Kentucky River section but no connection can be made between the two because of the disturbance made by the upheaval of the Pine Mountain shown in Plate 1. This coal is the one now being coked at this plant. Its height in Benham Spur averages 5 ft. 8 in.

The D, or Low Splint seam, is now operated by the company for domestic and foreign market purposes and gives the following test: Moisture, 5.012 per cent.; volatile combustible, 35.54 per cent.; fixed carbon, 52.002 per cent.; ash, 6.7855 per cent.; sulphur, 0.635 per cent.; phos., 0.025 per cent. This seam averages at the outcrop a height of 4 ft.

Only One Seam Is Coked

As stated above, the company is at present working two distinct beds of coal, one 60 ft. above the other.

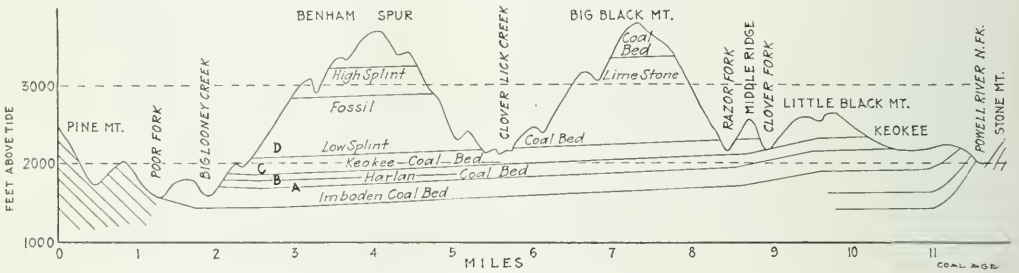


Fig. 1. Cross-Section of Coal-Bearing Strata near Benham, Ky.

Each has a separate tipple. The upper seam is worked entirely for domestic purposes and the market, none being used for the manufacture of coke. The coal is lowered to the tipple by two monitors of 5 tons capacity each, running on a three-rail, gravity incline. It is passed over gravity screens, making three sizes of coal.

The other or lower tipple is equipped with two Jeffrey swing-hammer crushers of 1500 tons capacity each. The maximum size of the crushed coal is ¼ in. and all crushing is done dry. A bin of 1200 tons capacity takes care of the fine material.

At present there are 300 coke ovens of the beehive type in operation and 108 under construction, requiring on the average 1400 tons to fill with 48-hr. charges.

All the machinery of the lower tipple is run by electric power except the crushers, which are driven by two steam engines of 150 hp. each. The power plant consists of a separate power house, equipped with two 250-kw. 250-volt generators and one 100-kw. 250-volt generator. The boiler house is equipped with four Stirling water-tube boilers of a total of 1400 hp., working under a steam pressure of 125 lb. The mine is worked on the four-entry system, all haulage being done by electric motors. It is ventilated by a Jeffrey fan, with an ultimate capacity of 200,000 cu.ft. per minute. This is now working at a capacity of 60,000 cu.ft. and a present speed of 30 r.p.m.

*Coke foreman, Wisconsin Steel Co., Benham, Ky.

As above stated, all the coke ovens in operation are of the beehive type. There are two parallel batteries, which contain 120 ovens each and one short battery of 60 ovens. The coal cokes exceedingly well, requiring little air, ¾-in. to 1-in. draft openings being used for 72-hr. coke and 1½-in. for 48-hr. coke. Six tons of coal are charged for 48-hr. and 7½ to 8 tons for 72-hr. coke.

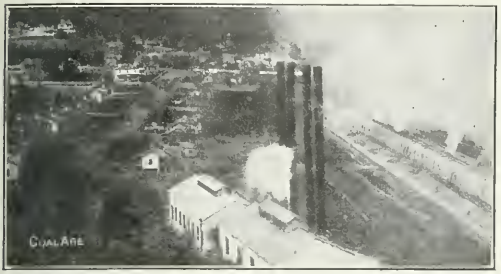


FIG. 2. BIRDSEYE VIEW OF BENHAM, SHOWING POWER PLANT AND COKE OVENS

The government test shows this coke to be among the best in the country. It has a light gray or silver color; the cell structure is small but not dense. It breaks in fingered pieces of fair size, which have a noticeable metallic ring. The 72-hr. charges make a high-grade foundry fuel. The per cent. of recovery is 63.5.

MUCH ATTENTION IS GIVEN SANITATION AND SAFETY

The town of Benham is laid off in streets and blocks, having the appearance of a well planned village rather than that of a mining camp. The houses vary in style and color, and all have hydrants in the back yards, the water supply coming from a reservoir, which is fed by mountain springs. This arrangement gives clean, wholesome water for domestic use, a separate system being provided for the power house and coke yard. The houses are

FIG. 3. BENHAM FIRST-AID TEAM AT PRACTICE

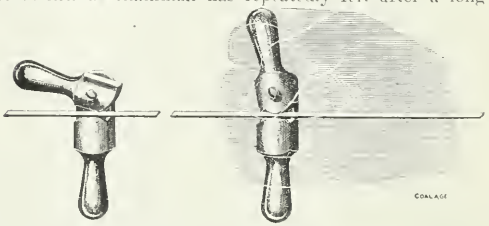
fenced and ample space is given for chicken yards and vegetable gardens at the back. Those desiring them are furnished with electric lights at a cost of 25c. per room per month.

Safety committees, made up of three men on each entry in the mine and in the different departments outside the mine, have been appointed. Each member wears a badge and it is his duty to observe closely and report any practice conflicting with the rules governing the operation of the mine or violating the mining laws of the state.

At the mouth of the main entry of the mine is printed in large letters, "Safety First." It will be easily perceived from the above that the company is sparing no effort to protect the lives and health of its employees. W. C. Tucker, superintendent, has given particular attention to the comfort and welfare of his men and to the sanitary condition of their surroundings.

A Tape Grip

The device illustrated below is a tape grip, and its purpose is to enable a chainman to obtain a firm hold at any desired point of the measuring line. In plumbing down a steep hill, using broken distances, it is not possible to make use of the hold furnished by the handles provided, but with the aid of this device, the tape can be stretched as tightly as if the whole line were being used. That soreness around the thumb and finger nails, which every conscientious chainman has repeatedly felt after a long



A DEVICE BY WHICH A TAPE CAN BE HELD AT ANY POINT ON ITS LENGTH

day's work, will be entirely removed by the use of this handy device, which he can slip in his pocket whenever it is not needed. The makers of the grip are Eugene Dietzgen Co., of 218 East Twenty-third St., New York City.

Increased Coal Output in Georgia

In 1912, for the first time in five years, the coal production of Georgia showed an increase over the preceding year, says E. W. Parker, of the United States Geological Survey. The production was 227,503 short tons, valued at $838,126. The decreased production in the last few years has been attributed to the withdrawal by the state of the convicts with which the mines had been operated.

The production in 1912 exceeded that of 1911 by 62,293 tons, or 37.7 per cent.; while the value increased $92,218. More than 50 per cent. of the increased production in 1912 was in the quantity of coal made into coke. This item amounting to 111,923 tons in 1912, against 72,677 tons in 1911, or a gain of 39,246 tons.

The total area of the coal field in Georgia is estimated at 157 sq.mi., this being the smallest coal area in the Appalachian states and not all of it workable. All of the production in 1912 was by two companies operating in Walker County.

On account of its high percentage of fixed carbon (80) and its low sulphur content, the Lookout Mountain coal of Walker County gives a large product of excellent coke, which is sold to the furnaces of Chattanooga and other points in Tennessee and Georgia.

An Italian Aërial Tramway

By Our Berlin Correspondent

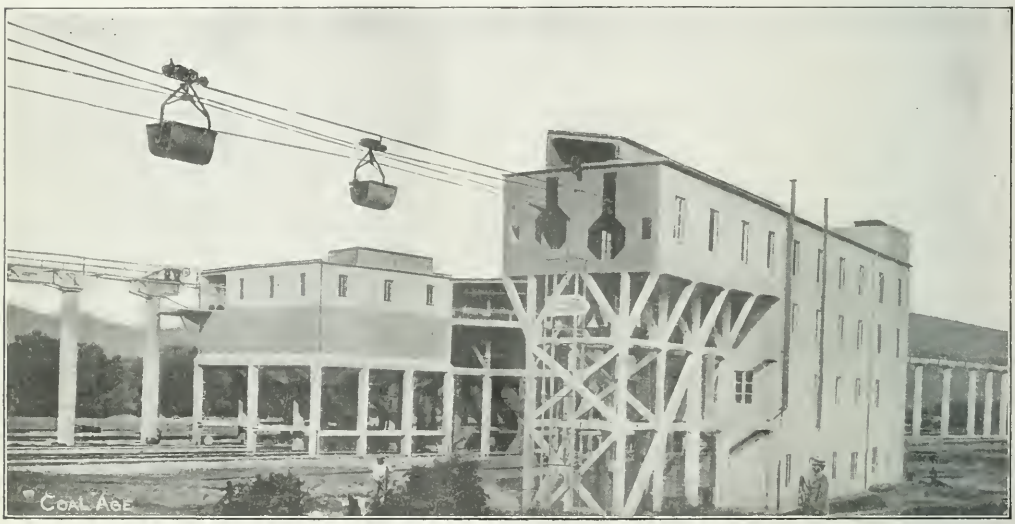
SYNOPSIS—A description of an aërial tramway which was installed to transport coal over rugged country from the harbor of Savona to the town of San Giuseppe, supplementing the facilities of a single-track railway, upon which the towns of northern Italy were dependent for their supply of coal and which could not be duplicated on account of the expense of construction.

The industries of northern Italy mainly depend for their supply of coal on the two harbors of Genoa and Savona, which, though near together, are separated by a precipitous spur of the Apennines which until a short time ago made any intercommunication impossible. Since Savona has only a single-track railroad to the interior, there were frequent disturbances in the coal supply, affecting the industry of Milan, Turin, etc. At times more than 30 coal barges would lie in the harbor unable to discharge their cargo. An improvement of this state of affairs was prevented by the expense which the installation of a second railway line, and the reconstruction of the quays of Savona would have entailed.

An Aërial Tramway 11 Miles Long

In order to avoid this expense, two Italian engineers, Carrissimo and Crotti, drew up plans for an aërial tramway to attain the same end. This plan required only small pocket installations at the terminal of the railway to act as buffers between the supply from the vessels and the actual demand. The terminal point of the ropeway was to be the railway station of San Giuseppe, which is 10.9 miles from Savona on the Lombardy slope of the Apennines and where there are railway connections with Turin and Milan. The scheme required the transportation of 900,000 to 1,200,000 tons per annum, which was found to be readily obtainable by means of a Pohlig aërial tramway. Therefore, Messrs. J. Pohlig, Ltd., with whom the scheme had been worked out, were entrusted with the installation, and the following plan was adopted:

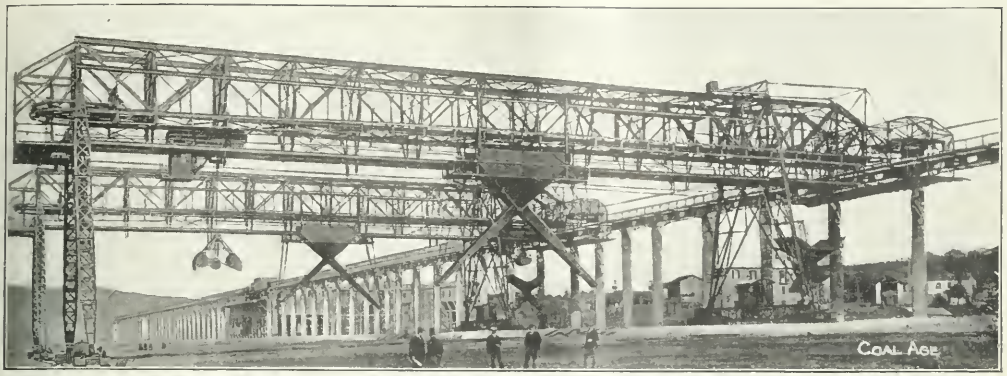
Lighters were designed for receiving buckets of 30 tons capacity. These buckets, which empty at the bottom, are lifted by gantry cranes and unloaded into pockets which serve as the loading station for the aërial tramway to which they are immediately connected. The rope railway, 10.9 miles in length, terminates at San Giuseppe in a telpher line about 2950 ft. long where it passes over pockets and open store yards. The coal from the pockets is loaded into railway cars through chutes, but on the open store yards, loading bridges and crabs with automatic grabs had to be provided.



The San Giuseppe Unloading Station, Showing the Concrete Construction

The Plant at Savona Harbor

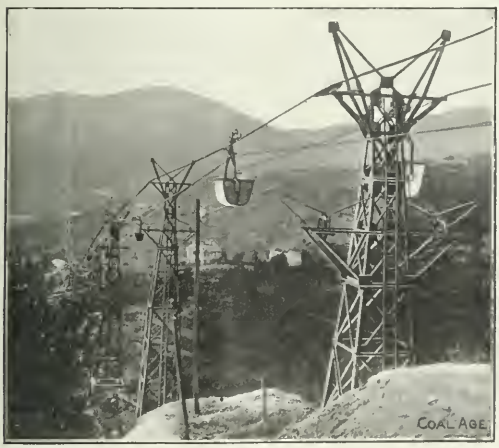
The whole plant consists of three main parts: First, lighters, cranes and pockets in Savona Harbor to unload the coal; secondly, the Savona, San Giuseppe aërial tramway; and, thirdly, a storing and unloading plant at San Giuseppe. In order to take up a minimum of the available space on the sea coast, the pockets in Savona Harbor were built out over the water as far as possible. They are made of reinforced concrete throughout and rest on concrete foundations. Each of the 24 pockets is 23x26.24 ft. in cross-section and 29.5 ft. in height, exclusive of the discharging funnel. Each compartment has a capacity of 17,650 cu.ft., corresponding to 400 tons of coal. Above these pockets, 59 ft. above the level of the water, there are three traveling gantry cranes, which can advance over the water on a projecting structure carried by pillars in order to pick up the buckets from the lighters.



View of Two Unloading Bridges and Storage Yard

A Bucket with Three Lifting Gears

Each crane has a main and two auxiliary lifting gears operated from a common lifting motor. The bucket is of the clam-shell type with two parts hinged near the top. From the main lifting gear there is suspended a transversal beam which when lowered causes the bucket to open. Transversal pieces suspended from the two auxiliary lifting gears, support the outside edges of the bucket. When raising coal, the three lifting gears are coupled together and thus operate jointly; in unloading, the two



A General View of the Line

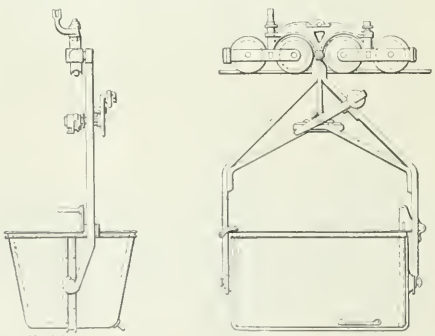
auxiliary lifting gears are kept in position while the main gear is lowered, causing the bucket to open.

The lifting motor of each crane develops 150 hp. and is designed to lift a loaded bucket 10 tons in weight at a speed of 39.1 ft. per min. It operates both the main and the auxiliary lifting gears. The crane travels at a speed of 161 ft. per min., the traversing motor developing 45 hp.; the crab is traversed by a 14-hp. motor at a speed of 82 ft. per min. Continuous current at 250 volts, reduced by a convertor from 22,000-volt three-phase current is used for operating the crane, a storage battery balancing any heavy fluctuations in current consumption.

The lighters transporting the filled buckets are built of iron throughout and are provided with double gearing fore and aft, being operated by a 10-hp. electric motor, fed from a small accumulator battery which is recharged during the time the lighters are being unloaded in front of the pockets.

A Long Ropeway with Two Large Turns

The loading station of the aërial tramway immediately adjoins the pocket. The suspended ropeway is 57,000 ft. in length and comprises five sections with intermediary stations at the points of connection. Section 1, which is 16,080 ft. in length, goes from the terminal station of San Giuseppe as far as Sella, and reaches at a distance of 2.4 miles the greatest altitude of the line, which is 1705



Bucket Showing Poihlig Traversing Gear

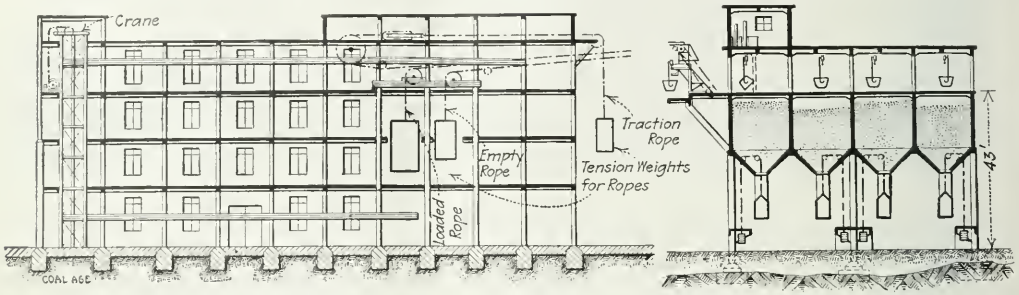
ft. The ropeway then continues in a straight line as far as Caribona, a distance of 9975 ft., and from there goes to Ciatti, 18,050 ft. At Ciatti section 3 joins section 1, which is 9300 ft. long, the ropeway at this station making an angle of about 111 deg. At Lorenzo station there is another point of dellection, the last section, 3700 ft. in length, between San Lorenzo and Savona being connected at an angle of about 105 degrees.

The track of this aërial tramway consists of locked steel cables, the load cable being 2 in. and the no-load cable 1.38 in. in diameter, with a breaking strength of 135,000 lb. per sq.in. The cables are carried by 208 iron

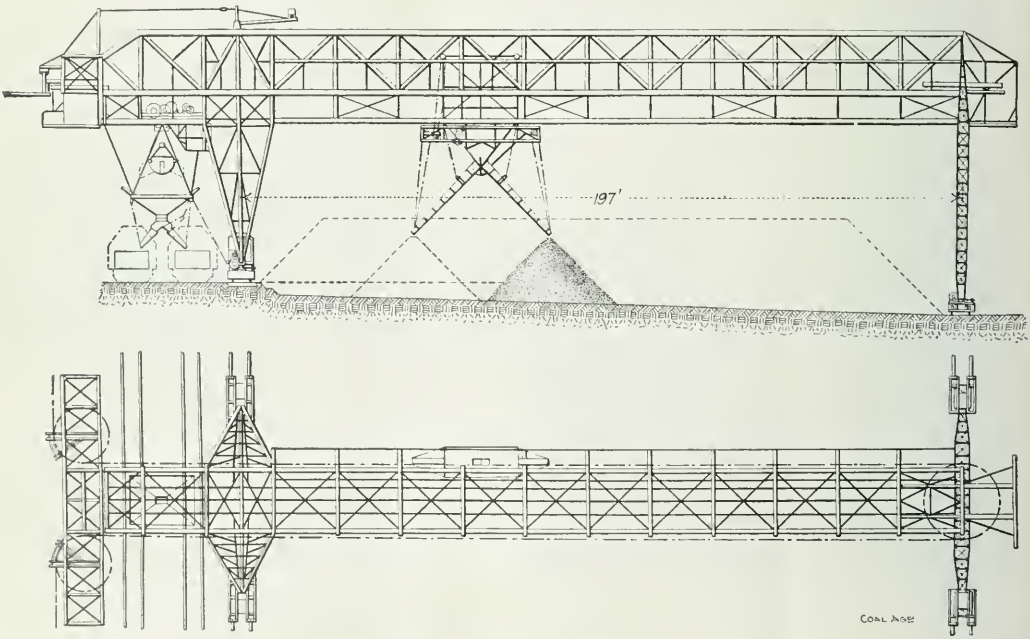
framework supports, the maximum span between two supports being 1068 ft., and the maximum height of supports 152 ft. The supporting cable is subdivided into sections of an average length of 4920 ft., which are substantially moored at one end, being kept taut at the other end by a weight. The traction cable is one inch in diameter and consists of steel wire of a breaking strength of 255,000 lb. per sq.in., and 1.58 lb. per ft. in weight.

the other buildings, is made of reinforced concrete. It is carried by hollow pillars 4.6 ft. in diameter, and about 52.5 ft. in height, which are placed at distances of 328 ft., at which point an interruption is made in the bridge to allow for temperature expansion. The two tracks for going and coming on the bridge are parallel to one another and are situated 13 ft. apart.

The aërial tramway buckets are driven on the elevated



Side and End Elevation of the San Giuseppe Station



Plan and Elevation of the Loading Bridges

Each driving station is equipped with two 180-kw., 3-phase-current motors, one of which serves as a standby. The working tension of 500 volts is obtained by transforming the 22,000-volt current supplied to the railway.

The Telpher Plant at San Giuseppe

At the terminal station the aërial tramway is connected immediately to an extensive telpher plant, the tracks of which are installed partly above the pockets, and partly on an elevated bridge 2955 ft. in length, which, like all

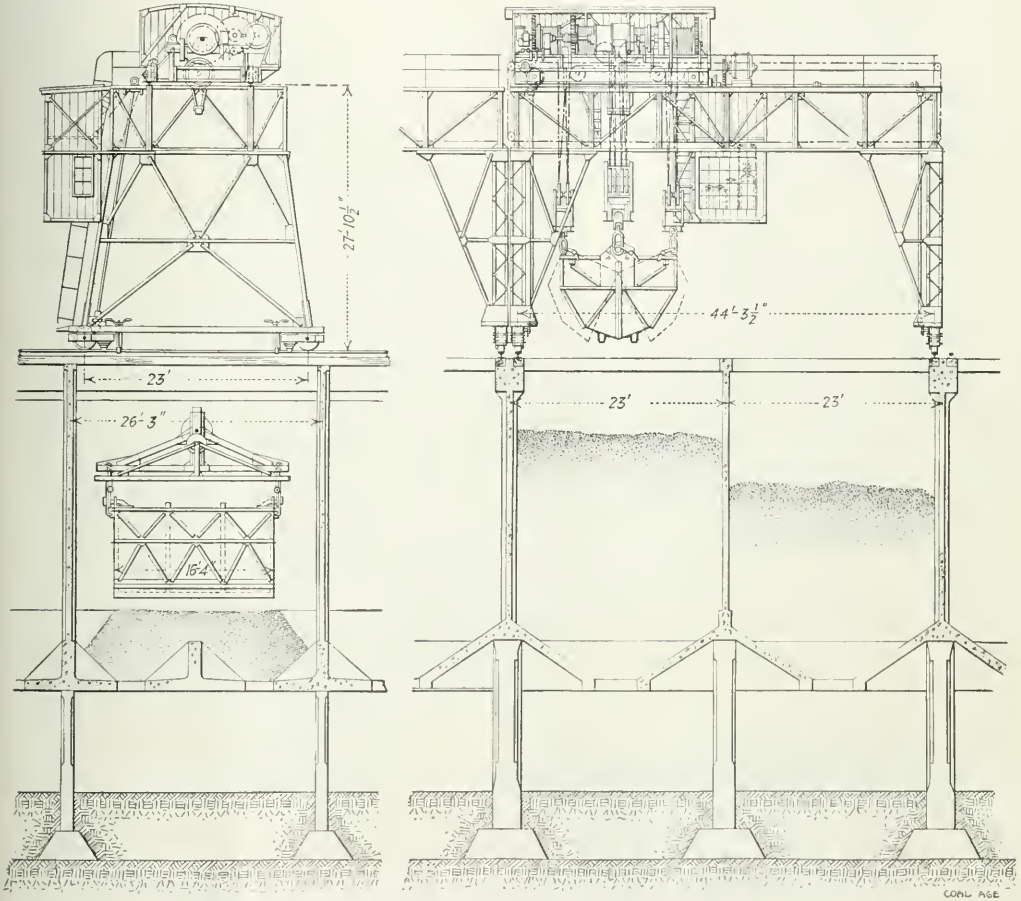
bridge by means of an endless cable arranged above the rails, the driving gear being situated near the center of the elevated bridge and operated by a 35-hp. motor. They are each designed for carrying 2200 to 2425 lb. of coal, and are about 3300 ft. in gross weight when fully loaded. As the ordinary two-wheel traveling gears could not be used to transport such high individual loads, and the adoption of twin traveling gears would have given rise to many drawbacks, a special type of four-wheel traveling gear was adopted, which has given satisfactory results in

connection with a number of heavy wire-rope tramways. The distinctive feature of the traveling gear is the design of the connecting beam above the traveling rollers. It has a hollow cast-steel body with an elliptical cross-section and possesses an extremely high resistance to torsion.

System of Unloading

The loaded cars arriving at the unloading stations are uncoupled automatically from the traction cables. They are then moved by hand onto the telpher tracks above the pockets and there unloaded. Whenever the coal is to be unloaded on the storage yard, the cars are moved by hand to the coupling station on the elevated bridge, where they are automatically coupled to the cables. The cars then travel along the cables on the elevated bridge, passing onto one or another of the traveling unloading bridges in order there to be unloaded automatically. These are each 197 ft. in span, and have runways 279 ft. in length.

While the support turned toward the elevated bridge is an ordinary pillar, the other has been designed as a gantry, each foot of the former resting on four pairs of wheels traveling on a standard-gage double track and operated by a 50-hp. motor. Each of the two feet of the gantry pillar has a traversing gear with two pairs of traveling wheels which run likewise on a standard-gage track, being operated by a 25-hp. motor. The two supports thus have self-contained drives, the steering and balancing of any speed difference being effected from the driver's stand, which is fitted into the stationary support.



Gantry Cranes and Dropping Buckets over Concrete Pockets

The Three Runways

The traveling speed of the bridge is 49 ft. per min. There are three runways on the bridge: First, the crab runway, which is suspended by means of brackets from the lower flange. Second, that carrying the wire rope resting on lateral projections of the lower flange. Third, the runway of the hoppers into which the cableway cars are unloaded. These hoppers, which are traversed at a speed of 79 ft. per min. by a special 8-hp. gear, have two chutes about 20 ft. in length, the lower half of which can be folded up. The crab comprises a 23-hp. traversing

motor and a 93-hp. lifting motor, the traveling speed being 591 ft., and the lifting speed 164 ft. per minute.

It is expected eventually to extend each of the two loading bridges by an additional bridge 187 ft. in length. The pockets at San Giuseppe have 48 compartments, 16½ x16½ ft. in cross-section and 16½ ft. in height. Each of these compartments has a capacity of 100 tons, and the whole plant a capacity of 4800 tons of coal. The store yard is 646,000 sq.ft. in area and has been designed to receive 300,000 tons of coal.

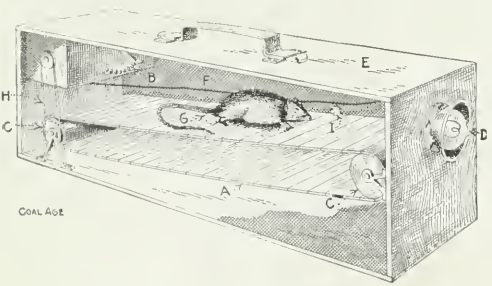
The whole plant as now completed is able to transport 900,000 to 1,200,000 tons of coal. As the need occurs, which is likely to be soon, this is to be extended by the addition of another aërial tramway of equal dimensions parallel to the former, and with duplicate pockets and loading devices at Savona Harbor, thus raising the transportation capacity to twice the present figure.

I am indebted to the *Zeitschrift des Vereines deutscher Ingenieure* for permission to publish the line drawings which accompany this article.

A Suggestion in Mine Safety Lamps

A contributor with a somewhat inventive turn of mind, and possessed of a desire to accomplish the dual purpose of detecting dangerous gas, and at the same time illuminating the gloomy corridors and passages of the mine, has sent us the accompanying drawing.

This device is simple, and requires but slight explanation. *A* is the apron of a tread mill, carried upon the ball-bearing rollers *C*. *B* is a gas-tight box containing a small electric generator, which is driven from the tread mill tail roller by means of the belt *H*. The terminals of the dynamo are connected through suitable cables to the electric bulb *D*, inclosed in an efficient reflector. The sides of the box, as may be seen in the drawing, are composed of wire netting *M*, which allows a free and practically unobstructed circulation of the mine atmosphere.



THE SUGGESTION

The motive power is furnished by a nimble and sinewy mine rat, which, for best results, should weigh approximately 3 lb., and stand about one hand, or less, high at the withers. As an incentive for vigorous and long continued action, a small piece of fragrant cheese may be suspended in the manner shown at *I*.

It is well known that all animals are easily susceptible to the action of mine gases, and the presence of the latter could therefore be easily detected from the behavior of the rat, thus dispensing with the necessity of carrying an innocent and attractive song bird to a hideous death. Furthermore, all animals work best when in their natural environment. In the dark and cavernous mines the rat, above all other creatures, should be strictly at home, and, with such an irresistible attraction before his nose as we have above named, he should be capable of proceeding at top speed (say 15 to 17 knots per hour) for as long a time as the oxygen will last in the helmet cartridges, or while the fireboss is making his noctural peregrination. Such a speed will make the dynamo fairly "hump itself," and send a clear penetrating beam of light far ahead.

As soon as the gas inspection is finished, or the helmet man returns to his base of supplies, the faithful animal upon the tread mill may be gently removed, carefully curried and rubbed down, given food and water, and allowed to sleep and recuperate until the next shift.

It is claimed that many advantages are to be gained from the employment of this ingenious, gas-detecting light-giving device. The supply of motive power is always abundant and cheap around coal mines, so much so, in fact, that it may be rightfully considered as a by-product. The expense of feeding an adequate number of rats while in captivity is small, since to keep them in good running condition they should not be allowed to acquire superfluous flesh, as this renders them phlegmatic and short-winded. Their care would require the services of a trained veterinary as such hardy animals thrive naturally when only sufficiently fed and properly exercised. The cost of their capture in most cases is merely nominal, amounting only to keeping an efficient wire trap baited with a few kernels of corn or other suitable lure.

L'ENVOI

"A little nonsense now and then
Is relished e'en by mining men."

[When this picture of the rat in his little box was shown to an inventive friend and the operation of this wonderful apparatus had been described to him, the dream light came into his eyes, and sitting down he composed the following lyric, in broad daylight and without the use of any subtle stimulants.—EDITOR.]

Here a little rat you see,
Held in dread captivity,
Chasing after toasted cheese
Instead of catching hungry fleas,
Doing at last some useful work,
Proving to all he is no shirk.

The rat, we almost all suppose,
In place of what we here disclose,
To be a dirty, lousy beast
Inclined upon our lunch to feast,
Tipping over our dinner cans
With scientific ratty plans.

But now he's found a job at last
And on a tread mill running fast,
He works away with all his might
To turn the wheels that give us light,
Until the time—alas!—alas!
He's overcome by deadly gas!

Say, who the —— was the —— fool cuss
Who invented this marvelous appa-rat-us.

EDITORIALS

Colliery Boiler Plants

An editorial appearing in the June 17 issue of *Power* entitled "Colliery Boiler Plants," calls attention to the lax and wasteful methods and practices prevailing in many, if not most, of such installations. The article says in part:

Many such installations are very dirty with coal strewn thickly over the floor and ashpits nearly full of ashes. When the ashpit is cleaned out, but scant attempt is made to prevent mixing good coal with the ashes and throwing all out together. Then, again, neglect is indicated by the cracked condition of the boiler settings, especially where return-tubular boilers are used, and by badly cracked furnace fronts and warped firedoors. Many of the latter are so out of shape that it is impossible to shut them tightly.

Leakage of air through the cracked boiler setting into the combustion chamber and an excessive amount of air leakage past the furnace doors above the fire produces but one result, improper combustion.

If the exteriors of the boilers show neglect, it is natural to assume that the interiors are no better, and, if so, many of them are evidently operating under dangerous conditions. The few colliery plants operating without this neglect of economy and safety, for some are kept clean and orderly, by contrast, reflect the greater discredit on the rest.

Reasons for this state of affairs are cheap coal, indifference, ignorance and lack of opportunity. The first three probably have much more to do with the effect than the last named.

None of these reasons is sufficient to excuse the situation. Even if the coal is cheap, it is worth as much in the plant coal bin as on a car ready for shipment. If a ton of coal is worth a dollar when ready for the market it is worth a dollar in the boiler room. Every ton of coal needlessly consumed in the boiler furnace is a dollar thrown away.

An increase in the selling price of coal is maintained by the mine operators as justifiable, because of the increased cost of production, but has any attention been given to the economical operation of the power plant which produces the steam and power necessary as an element in economical production? We believe not in a large number of installations.

Is not the boiler plant left in the hands of men who are coal handlers rather than men capable of keeping the boilers in proper condition? Although neglect plays an important part in the conditions existing in so many of these mine plants it would appear that ignorance regarding boiler economy and safe operation is largely responsible.

In a large measure we are inclined to agree with rather than dissent from the views of our contemporary. The conditions existing in many colliery plants are highly reprehensible and deserving of such bitter condemnation as is given above. On the other hand, there exist in many instances, circumstances which may strongly mitigate an apparent evil.

At many mines, particularly in the bituminous region where coal is sized for the market, it is only the poorest and least valuable of fuel that finds its way to the boiler furnaces. In many such plants, the best grade of slack that it is possible to secure will bring a price which is far below the cost of production. Frequently, also, the material removed from the coal in the picking process contains a considerable amount of combustible matter, and this refuse, which would otherwise have to be disposed of at an appreciable cost, is burned under the boilers.

While there is no possible excuse for dangerous methods of procedure in boiler practice, or for slovenliness in plant operation, regardless of the quality of fuel burned, yet we would call attention to the fact that good engineering in the operation of a plant upon coal costing $1 per ton may be decidedly different from the economical operation of the same plant on a fuel which costs only 25 or 30c. per ton. This practice would again vary upon the use of mine refuse, for which no legitimate charge in dollars and cents could be made.

In such a case, it may be quite true that care and forethought, together with a small investment in cash, may effect a saving of one-half in the amount of fuel burned. Considering the monetary value of the conserved material, however, we might well ask, in the language of Petroleum V. Nasby, "how much is twice nuthing?"

The Evolution of the Mine Foreman

There is some truth in the statement made by a Pennsylvania Engineer, in the preceding issue, that the mine foreman has been a victim of two opposing duties.

The belief is commonly expressed, whether it be true or false, that the cause of the inefficiency of our laws is to be found in the fact that those who enforce them are "openly and notoriously" in the pay and financial or moral control of those against whom the enforcement must proceed. "Open and notorious" indeed is the control of the mine foreman, when that control is embodied in the state statute, when all pay, emoluments, duration of service, reputation, everything in short, are dependent on one of the parties, which he is required to keep amenable to those statutes. It is as if a federal law provided that each distillery hire a gager, who shall determine the taxes upon the product of the still, or each abbatoir shall engage enough inspectors and bacteriologists to protect the public against diseased meats, said gagers, inspectors and bacteriologists to be answerable for all the acts of their employers, yet to look to them for every tittle of compensation on which they and their families depend.

The existing enactments resemble a contract so written that the contractor is bound to provide a "qualified" inspector of the work thereby contracted, is to select and to pay him with privilege to remove him at his pleasure, without reason given, is permitted to give him enough other duties to keep him continuously employed and yet provides that the decision of the said inspector or his underlings is binding should any question arise as to compliance with the specifications. But there is yet another provision that every six months or so, a real, independent inspector shall spend a day or half day on the job ordering a correction of all those defects which the *ex-parte* inspector has been unable to cover up for his employer.

In these facts are to be found an important justification of the acts about to be passed or already in force making the operator liable for accidents to the employee. The monetary interest of the operator is then centered in the safety of the men he employs and the foreman knows he is as much liable to the employer for loss of life as for waste of material or high cost of coal.

In all branches of human activity are sordid and reckless persons, and legislation which will make them pay the costs of their penuriousness and of their gambles with death is usually in the interest of humanity. There are also careless and foolish workmen. It has been hard to control such men hitherto, but it is likely that when the operator has to compensate the families of such men in case of death, men with dependents will find it hard to get employment anywhere unless they subject themselves to such reasonable discipline as will assure their safety. It is unfortunate that the laws have been so weak that the disciplining can only be effectual when the operator, who has normally nothing at stake, is compelled with some measure of injustice to restrain the wilful workman from his own destruction.

The operators who have been making money have been disposed to compel the foremen and their workingmen, when compulsion was necessary, to comply with the law, but some of those who were hardly able to make a profit have been disposed to content themselves with doing only what the inspector demanded.

Perhaps it may be necessary under a liability law to appoint a safety inspector in every mine, and it may yet come about that he will be appointed like boiler and elevator inspectors by the company which assumes the operator's risk, only his work will be continuously at one mine and not an unending travel from operation to operation. His mind will be as keenly on the liability per ton produced as the foreman's is on cost per ton and output per running day.

The West Virginia Investigation

The majority of people in this country would like to know the real truth concerning the labor situation on Paint and Cabin Creeks in West Virginia. The interest extends to the whole mass of people and is not confined to those engaged in mining, though their interest is probably greater. That disinterested citizens can and will judge fairly concerning any question, when the truth is laid before them, is demonstrated every day by the jury system used as a basis in our trial of causes. It is hard to know what the true facts are in West Virginia.

Everyone is aware that there is trouble at the mines, that a controversy is being carried on between those who own the mines and those who work in them. Some facts concerning it seem to be well established, as they are often repeated without denial. It is true that men have been employed to guard the mines and that there have been fights between them and others, so that it has been considered necessary to declare martial law throughout a certain region. It is true, also, that men have refused to work and that some mines have been idle. Statements have been issued that no strike was in progress and then a contradiction has been made. Yet all the signs of a strike and its accompanying trouble exist. From all the mass of contradictory statements it is hard to find out what is and what is not so.

It was to be hoped that the investigation by the Senate committee would disclose the true situation, but confidence that it will do so is destroyed, when the investigators do not conduct themselves in the manner of impartial judges. It is rather shocking to read in the papers that one member of the investigating committee made a speech in church on a recent Sunday in which he used flowery language concerning the fair state of West Virginia, and then boldly stated that some of its citizens had been consumed by greed. When it is realized that this same man, as a member of the committee, had listened only to the testimony of one side, it is hard to believe the mine owners will get a square deal. At a later date it is reported that the same senator used abusive language toward a man appearing before the committee.

This is not the attitude of a judge quietly seeking justice for all the people, but that of a politician to whom his colleagues have granted the favor of a place on an investigating committee, that he may have the opportunity to gain publicity so as to promote his political future.

It is doubtful if any real good can come from an inquiry conducted in such a spirit. An investigation of another sort, however, might be able to bring about an adjustment of relations between owners and miners which would result in lasting peace and prosperity.

The Operators' Attitude toward Legislation

The addresses and articles delivered by operators before institutes and contributed to the technical press are an answer to the statement that the mine owner manifests no interest in safety. Representatives of capital serve on committees to formulate new mining laws and the measures they aid to draft completely refute the assertions of those who would represent them as callous to the needs of the mine worker.

We are convinced that there are many operators who are anxious to make their mines as safe as they can be made. They will not be content simply with having their men live longer than the average man, but desire that no employee shall suffer by reason of any oversight or omitted precaution of which they may be guilty.

But as long as the law does not compel sufficient safety on all, as long as one state is more careless than another, so long the operator who would make his mines the last word in security will hesitate to expend the money which now shields him from bankruptcy.

Many a man, able to see a balance in normal years, only by closing his eyes to the value of his coal in the hill and to the depreciation of his plant, is fain to go not a step beyond the law's imperative demands till his neighbors are compelled by a new enactment to make like improvements.

This is one reason why the anthracite corporations and the subsidiaries of the several steel companies, have been more active than other bodies. Those organizations could see a balance at the end of the year's expenditures and they have unstintedly spent money which the law did not demand, for the comfort and happiness of their employees. Sometimes we wonder whether a stockholder, filled with the narrowness which only too often distinguishes those who seek to enforce the law against corporations, might not bring suit against these beneficent organizations for following the dictates of the company soul rather than the undoubted law of the land, which requires that the corporation shall conduct its business to the best interests of those who have intrusted it with their money, subject only to the law's restrictions.

SOCIOLOGICAL DEPARTMENT

Is the First-Aid Situation Muddled?

By Daniel J. Boyle*

I read the remarks entitled "The First-Aid Muddle" in your issue of May 17 with some concern. The physician who wrote this article deplores the attempt of the promoters of first aid, in this country, to perfect and promote first aid among workers in hazardous occupations.

My experience in first-aid work leads me to believe that there cannot be a definite system of treatment which will apply to all conditions. Even the St. John Ambulance Corps does not specify any individual preference for any special form of artificial respiration or of applying bandages. Moreover, it does not advocate any special appliance for use in treating injured persons. Different conditions demand varying methods of treatment.

There is an essential difference between the conditions on the field in which a meet is held from those which obtain in a mine, for the rescuemen underground do not have all kinds of antiseptic bandages and suitable appliances with which to perform their work.

It is possible that the first-aid man will have to use, in the actual conditions which confront him, part of his own clothing, pieces of lagging or bark, to bind and hold respectively a simple, a compound or even comminuted fracture.

Moreover in the case of artificial respiration, it must be remembered that the victim may be injured in several parts of the body and his ribs may be broken, or he may also be seriously burned about the chest or arms. If this is the case, he could not be treated by the Sylvester, Schafer, or Lathrop method. In fact, no form of artificial respiration could be used which would require that the operator should touch the burned or broken parts of the arms, chest or abdomen. For an injury such as that described, Laborde's method of artificial respiration, or some like method, would have to be practiced. I believe that any of these methods are good when you can use them, and that due credit to their value should be accorded by physicians and by the men whom they train. They should all be taught to first-aid men.

The first thing which rescuemen should learn is how to stop bleeding, for in case of an accident which severs a blood vessel or in any way produces a marked effusion of blood the injured man must be treated for this injury whether he is conscious or not. After the bleeding has been stopped respiration should be restored.

The physician's remarks that too much stress was placed on aseptic treatment of wounds in according the demerits at a meet are, it seems to me, unfair. No lesson can be more important to the average first-aid man. Only a few years ago, when patients were bleeding, it was thought the proper treatment to take a cud of tobacco from the mouth and put it on the cut. The man who gave up his quid may have had a cankerous mouth, or may have been a sufferer from tuberculosis, but his chew of tobacco was a styptic and therefore was thought available for use.

The Bureau of Mines, in calling a conference of first-aid workers at Pittsburgh, Penn., Sept. 25, 1912, and in forming the American Mine Safety Association, performed a valuable service to the mining community. I do not think that the principal results to be attained by such a conference, or by the formation of such an association, are to be found in the formulation of a series of standards for first-aid work. Its largest function is educational.

*Fern Glen, Penn.

A British House-Building Experiment

The house shown in the illustration was designed by J. M. Milner, vicar of Poundstock, Cornwall, England. The foundation walls are built by sections in what is termed a "pattern mould," and by employing, in part, modern patented materials, a six-room cottage of two stories can be erected for $650.

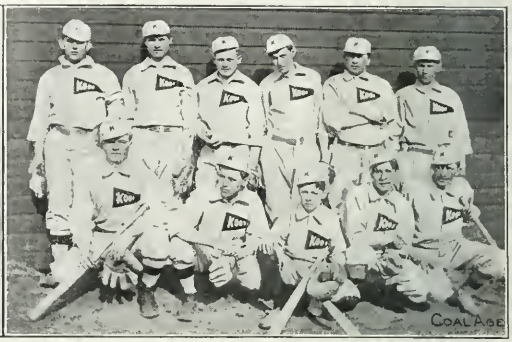
The kitchen or living room measures 15x12 ft. and the height is 9 ft. 6 in. except for 3 ft. on one side where a bacon rack is hung. The stove is of cast iron, having a boiler set in brickwork and furnished with a wide shelf ("hob"). The chimney is of brick. A cupboard is provided to serve as a larder. The scullery contains a sink with a tap from the rain-water tank, while in a recess is a Thompson seamless copper boiler, with the flue entering the kitchen chimney.

An English Experiment in Cheap Housing

The other rooms are a large bedroom, two smaller sleeping rooms, and a small parlor. The walls are of weather-boarding either over a thick vulcanized sheeting or asbestos-cement sheets $\frac{3}{16}$ in. thick nailed to 3x2-in. framing and lined with $\frac{3}{4}$-in. match-boarding. These walls are of good red fir and are rain-proof. They are quite stiff and it is claimed that they are dryer than those of a stone house, the woodwork below the vulcanite being better protected than it is in a building constructed of stone.

The Human Element in Coal Mining

Car Haul and Tipple



The Baseball Team and Its Mascot

THE KOOI PEOPLE AT WORK AND PLAY

Correct Manner of Placing on Stretcher

Squad About to Carry Patient Up-Hill

THE RESCUE TEAM AT KOOI, WYO.

The Victim Covered by a Fall of Rock

The Broken Leg and Arm Are Bandaged

FIRST-AID SQUAD OF VANDALIA COAL CO., INDIANAPOLIS, IND.

DISCUSSION BY READERS

Mixed Lights in Mining

Letter No. 1—It is an interesting fact that in mines where the workings are extensive, certain sections may generate gas in sufficient quantities to necessitate the use of safety lamps. If the ventilating currents, however, are kept separate, no trace of gas may ever be found in the other sections of the mine. Where such conditions exist, I believe it is entirely consistent with safety, if the ventilating system is properly planned, and the overcasts and stoppings are substantially constructed, to use open lights in the nongaseous sections.

Where this is done it is advisable to use an exhaust fan and great care must be exercised to keep open lights off of the return airway. The overcasts should be of concrete reinforced with discarded mine rails and made sufficiently strong to resist the force of a possible explosion. The gaseous section of the mine should, so far as possible, be isolated from the other workings, by means of barrier pillars; but where necessary connections have been made, the stoppings in such openings should be constructed of reinforced-concrete or stone, and should be built in pairs. Then, in case of the failure of one, the probabilities are that the force of the explosion will have spent itself to such a degree that the remaining stoppings will be able to resist being blown out

I believe that the above method of isolating each section of the mine ventilated by a different current if introduced into every mine, would prove equally valuable in localizing the effect of a dust explosion.

Ernest L. Bailey, Mining Engineer.
Crumpler, W. Va.

Letter No. 2—The large majority of miners prefer to use an open light in place of a safety lamp, because it is more convenient and gives a better light, which enables them to perform more work in the same time. On this account, the miners and, too often, the mine officials are willing to assume a considerable risk in order to get out more coal, increase the output of the mine and keep down the operating expenses.

Most miners and many mine officials have never made a study of the formation and occurrence of natural gases in the strata overlying or underlying the seam of coal. They do not realize as they should that the working places and other parts of the mine that are at present free from gas may become gaseous, and that dangerous bodies of firedamp may accumulate, at any time, in such mines.

A study of the subject of mine gases makes it clear that it is practically impossible to determine, with any exactness, where gas may be expected in coal formations, or the exact location of pockets of gas, which occur frequently in the strata. Also, it is impossible to determine the amount of gas that may be given off in the mine workings.

After all that has been written in regard to mine explosions, it is quite clear that there is no means of determining, in advance, the strength and magnitude that an explosion of gas or dust in the mine may attain when such an explosion has once originated. For this reason, it is better practice to try and prevent the occurrence of an explosion by avoiding the ignition of gas or dust in the mine atmosphere. There are too many lives and too much property at stake to run any risk in this regard. In most cases, it will be found that the increased cost of operation, due to the use of safety lamps, will be offset by the increased protection afforded thereby, in the operation of the mine—protection against fire and explosion.

In my opinion, all mines where gas has been detected should be worked exclusively with safety lamps. When mines are worked with mixed lights, the miners are apt to think that open lights being used in one part of the mine, they can be used also in other portions. They become careless and often proceed to enter places where gas may exist, unconscious that they have an open light on their heads, until they are made aware of the fact by the ignition of the gas at the roof. Even with strict mine regulations, it is difficult to avoid such an occurrence where mixed lights are used.

I believe that the exclusive use of safety lamps throughout the mine where gas is generated in any part of the workings, has a tendency to make the miners more careful in regard to the gas, which they know exists in places. Safety lamps, also, offer a greater amount of protection, because they indicate more clearly the presence of dangerous gas in the mine atmosphere, and this warning permits the miner to retreat to a place of safety without igniting the gas.

Benjamin Bartill.
Johnstown, Penn.

Shooting Mine Timber

The seam of coal we are working is known as the "Big Seam." A section of the seam is as follows:

Top coal	2 ft. 0 in.
Rock	0 ft. 8 in.
Coal	2 ft. 0 in.
Rock	1 ft. 8 in.
Coal	3 ft. 0 in.
Total	9 ft. 4 in.

The two lower seams of coal and the one of rock between them are worked out as the rooms are driven up, the remaining top coal and rock being left up until the room has reached its limit, when they are taken down as the pillars are drawn back, or in "retreating."

Gas is found to some extent in this mine, and the method employed here of shooting instead of drawing the timbers when retreating is calculated to cause trouble. Two sticks of permitted explosives are used in each timber, making an average of 12 lb. of powder exploded on the air.

The Sylvester machine, recently described in the article, "Recovery of Mine Timber," Apr. 5, p. 529, could undoubtedly be used to advantage in some of the rooms,

in this mine; but in other rooms it could not be put into practical use, owing to the waste being built up to within a foot of the roof.

If any reader has worked a similar seam, I would be glad to know the method he employed for drawing the timbers.

MINER.

Littleton, Ala.

Effect of Safety Lamps on Eyesight

There appeared some time since, in COAL AGE (Vol. 2, p. 734), a brief comment on the use of the safety lamp as affecting the eyesight of miners. The article stated three objections to the use of the safety lamp; namely, the poor light given in comparison with other lamps; the shadow thrown by the lamp on the roof and floor; and the irritation to the nerves of the eye caused by the alternate light and shadow to which the eye was exposed by reason of the alternate upward and downward glance, in observing the roof and floor of the mine.

I have used safety lamps for the past 14 years; and, while it is true that a safety lamp does not give a light equal to that of an open lamp, the security afforded by its use, in a large measure, makes up for this deficiency. The shadow cast by the lamp on the roof and floor depends largely on the style of lamp used and the way in which it is carried. The safety lamp should always be carried in an erect position. The best style of safety lamps has three standards securing the chimney of the lamp to the oil vessel. The safety lamp used by firebosses should be provided with a shield encircling about two-thirds of the lamp gauze. This shield forms a suitable screen to the eyes and reflects the light forward, which greatly improves the illuminating power of the lamp.

Any practical fireboss can put a shield on his lamp if this is not provided. The shield consists of a piece of tin, or copper, of the same height as the lamp gauze and bent in the form of a semicircle, the two edges of the shield being turned so as to partly encircle two of the lamp standards. These shields are also supplied by manufacturers on request.

From my experience, I think I am safe in stating that my eyesight has not been injured, in any manner, by the use of the safety lamp. From observation, I would say that not 5 per cent. of the firebosses employed in mines would admit that their eyesight was at all affected in this manner. I believe there is greater danger, as far as the effect on the eyesight is concerned, in the use of the carbide lamp, and in the use of a poor grade of lamp oil, such as is often sold to miners. The carbide lamp produces a strong light that requires some effort of the eye to adjust itself to the difference between the light and dark in the mine.

JOHN SUTTON, Fireboss.

West Terre Haute, Ind.

Study Course in Coal Mining

BY J. T. BEARD

The Coal Age Pocket Book

Addition of Larger Numbers—When numbers of two or more figures are to be added together, proceed according to the following:

Rule—Write the numbers one under the other. Beginning on the right, place units under units, tens under tens, hundreds under hundreds, etc., etc. Add, first, the column of units, and place the units figure of this sum under the units column for the units figure of the required sum. Then carry the tens, or hundreds figures forward, writing them above their respective columns, to be added with the figures in those columns. Now, proceed to add, in turn, the tens, hundreds, etc., columns separately, including the figures carried forward from the preceding columns and written above these columns. As before, write the units figure of the sum of each column below the column added, for the corresponding figure of the required sum and carry the remaining figures forward, writing them over the next preceding columns, to be added in those columns. The full sum of the last column added, on the left, is written below for the corresponding figures of the required sum.

One or two examples will make the process clear.

1 2 3 1 2 2		1 1 2 2 2 3	
3,467,448	0	6,321,824	8
632,123	8	1,520,209	1
9,547,379	8	78,367	4
29,280	3	925,056	0
246,563	8	7,698	3
13,922,793	0	8,853,154	7

Proof by Throwing Out Nines—To prove the addition to be correct, the method of throwing out the nines is the simplest and best. It is as follows: Beginning with the top row of figures add the figures in that row, subtracting 9 whenever the sum equals or exceeds that amount. For example, taking the top row of figures, in the example on the left, and adding the figures from left to right, throwing out 9 as often as possible,

$$3 + 4 + 6 - 13 \mid \quad 9 - 0 + 7 - 11 \mid \quad 9 - 2 \mid + 4 + 4 = 10 \mid - 9$$
$$= 1 + 8 - 9 \mid - 9 = 0$$

Again, for the second row,

$$6 + 3 = 9 \quad 9 - 0 \mid + 2 + 1 + 2 + 3 = 8$$

The same process is repeated for each successive row of figures, including the final sum; and the result in each case is written in a separate column on the right. If the work is correct, the same process of adding the figures in this column and throwing out the 9's will give the same result as was obtained by applying this method to the final sum. For example, adding the column on the right, throwing out the 9's, and then doing the same in the final sum, we have

$$8 + 8 = 16 - 9 \quad 7 + 3 = 10 \mid - 9 \quad 1 \mid + 8 = 9 \mid - 9 - 0$$
$$+ 3 + 2 + 7 - 15 \quad 9 - 6 + 3 = 9 \mid \quad 9 - 0$$

The Coal Age Pocket Book

In each of the above solutions, the bar is introduced to divide the several operations, as these do not represent a continuous equation. Also, the work is simplified very much by ignoring any 9's among the figures as was done in the last operation.

SUBTRACTION

Subtraction is the operation of finding how much greater one number is than another; or, in other words, finding the difference between two given numbers. The operation is the reverse of addition. The greater number is called the "minuend" and the lesser number the "subtrahend." The sign of subtraction (—) is called "minus," and when written between two numbers indicates the number following the sign is to be taken from that preceding. Thus, $8 - 5 = 3$ shows that five taken from eight leaves three, which is called the "difference" or the "remainder."

In subtracting a less figure from a greater, the difference can be found readily by counting the number of consecutive units necessary to reach the greater number. For example, to subtract 4 from 9, it is necessary to count five units beyond 4 to reach 9, as shown thus:

1 2 3 4 5
1 2 3 4 | 5 6 7 8 9

The operation is expressed thus, $9 - 4 = 5$.

Subtraction of Larger Numbers—When numbers of two or more figures are to be subtracted, the one from the other, proceed according to the following:

Rule—Write the lesser number under the greater, placing units under units, tens under tens, etc. Beginning on the right, subtract the units figure in the subtrahend from that in the minuend and write the difference for the units figure of the remainder. It frequently happens that the figure in the subtrahend is greater than the corresponding figure in the minuend, in which case it is necessary to borrow one from the next figure on the left, writing the borrowed 1 as tens. Now, subtract the figure in the subtrahend from that in the minuend increased by ten and write the difference in the corresponding place in the remainder. When making the next subtraction, however, the figure in the minuend must be regarded as diminished by 1.

One or two examples will make the process clear.

1 1		11 11	
3,468,509	Minuend	1,630,001	Minuend
1,384,317	Subtrahend	29,999	Subtrahend
2,084,192	Remainder	1,600,002	Remainder

Proof by Addition—To prove the subtraction to be correct, add together the subtrahend and the remainder, and if the work is right the sum obtained will be the minuend.

	1 1		11 11
Proof	1,384,317	Proof	29,999
	2,084,192		1,600,002
	3,468,509		1,630,001

INQUIRIES OF GENERAL INTEREST

Working in Compressed Air

What are the effects of compressed air upon the human system when a man is following up that kind of work?

SUBSCRIBER.

Olyphant, Penn.

The effect on the human system due to working in compressed air for any given length of time varies with the health and physical condition of the individual. It has been found unsafe to allow anyone to enter an air chamber where the air is compressed to two or more atmospheres, without a previous medical examination. Even when this precaution has been taken, fatal results have ensued, the victim dying from what is known as caisson disease. At times, sudden death has resulted after the person has worked in compressed air for several months without being apparently affected thereby up to the time of his death.

The symptoms, in severe cases, are unconsciousness or paralysis, or both, accompanied by acute pain in the limbs. This was at first thought to be due to the compressed air being absorbed in the blood and tissues, and later liberated throughout the body when the pressure was relieved. The liberation of the compressed air from the blood and tissues was believed to be sufficiently violent to disrupt the tissues, froth the blood and interfere seriously with the circulation.

The continued study of the subject, both by doctors and engineers, revealed the fact, however, that the true source of the trouble could probably be ascribed to the saturation of the blood with nitrogen. It is true that aërated air contained in a bottle effervesces freely when the cork is drawn, owing to the escape of the air from the water. The effervescence is much more violent in the case of water saturated with carbon dioxide, owing to the greater solubility of this gas in water.

Dr. J. S. Haldane showed conclusively that the percentage of carbon dioxide absorbed varies inversely as the pressure on the air. For example, the percentage of carbon dioxide in the air exhaled from the lungs, under atmospheric pressure, is 5.6 per cent.; under two atmospheres, the carbon dioxide in the exhaled air is 2.8 per cent.; and, under three atmospheres, 1.86 per cent. In addition to this automatic regulation of the percentage of carbon dioxide, Dr. Haldane has said that, owing to the oxygen of the air being taken up chemically by the hemoglobin, the blood in the human system soon becomes poisoned with an excess of nitrogen, where the atmosphere is compressed.

In the practical application of this theory, the difficulty of respiration in compressed air has been, it is stated, wholly overcome by supplying a constant volume of *compressed* air per minute to the workers, instead of a constant volume of *free* air per minute. It was found that some parts of the body are affected more quickly than others; and experiment showed that 90 per cent. saturation took place in the slowest parts, in 4 hr.; while complete saturation took place, in the quickest parts, in 40 min. From this it was concluded that there was danger in removing too quickly from a compressed atmosphere, after an exposure of 40 min.

The period of time of withdrawing from a compressed atmosphere is called the period of "decompression." Observing that no serious results had occurred by rapid decompression up to about two atmospheres, Doctor Haldane concluded that no danger was to be anticipated by decompressing rapidly to the extent of one-half the absolute pressure; but, beyond this point, sufficient time must be given for complete decompression to allow desaturation of the blood to take place, depending on the time of immersion in the compressed atmosphere.

The disorders resulting from working in compressed air were seemingly removed when the person affected reentered the compressed atmosphere from which he had withdrawn. The most practicable method of avoiding the troubles arising from working in compressed air, it has been found, is to lengthen the period of withdrawing from the compressed atmosphere.

The same theory now advanced by Doctor Haldane was promulgated by one Paul Bert, about 1880. Mr. Bert then claimed that the effect on the human system was caused by the absorption of nitrogen in the blood; and he advocated withdrawing slowly from the compressed atmosphere, suggesting a period of 30 min., for compressions up to three atmospheres, and 60 min. for compressions up to four atmospheres.

In late practice, in tunnel work, two or three air locks are provided, and the men are required to spend a certain number of minutes in each lock, the time increasing as the pressure decreases in each successive air chamber. The greatest pressure under which men can work with safety may be stated as four atmospheres, although men have been exposed, for short periods, to pressures of six atmospheres, without experiencing any ill effects.

Why Compressed Air Freezes

Kindly explain why compressed air freezes.

INQUIRER.

Kingston, Penn.

Compressed air does not freeze, but the moisture it contains is deposited as frost when the air is allowed to expand by escaping into the atmosphere. This expansion is accompanied by an absorption of heat from the surrounding air, the absorbed heat becoming latent in the air. As a consequence, the temperature of the surrounding air falls sufficiently to freeze any moisture that may be present. The capacity of air for holding moisture decreases with the fall of temperature, and the moisture appears as a vapor, which is frozen immediately, if the temperature is sufficiently low.

This effect is often observed at the exhaust ports of the air cylinder of a pump operated by compressed air. It frequently happens that when the pump is driven by compressed air, the freezing of the moisture completely closes the exhaust ports of the air cylinder.

EXAMINATION QUESTIONS

Miscellaneous Questions

(*Answered by Request*)

Ques.—A mine ventilated by three splits of air showed the following distribution of current: Split A, 2500 cu.ft.; split B, 1500 cu.ft.; split C, 2000 cu.ft.; making a total of 6000 cu.ft. per min. What quantity of air will pass in each of these splits if the total quantity is increased to 75,000 cu.ft. per min.?

Ans.—Provided there is no change made in the mine airway so as to increase or decrease the resisting power of any of the splits, each split will pass the same proportion of air as before the circulation was increased. The ratio of increase is 75,000 : 60,000, or 5 : 4. The quantity of air passing in the several splits after the circulation has been increased is, therefore, as follows:

Split A,	$2500 \times \frac{5}{4} = 3125$ cu.ft. per min.
Split B,	$1500 \times \frac{5}{4} = 1875$ cu.ft. per min.
Split C,	$2000 \times \frac{5}{4} = 2500$ cu.ft. per min.
Total	7500 cu.ft. per min.

Ques.—If a barometer registers 30 in. at the surface or mouth of the shaft, what will it register at a point in the shaft, 1890 ft. below the surface?

Ans.—It is customary to allow one inch of increase in barometric pressure, for each 900 ft. of depth below the surface. Making this allowance, the increase of barometric pressure for 1890 ft. is $1890 \div 900 = 2.1$ in. The barometer would, therefore, register, in this case, $30 + 2.1 = 31.1$ in., which is approximately correct.

Ques.—What is the breaking strain of a plow-steel, hoisting rope, 1½ in. in diameter? Also, find the safe working load of this rope.

Ans.—Since the breaking strain of a 1-in., 6-strand, 19-wire, hoisting rope is 44 tons, and the strength of wire rope varies as the square of the diameter, the breaking load of a 1½ plow-steel, 6-strand, 19-wire rope is

$$L = 44\,d^2 = 44 \times 1.5^2 = 99 \text{ tons}$$

It is customary in ordinary hoisting to allow a factor of safety of 5, except for deep shafts, when this factor may be increased to 8 or 10. Using a factor of safety of 5, the safe working load is $99 \div 5 =$ say 20 tons.

Ques.—Given 10,000 cu.ft. of air circulating per minute, in an airway 8x10 ft., under a pressure of 10 lb. per sq.ft., what is the estimated length of the airway?

Ans.—The sectional area of the airway is $8 \times 10 = 80$ sq.ft. The velocity of the air current is $10{,}000 \div 80 = 125$ ft. per min. The total pressure (pa) on the entire sectional area of the airway is $10 \times 80 = 800$ lb. Since this total pressure is equal to the mine resistance (ksv^2)

$$ksv^2 = 800$$

and $$s = \frac{800}{0.00000002 \times 125^2} = 2{,}560{,}000 \text{ sq.ft.}$$

The perimeter of the airway is $2\ (8 + 10) = 36$ ft. The estimated length of the airway is, therefore: $2{,}560{,}000 \div 36 = 71{,}111$ ft. As this is an extraordinary length of airway, for a single current, it is probable that the above ventilating pressure should read 1 lb. instead of 10 lb. per sq.ft., which would make the length of airway practically 7000 ft.

Ques.—If a ventilating fan running at 80 r.p.m. produces a water gage of 3.75 in., and the fan is slowed down until the water gage reads 1.82 in., what is the speed of the fan?

Ans.—Approximately, the quantity of air in circulation varies as the speed of the fan; hence, since the pressure varies as the square of the quantity, the square root of the pressure varies as the speed. In other words, approximately, the square root of the pressure ratio is equal to the speed ratio. Calling the required speed of the fan x, we have

$$\frac{x}{80} = \sqrt{\frac{1.82}{3.75}} = \sqrt{0.4853} = 0.696$$

$$x = 80 \times 0.696 = \text{say } 56 \text{ r.p.m.}$$

Practically, the fourth power of the speed varies with the fifth power of the quantity of air in circulation; and the speed of the fan, for this reduction of pressure, would be about 51 r.p.m.

Ques.—What would be the ratio of expansion in an explosion of gas, assuming the original temperature of the gas to be 70 deg. F. and the temperature of the explosion 9564 deg. F.?

Ans.—The volume of gas or air varies as its absolute temperature; hence, the volume ratio or the ratio of expansion is equal to the absolute temperature ratio, and may be expressed as follows:

$$\frac{v_2}{v_1} = \frac{460 + 9564}{460 + 70} = \frac{10{,}024}{530} = 18.9$$

That is to say, the volume of the gas is expanded, at the moment of explosion, to 18.9 times its original volume.

Ques.—If 36,000 cu.ft. of air per min., is passing through an airway 6x10 ft., under a pressure of 3.6 lb. per sq.ft., what pressure will pass the same quantity of air through an airway 5x10 ft., of the same length?

Ans.—First, write the formula for pressure, in terms of the quantity of air in circulation; thus,

$$p = \frac{klo q^2}{a^3}$$

In this formula, the coefficient (k), the length (l), and the quantity (q) are constant; and p varies as the potential factor o/a^3. The perimeter and area of the first airway are: $o = 2\ (6 + 10) = 32$ ft.; $a = 6 \times 10 = 60$ sq.ft. The perimeter and area of the second airway are: $o = 2\ (5 + 10) = 30$ ft.; $a = 5 \times 10 = 50$ sq.ft., respectively.

In comparing these two airways, the pressure ratio is equal to the product of the perimeter ratio times the cube of the inverse area ratio. Thus, calling the required pressure x,

$$\frac{x}{3.6} = \frac{30}{32}\left(\frac{60}{50}\right)^3 = \frac{15}{16}\left(\frac{6}{5}\right)^3 = \frac{15}{16} \times \frac{216}{125}$$

$$x = \frac{3.6 \times 15 \times 216}{16 \times 125} = 5.8 \text{ lb. per sq.ft.}$$

COAL AND COKE NEWS

Washington, D. C.

Further evidence from the West Virginia field where the coal mining situation is being investigated by the special Senate Committee at work on the subject shows that there is more and more apparent certainty that there will be a positive finding against the coal mine operators, but that there is an increasing degree of certainty that nothing can be done with regard to them, no matter how severe may be the condemnation which the Committee for political reasons may choose to measure out to the operators.

The outbreak of Senator Martine during the past week with reference to the operations of the armored train which carried forces on behalf of the operators up into the regions where disorder was prevalent is regretted here by those who have been expecting to get a verdict against the mine owners as it is considered undignified and likely to prejudice the decision that may be finally arrived at.

It is understood that a final decision will not, however, be reached for some little time.

Free Coal Still on Tariff Bill

While some minor changes have been made in the paragraphs of the tariff bill relating to coal and its products, these remain substantially the same as reported by the Finance Committee of the Senate to the Senate caucus as they were in the original draft of the bill as it came from the House. The paragraphs in the free list as they stand in this latest draft reported on June 21 are as follows:

Coal, anthracite, bituminous, culm, slack, and shale; coke; compositions used for fuel in which coal or coal dust is the component material of chief value, whether in briquets or other form.

Coal tar, crude, pitch of coal tar, wood or other tar, dead or creosote oil, and products of coal tar known as anthracene and anthracene oil, naphthalin, phenol and cresol.

HARRISBURG, PENN.

The joint resolution introduced in the Senate by Senator Catlin calling for the appointment of a commission to investigate the causes of mine accidents in the anthracite region, has passed both houses and is now in the hands of the Governor for his signature.

The commission will have the authority to enter mines and make investigations, and will make tests and experiments to determine the efficacy and practibility of roof supporting materials and other methods of safety.

Dr. Holmes, director of the U. S. Bureau of Mines has tendered to the state of Pennsylvania, the use of the bureau's experimental station located at Pittsburgh, to make the necessary tests and to coöperate with the state in any effort that will tend toward the safety of those employed in the mines.

The governor is required to appoint within 30 days after the passage of the act three citizens from within the anthracite region one to be a competent mining engineer, one to be versed in anthracite mining and the other shall be a practical miner, to investigate into the causes of mine accidents. They will report the result of their investigations, etc., to the next General Assembly, together with such recommendations and drafts of such bills as in their judgment may be necessary.

Each member of the commission shall receive for his service $2400 per annum, and $25,000 is appropriated for the purpose of carrying into effect the provisions of this resolution. The commission is authorized to employ a secretary, stenographer and such other assistants as may be necessary.

The bill making it unlawful to mine or remove any pillars of coal in any anthracite mine where the seam has a pitch of 25 deg. or more unless two or more miners are employed and engaged at the same time, has passed both houses, but was amended in the Senate. The House would not concur in the amendment, and a committee from each branch has been appointed to confer on the bill, and as yet have not made a report thereon.

The Ehrhardt bill amending the act approved May 1, 1909, which provides for the health and safety of miners in bituminous coal mines and anthracite collieries or breakers by regulating the ages at which such persons may be employed, their hours of labor and prescribes rules for the obtaining of employment certificates, etc., extends to truant officers of the several districts the same right to prosecute violations of this act as has the Chief of the Department of Mines. This bill has been signed by the Governor and is known as "Act No. 48. Approved Apr. 15, 1913."

The McDermott bill has been introduced in the House making is unlawful to use electric current for any purpose in any room, breast or entry where miners are engaged in mining or loading coal in the mines of the Bituminous region that generate explosive gas. This does not apply however to the use of electricity in the main haulageways of these mines. This bill has passed second reading, and is receiving much opposition from the bituminous operators, who appeared before the mines and mining committee.

PENNSYLVANIA

Anthracite

Scranton—Another mine cave occurred in the vicinity of Prospect Avenue and Gibbons Street recently, but prompt action upon the part of the Illuminating Gas, and Water Works Co.s rendered the damage comparatively small. It is expected that the D., L. & W. Co. will repair all damage and leave both public and private property in as nearly the same condition as it was before the cave occurred as is possible.

Pittston—The North Pittston District of the Pennsylvania Coal Co. will be represented in the annual first aid meet to be held at Valley View in the fall by the Clarence team. The preliminary meet of the teams comprising this district was held in the Pittston Y. M. C. A., and the winning team received the high score of 97¾.

Wilkes-Barre—The Lehigh Valley Coal Co. will publish the first issue of its new employees magazine early in July. This is to be a monthly and will contain news from all the divisions and from the general offices, as well as articles on mining topics.

Bituminous

Monongahela—The Cincinnati mine of the Monongahela River Consolidated Coal and Coke Co., in which 97 men lost their lives in an explosion on Apr. 23, will resume operations shortly. A new ventilating system has been installed, together with a new gas proof electric coal cutting machine. Fifty men have been at work cleaning up the mine for some time.

WEST VIRGINIA

Charleston—The United Mine Workers of America have decided to call a strike in district 29, embracing Raleigh and Fayette counties, and affecting approximately 15,000 men.

Wheeling—Three hundred miners at the Pultney mine of the George M. Jones Coal Co., south of Bellaire, O., struck June 19. District officers from Bridgeport are making an effort to adjust the trouble.

OHIO

Columbus—The commission appointed by Governor Cox June 7 to investigate the report on the equitable method of weighing coal in the mines of Ohio met recently and organized by electing Judge Phil M. Crow, of Kenton, chairman and Prof. M. B. Hammond, of the Ohio State University, secretary. It is announced that sessions will start soon and that trips will be made by the commission to every mining district in the state. Testimony will be taken both from mine owners and miners. The commission will report its findings to the Governor early in the winter, in time to have it submitted to the General Assembly which meets in extraordinary session shortly after the first of the year.

INDIANA

Evansville—The old Ingle coal mines, owned by James H. Moore, of this city, and closed several weeks ago because of a fire, will reopen about July 10. More than 100 miners will be employed.

Oakland City—The Peacock Coal and Mining Co., owner of the Massey mines near this city, will abandon the present workings and sink a new shaft this summer.

Lyons—While drilling for oil on the farm of Mrs. Anna Theunds, a vein of coal nine feet thick was struck.

Sedalia—The Sedalia Lumber and Coal Co. of this town has filed preliminary notice of dissolution.

Indianapolis—The proposed increase from 50c. to 55c. a ton for coal, carried from the Indiaa fields to Indianapolis has been withdrawn by the Indiana carriers. It was vigorously opposed by shippers and buyers.

Fremont—The Fremont Lumber and Coal Co. has been incorporated here, with $10,000 capital stock, to deal in fuel. The directors are E. C. Shupp, N. G. Ball and H. I. Isbell.

ILLINOIS

Duquoin—The Leiter colliery, at Zeigler, which has been sealed up for years as the result of a series of explosions in which nearly 100 men lost their lives, was recently reopened. The task of the experts who unsealed this mine is said to have been one of the most difficult in the history of mining in Illinois.

FOREIGN NEWS

Düsseldorf, Germany—Rescuers on June 19 saved the lives of fifteen miners who were imprisoned the previous day at Lindorf by the caving in of the shaft of a coal mine.

Rotherham, England—Eight men were drowned June 17 and as many more had narrow escapes when Brown's colliery, near here, was flooded. It is believed that in extending a tunnel the workmen accidentally struck some old workings, resulting in the flooding of the mine.

Toronto, Canada—The ninth annual meeting of the Canadian Retail Coal Association was held at Toronto on June 19 and 20 with an attendance of 176 members from various points in Ontario. The delegates were welcomed to the city by Controller Church. The reply to this greeting was made by one of the directors, J. C. Hay. After the reports of officers, addresses were delivered on "The Labor Problem Solved for the Coal Merchant," by J. A. W. Archer, and "Coal from Mine to Consumer," by W. H. Lesser, an engineer of the Philadelphia & Reading Coal & Iron Co. The latter address was illustrated by 150 slides showing in an interesting way the evolution of coal.

PUBLICATIONS RECEIVED

Journal of the American Society of Naval Engineers—May, 1913, Vol. 25, No. 2.

Western Society of Engineers—Journal for May, 1913, pages, 329-446; 6x9 in.; with many insert figures and diagrams.

The Illinois Coal Mining Investigations—Preliminary Report on Organization and Method of Investigation; 71 pages 6x9 in., 26 figures and illustrations.

Department of the Interior—Bureau of Mines. The Flash Point of Oils, Methods and Apparatus for its Determination. By Irving C. Allen and A. S. Crossfield; 31 pages 6x9 in. two figures.

Department of the Interior—Bureau of Mines. Monthly Statement of Coal Mine Fatalities in the United States, April, 1913, with revised figures for preceding months. Compiled by Albert H. Fay; 15 pages, 6x9 in.

University of Illinois—Bulletin No. 65. The Steam Consumption of Locomotive Engines from Indicator Diagrams. By J. Paul Clayton Seventy seven pages, 6x9 in. Numerous illustrations, curves and diagrams.

University of Illinois—Bulletin No. 66. The Properties of Saturated and Superheated Ammonia Vapor. By G. A. Goodenough and Wm. Earle Mosher; 94 pages, 6x9 in.; with numerous diagrams, curves and tables.

TRADE CATALOGS

Atlas Powder Co.—Wilmington, Del. High Explosives, Blasting Powder and Blasting Supplies; 107 pages 6x9 in. with numerous illustrations and diagrams describing the selection, storage and use of high explosives.

New York and New Jersey Lubricant Co., 165 Broadway, New York, Bulletin No. 21, April, 1913. Hyatt Roller Lubricants for mine car wheels equipped with Hyatt flexible roller bearings; 11 pages, 7½x10 in.; illustrated.

Sullivan Machinery Co.—Bulletin 58-M. Sullivan Cross-Compound Power-Driven Air Compressors; 19 pages, 6x9 in. Also Bulletin 66-M Sullivan Hammer Drills for Quarry Purposes and Stone Dressing Tools. Also Booklet 112 Sullivan Air Compressors.

PERSONALS

Edgar A. Perkins has been appointed chief mine inspector to take the place of Elliott R. Hooton, effective May 1.

L. Blenkinsopp has been appointed mine inspector for the 11th West Virginia district,, with headquarters at Welch, W. Va.

Alfred G. Heggem, of Pittsburgh, has been appointed petroleum engineer in the Bureau of Mines, at a salary of $3000 per annum.

J. C. Koslem has resigned as president of the Indiana Coal Operators' Association, after ten years of continuous service. Hugh Shirkle succeeds him.

A. J. Sayers, engineer in charge of the tipple and washery work of the Link-Belt Co., has just returned from a four weeks' trip in the Utah coal mining district.

Julius Anson has discovered a 4-ft. vein of coal on a deserted farm 9 miles from Boise, Ida.. It is expected that the Idaho Northern Ry. will build a spur for the purpose of developing this deposit.

George Sylvester, chief mine inspector of Tennessee has appointed the following deputy mine inspectors: John Rose, H. H. Braden and W. A. Overall. The appointments are for a period of 2 years, commencing June 1, 1913. H. B. Jackson, a former stenographer, has been appointed clerk and statistician for the mining board.

John T. Diehm, of Bluffton, Ind., was recently elected president of the Michigan-Ohio Coal Dealers' Association, succeding Robert Lake, of Jackson, Mich., who declined renomination. The other officers elected were: Vice-President, J. W. Ballard, of Detroit; Secretary, B. F. Nigh, of Columbus; Treasurer, W. A. Gibson, of Upper Sandusky. These were all elected by acclamation.

COAL AND COKE PATENTS

Miner's Lamp—W. P. Rice, Regina, Ky., 1,062,504, May 20, 1913. Filed Sept. 11, 1912. Serial No. 719,795.

Coal Drill—J. G. Huntley, Pittston, Penn., 1,055,464, March 11, 1913. Filed Sept. 3, 1912. Serial No. 718,303.

Conling System. D. A. Lee, Centerville, Iowa. 1,048,325. Dec. 24, 1912. Filed Apr. 3, 1912. Serial No. 688,241.

Smoke Consumer—W. Kelly, Memphis, Tenn., 1,002,473, May 20, 1913. Filed Aug. 3, 1912. Serial No. 713,077.

Mining Car. L. G. Helmick, Fairmont, W. Va. 1,048,309, Dec. 24, 1912. Filed July 15, 1912. Serial No. 709,581.

Smoke Consumer—A. E. Wilson, Indianapolis, Ind., 1,060,-051. Apr. 29, 1913. Filed Oct. 30, 1911. Serial No. 67,534.

Smoke Consumer—J. H. Ottman, Milwaukee, Wis., 1,059,-559, Apr. 22, 1913. Filed Oct. 14, 1909. Serial No. 522,565.

Improvements in and Relating to Miners' Safety Lamps. No. 4193 of 1913. J. Naylor, 23 The Wiend, Wigan, England.

Hand Machine to Undermine Coal—A. Roe, Beaver, Ohio, 1,062,854, May 27, 1913. Filed June 18, 1912. Serial No. 704,-286.

Automatic Coaling Bucket—J. T. Richards, Chicago, Ill., 1,062,359, May 20, 1913. Filed Mar. 22, 1911. Serial No. 616,-194.

Improvements in and Relating to Mining Machines. F. E. VanSlyke, 4 Eslington Road, Newcastle-on-Tyne; 12,364 of 1912.

Inexplosive Steam Boiler—E. Maslin, L'Estaque, France, 1,059,481, Apr. 22, 1913. Filed Jan. 22, 1911. Serial No. 605,252.

Power Loading Ash Pit—J. H. Hogston, Ladysmith, Wis., 1,059,955, Apr. 29, 1913. Filed Mar. 26, 1912. Serial No. 686,410.

Tender Coal Gate. M. A. Smith and T. J. Thornton. Albion, Penn. 1,048,222, Dec. 24, 1912. Filed Apr. 13, 1912. Serial No. 690,580.

Mining Tool—L. F. Hess assignor to Hess Dustless Mining Co., Ansted, W. Va., 1,059,463, Apr. 22, 1913. Filed Oct. 4, 1912. Serial No. 725,951.

Automatic Gate for Mine Elevator Shafts—M. W. Harvey, Sykesville, Penn. 1,055,633, March 11, 1913. Filed April 15, 1912. Serial No. 690,001.

Improvements in Blasting Detonators for Coal Mining and Like Purposes. No. 15,600 of 1912. W. A. Malson, Sheffield Road, Chesterfield, England.

Mining Tool. C. L. Aragon, assignor of one-half to O. Ellmore; both of Ely, Nev. 1,047,910, Dec. 24, 1912. Filed Oct. 12, 1911. Serial No. 654,396.

Coal Washing Apparatus—A. France, rue de l'Esperance, 223, Liege, Belgium, and P. Habets, Montegnee, Belgium. Filed in London, 22,655 of 1912.

Blower for Rollers—J. Magee assignor to Diamond Power Specialty Co., Detroit, Mich., 1,059,479, Apr. 22, 1913. Filed July 22, 1912. Serial No. 711,014.

Chamber Ovens—Especially Such as Are Suitable for the Manufacture of Coke or Gas. No. 19,812 of 1912. N. Lengersdorff, of Bunzlau, Silesia, Germany.

Gas Producer—W. F. Luick and A. J. Bassett, assignor to Luick-Bassett Producer Co. a corporation of Wisconsin. 1,062,721, May 27, 1913. Filed Oct. 2, 1911. Serial No. 652,396.

Improvements in Methods of Mining Coal, Converting it into Gas, and Then Conveying the Gas from the Mine. J. H. Hoadley, 18 East 82d St., New York, U. S. A., 14,494 of 1912.

A New and Improved Conveyor Specially Adapted for Use as a Coal Face Conveyor in Collieries. No. 1966 of 1913. H. Hirst, Crescent House, Moorelands Avenue, Dewsbury, England.

Means for Protecting the Seams of a Boiler directly exposed to the Fire. J. J. Gage assignor to Gage Co., Dayton, O., 1,059,962, Apr. 22, 1913. Filed May 20, 1912. Serial No. 698,449.

Improved Process and Apparatus for the Treatment of Coal, Shale, or the Like, in Vertical Retorts. A Waddell, Dunfermline Corporation Gas Works, Fife, Scotland; 21,991 of 1912.

Improvements in Direct Recovery of Ammonia from the Products of the Destructive Distillation of Coal or Similar Material. Chas. Stell, 2-4 Bismarckplatz, Recklinghausen, Westphalia, Germany; 28,072 of 1912.

A Method of and Apparatus for Preventing the Spreading and Effect of Coal Dust and Firedamp Explosions. No. 16,440 of 1912. G. Kahler, 31 Kaiserstrasse and F. Junker, 48 Schalgerstrasse Gelsenkirchen, Germany.

Improvements in Machines for Washing and Separating Coal, Ore and Other Granular and Like Materials. No. 10,929 of 1912. R. S. Benson, Riverside, Middleton, St. George, Durham and Head Wrightson & Co., Ltd., Teesdale Iron Yorks, Thornaby-on-Tees, England.

CONSTRUCTION NEWS

Staunton, Ill.—The Consolidated Coal Co. has recently given the Link-Belt Co., of Chicago, an order for reconstructing their No. 14 tipple at Staunton.

Sturgis, Ky.—Two 8-ton General Electric mining locomotives will soon be placed in operation in the mines of the West Kentucky Coal Co. near here.

Royalton, Ill.—The Franklin Coal and Coke Co., of St. Louis, have recently awarded a contract to the Link-Belt Co. for a large re-screening plant at No. 1 mine near Royalton.

Lansford, Penn.—The Lehigh Coal & Navigation Co. will soon place in operation a new 15-ton electric mining locomotive which has been ordered from the General Electric Co.

Jedd, W. Va.—The Jedd Coal and Coke Co. have recently awarded a contract for a complete modern steel headframe and tipple equipment to the Link-Belt Co., of Chicago, Ill.

Knoxville, Tenn.—The Asher Coal Mining Co. expect to install a mono-bar chain retarding conveyor and screening plant purchased from the Link-Belt Co. at their mines at Amru, Ky., in the near future.

Plymouth, Penn.—A 50-kw. General Electric synchronous motor-generator set will be installed in the near future in the Loomis colliery of the Delaware, Lackawanna & Western R.R. Co.

Pittsburgh, Penn.—Owing to the heavy movement of coal over the Indiana branch of the Buffalo, Rochester & Pittsburgh R.R., new sidings are being laid by a large force of men, and it is understood that the line will soon be double-tracked.

Pottsville, Penn.—The Philadelphia & Reading Coal and Iron Co. have purchased from the General Electric Co. a 125-kw. two-unit, three-bearing motor-generator set and necessary switchboard. This will be installed in the power plant of the Silver Creek colliery.

Scranton, Penn.—The Pennsylvania Coal Co. is arranging to equip its tipple with new apparatus for electrical drives, including 32 motors ranging from 10 to 200 hp., with the necessary compensators and controllers. These have been ordered from the General Electric Co.

Barnesboro, Penn.—The Cambria Coal Co., of Philadelphia, expects to install soon, in its mines near here, a 200-kw. motor-generator set and three 7½-kv-a. transformers and the necessary switchboard apparatus, all of which has been ordered from the General Electric Co.

Sunnyside, Utah.—The Utah Fuel Co. expects to increase the equipment of the plant at this place by the installation of a 625 kv-a. Curtis turbo-generator unit, a 200-kw. motor-generator set, a 200-hp. induction motor and the necessary switchboard. This apparatus was recently ordered from the General Electric Co.

Lamont, Ia.—The new coal elevator which is in course of construction by Hammer & Co. is now nearly completed. This new structure is 50 ft. long, 12 ft. wide and 38 ft. high. It has five hopper bins, also five storage bins. The coal is unloaded from hopper cars into the elevator pit, and then distributed to the different bins. The elevator is of the bucket type, 35 ft. high and operated by a 5-hp. electric motor.

Lorain, Ohio—It is rumored that the Baltimore & Ohio R.R. will erect a third coal-loading machine at this place in the near future. The new loader will probably be erected at the bend opposite the shipyard just south of the site of the old Whirlies. The erection of the loader at this point will necessitate considerable dredging, and the building of several hundred feet of new dock. There is a bare possibility that the old No. 1 loader north of the viaduct will be replaced by a more modern machine.

Duluth, Minn.—Work in connection with the erection of the Boroughian Fuel Co.'s coal dock at West Duluth is now actively under way. The plant will be one of the largest on the lakes, with a storage capacity of more than two million tons, and a coal-handling capacity during the shipping season of two million tons. It will entail an expenditure of approximately one million dollars. The contract for the structural steel required for the dock and for the large machine shop adjoining it has been awarded to the National Iron Co. It is planned to have the dock ready for operation at the opening of the 1914 season.

NEW INCORPORATIONS

Henrietta, Okla.—The Modern Coal Mining Co.; capital stock, $10,000. Incorporators: Harry Lantz, T. J. Harris and S. J. Harris.

Uniontown, Penn.—The Westmere Coal & Coke Co.; capital stock, $5000. Incorporators: C. E. Bortz, J. C. Bortz and C. C. Baldwin.

Springfield, Ill.—The Bond County Coal Co.; capital stock, $200,000; to develop coal lands. Incorporators: D. J. Gray, Joseph Folarl and J. D. Adams.

Waukegan, Ill.—The Waukegan Fuel Co.; capital stock, $25,000; general coal and fuel business. Incorporators: C. E. Bairstow, F. R. Bairstow and J. E. Hussey.

New Philadelphia, Ohio—The Horger-Heldt Coal Co., capital stock, $10,000. Incorporators: G. R. Heldt, Emil Horger, J. W. Horger, Chas. Heldt, I. M. Horger and S. Ridgley Thrapp.

Indianapolis, Ind.—The Ohio Valley Coal Co.; capital stock, $125,000; to mine coal. Directors: F. M. Ayres, Clarence Stanley, C. C. Kendall, Samuel Ashby, Harry Stout, E. E. Stout and F. B. Danner.

Charleston, W. Va.—The Monroefield Coal Co.; capital stock, $10,000; to deal in real estate, coal and mineral land, etc. Incorporators: J. A. Martin, W. J. Snee, M. C. Martin, F. P. Weaver, B. C. Weaver.

INDUSTRIAL NEWS

Bens Creek, Penn.—The Old Piper Mine, at Bens Creek, has been abandoned and dismantled. The mine has been in operation for more than 60 years.

Du Bois, Penn.—It is reported that the Brush Run Coal Co. is preparing to operate a new coal field in Jefferson County by the stripping process.

Widnoon, Penn.—Operations of the Widnoon Coal Mining Co. were suspended for four days last week on account of breaking of cables which carried their coal across the river in buckets.

Traer, Iowa—The Rock Island R.R. is said to be making Traer a coaling station. Work has been begun on a plant 100 ft. east of the depot, which will have a capacity of 200 tons, and will be automatic.

Connellsville, Penn.—F. M. Tompkins has secured a lease on a coal acreage owned by the Cambria County Coal Co., near Portage. An opening is to be made on the upper end of Trout Run in the C prime bed of coal.

McArthur, Ohio—R. B. Cutter and H. B. Stevenson of Parkersburg, W. Va., have purchased the assets of the Mohr-Minton mines of the Mohr-Minton Co. The assets consist of coal mines and a brick plant near McArthur.

Connellsville, Penn.—The Consolidation Coal Co. is opening a new mine at Wilson Creek to supplant the old workings which are now approaching exhaustion. The new heading has already been driven some distance into the coal.

Terre Haute, Ind.—The Jackson Hill Mining Co. has contracted to furnish the Inland Steel Co., at Chicago, with several hundred tons of coal daily for the next five years. Crawford Fairbanks is president of the mining company.

Chattanooga, Tenn.—H. F. Noyes has been appointed receiver for the Dayton Coal & Iron Co. It is said that the assets of the company would invoice about one million dollars, including furnaces at Dayton. The liabilities were not stated.

Pleasantville, Iowa—The city of Pleasantville has recently employed M. B. Flanders to prospect for a municipal bed of coal in the suburbs of that city. Mr. Flanders has a diamond core drill at work at that point and says that he expects to strike coal at a depth of 300 ft. or more.

Browders, Ky.—The tipple, power house and machine shop of the Caldwell Coal Co., in the western Kentucky coal district, was destroyed by fire recently, with a loss between $20,000 and $30,000. The cause of the fire is as yet unknown. No men were in or around the mine at the time of the fire.

Louisville, Ky.—The O'Donnell Coal Co. has been incorporated with a capital stock of $50,000, for the purpose of operating a number of coal mines which will shortly become the property of the company. The incorporators are Joseph W. O'Donnell, M. O'Donnell and M. Lanning, all of Louisville.

New Orleans, La.—Owing to the low stage of the Ohio River the coal movement from Pittsburgh for New Orleans has been stopped. As the high stage began early this year, more coal has been brought down the river than in any other year in the history of the industry. The movement of Kentucky coal will continue.

Monongahela, Penn.—It is reported that several large tracts of coal land have been leased in the vicinity of Bentleyville, within the past few weeks, and that some important trades are now underway. It is said that one of the companies will haul its coal several miles underground in order to bring the product to the mine opening.

Chattanooga, Tenn.—Investigation of the affairs of the Dayton Coal & Iron Co., which has been placed in the hands of a receiver, shows that the local company was doing a profitable business. The cause of the assignment is the failure of James Watson and Sons, of Glasgow. This firm held a controlling interest in the Dayton company.

Marlins Ferry, Ohio—Chief mine inspector, J. C. Davies, several deputy mine inspectors and a number of representatives of the Pittsburgh Vein Operators' Association met June 16 to start upon an inspection trip of the mines in the No. 8 coalfield, with a view to making recommendations for improving the safety of operation, as well as the production.

Portland, Ore.—The mines of the Beaver Hill Coal Co. are in operation although there is considerable agitation over wages and a number of strikes have been the result. The labor organization is trying to get a foothold in the mines but with little success. Each mine has its own scale of wages and hours of work per day, so it is not a Union camp, as yet.

Birmingham, Ala.—A recent electrical installation by the Alabama Power Co., reduced the cost of operation of the plant from $45,000 per annum to $18,000 per annum, making a saving of $27,000 yearly, which was practically the cost of the new installation, and which, therefore, would pay for itself in one year. This is a good illustration of the saving effected by electrical installation in large plants now operated by steam power.

Dubois, Penn.—The Northwestern Mining and Exchange Co. has broken ground for a big electric power plant that is planned to be one of the largest in this section of the state, It will be located a mile above Brockport close to the Johnson Run coal tract.

The new plant is to be built to furnish light and power for the various plants of the company in Toby Valley and at Crenshaw and Brockwayville.

Athens, Ohio—The Athens & Pomeroy Coal & Land Co. has leased its coal lands in Meigs County to the Calvin Essex Coal Co. of New Straitsville and arrangements are now being made to operate upon the leases this summer. The company has been taking up coal lands in this section for some time and now has 700 acres outright. L. G. Worstell, Bart Davidson, H. D. Henry and C. J. Martin are owners of the Athens & Pomeroy Company.

Carbon Hill, Ohio—Labor troubles are reported from several mines near Carbon Hill due to trouble between union and non-union miners. It is said that 400 union miners carried from the mine 12 non-union men and threatened them with violence should they return to work. The mines affected are the Snake Hollow, New Pittsburgh and Sand Run. Charles Green and L. L. Sweazy have been selected to confer with the state mine department at Columbus over the trouble.

Geneva, N. Y.—Coal has been discovered on the Wm. Barron farm, owned at present by R. A. Cooper, of the Geneva Automobile Co. Several weeks ago Mr. Cooper engaged the Comstock Drilling Co. to sink a well on his farm for water. While drilling at a depth of 390 ft., the drill penetrated a seam of coal estimated to be between 7 and 9 ft. in thickness. Tests have proved the coal to be a fine grade of anthracite. It is said that a company will be formed immediately to mine the coal.

Louisville, Ky.—The Interstate Comerce Commission has ordered the suspension of recently-issued freight tariffs canceling through rates and routes on soft coal from West Virginia and Kentucky mines across the lakes to Milwaukee and other northwestern points, on the application of coal operators, who protested that the cancelation of existing tariffs would result in prohibitive rates. The Commission, however, held that existing rates were too low, and ordered a ten-cent increase on the ton.

New Orleans, La.—After a disastrous experience above Memphis, the big tow boat Sprague arrived last week with 34,000 tons of Pennsylvania coal. The large tow was caught in the current and several of the barges were sunk. The Sprague has started on her return trip with thirty-one empty barges and one loaded with lumber.

The Jos. B. Williams, another boat in the service of the Monongahela River Consolidated Coal & Coke Co., is in port with 23,000 tons of coal. Five thousand tons of the tow were left to fill orders at Baton Rouge.

Chicago, Ill.—It is reported that a new coal-mining company with a capital stock of two million dollars, and a like amount of bonds has been formed under the laws of the State of New York, to operate in Illinois, Indiana and Ohio. The new company is to be known as the Middle States Coal Corporation, and is controlled by T. J. O'Gara, of Chicago. It is said that the company will take over the properties of the Vivian Collieries Co., two of the Imperial Mining Co.'s in Ohio, as well as that at Springfield, Ill., owned by O'Gara. The officers will be the same as those of the O'Gara Coal Co.

Elmira, N. Y.—An increase of activity in the Morris Run coal mining district is assured in the purchase by O'Donnell Brothers of the farms near the old east Mine at Morris Run, owned by Martin Yenovik and Stans Laskaski. These farms comprise 160 acres and are underlaid by the Bear Creek, Bloss, Cannel, Morgan and Seymour seams. This purchase extends the holdings of O'Donnell Brothers to the Fall Brook. They have also bought the Kiley mine at Blossburg and are now building new chutes on the east side of Morris Run. Some new openings show from 3 to 6 ft. of clean coal. The purchases are said to give the O'Donnells possession of all the available coal land at Morris Run except that held by the Morris Run Coal Mining Co.

COAL TRADE REVIEWS

GENERAL REVIEW

While there are some soft spots in the hard-coal trade, there is, nevertheless, a strong healthy undertone apparent. Dealers are becoming over-stocked on some grades but there is no indication of any let-up in the demand. However, it is becoming clear that many consumers carried over fair supplies, because of the mild winter which will, of course, curtail the summer stocking, but it is difficult to tell how the fall trade will line up yet.

In bituminous, the West Virginia strike situation is assuming serious proportions again, and the Eastern bituminous market hinges almost entirely on developments there. As a result, the trade is firm in every particular, many operators being forced into the open market for prompt tonnages to fill out their contract obligations. There has been a perceptible rush to cover on the part of consumers, and preparations for the worst are being made at a number of points. At the moment there is a good car supply, but the feeling prevails that there will be a serious shortage the coming fall. Operators, as a rule, are afraid to accept further orders, and the situation in the Eastern market may be regarded as fairly tense at the present time.

The Pittsburgh district is operating at full capacity and making heavy shipments on contracts and into the Lake trade. The labor and car supply are good, but the men cannot be induced to work steadily. No surplus coal is available, and it is difficult to get tonnages to fill out corgoes, while some dealers are persistently advocating an advance in quotations. Conservative members of the trade, however, are against any such increase, although recognizing the general stiffness of the market.

The demand in Ohio continues strong, and is well distributed among both steam and domestic consumers. Domestic dealers are stocking up for the winter and are taking more than the usual tonnage since their supplies were depleted by the flood. The manufacturing demand is steady and the railroad consumption large, due to the heavy freight movement.

Most of the producers at Hampton Roads seem to be taking care of their contracts, but there has been a scarcity of coal all week, although the dumpings have been fair. Operators are inclined to hold any free tonnages available to apply on contracts later; with plenty of vessels awaiting tonnage in the foreign trade, the loading for coastwise shipment is becoming even slower. There has been a slight heaviness develop on steam coal in the Southern market, and producers are pushing their salesmen for orders. Conditions, as a whole, however, are about normal for this season of the year.

Consumers in the Middle West are watching the market closely in anticipation of an advance that now seems to be inevitable. Quotations are improving, particularly on the better grades, with full list prices being obtained on contract and occasional premiums on spot coal.

BOSTON, MASS.

Bituminous—Trouble having broken out anew in the New River field, news is eagerly sought from day to day. This week there has been some alarming rumors; one that there would be a general tie-up in New River beginning June 24, and others of less serious consequence. New England is certainly being prepared, so far as reports go, for the worst that can happen; during the last fortnight there has been a mild rush to cover, on the part of the few good sized buyers who had previously kept out of the market except for hand-to-mouth purchases.

With government colliers and steamers for foreign consignment, at Hampton Roads, there has begun to be an accumulation of tonnage and even slower loading is in prospect for coastwise transportation. There has been talk of $3 f.o.b. as an asking price for spot coal but no sales above $2.85 have been reported. Practically every shipper has all the business he dares take, and there is hardly any prompt coal offering. There is trouble hinted at in Pocahontas as well, and it will be an entirely new situation if both fields are kept from producing for any appreciable period. The situation is being anxiously watched, but there have been no marked developments in this market as yet.

There is practically no change in either the Georges Creek grades or those mined in Pennsylvania. There is active demand for all the good coals, and prices generally are firm at the levels reported last week. "Don't want any more business," is now the usual answer of the Pennsylvania operator. Labor troubles are heard from in nearly all the districts and it is an exceptional case where an operation is getting out a normal tonnage. For tide-water shipment the anthracite business is in such shape that transportation is not available for bituminous to the extent that was looked for this month, and that adds to the difficulty of getting adequate shipments.

Water Freights are firmer in response to a better demand. Large vessels are getting 80c., Hampton Road to Boston, and 75c. is the rate on barges, 3000 tons or so to Providence.

Anthracite—The demand continues steady. Some dealers are finding themselves with an over-stock of egg and chestnut and are therefore somewhat handicapped in their efforts to make up schedules that the companies can ship. There is, however, no present sign of any easing up in the call for hard coal. The retail business is exceptionally good for this time of the year. It is becoming apparent, however, that the mild winter has left a considerable supply in the cellars of many householders. Just what effect this will have remains to be seen.

Current wholesale prices on bituminous are about as follows:

	Clearfields	Cambrias Somersets	Georges Creek	Pocahontas New River
Mines*	$1.10@1.45	$1.30@1.65	$1.67@1.77	
Philadelphia*	2.35@2.70	2.55@2.95	2.92@3.02	
New York*	2.65@3.00	2.85@3.30	3.22@3.32	
Baltimore*		2.58@2.73	2.85@2.95	
Hampton Roads*				$2.85 *firm*
Providence†				3.836@3.88
Boston†				3.90@4.05

*F.o.b. †On cars.

PITTSBURGH, PENN.

Bituminous—Mines of the Pittsburgh district continue to operate at substantially full capacity, with heavy shipments in the lake trade and fairly heavy deliveries on contracts with commercial consumers. There has, however, been a slight seasonal decrease in the latter, and new demand is slightly less from the same cause. The market will probably make up this slight loss by the middle of July. Car supply is fairly good, but serious shortage is feared later in the season. The supply of men is good but they do not work steadily and several mines could produce a larger tonnage if more labor were available. Slack for prompt shipment continues to sell at 60@70c., well under the season price, while mine-run and screened coal occasionally bring premiums for prompt shipment, over the season level, which we continue to quote as follows. Slack, 90c.; nut and slack, $1.02; nut, $1.25; mine-run, $1.30; ¾-in., $1.40; 1¼-in. steam, $1.50; 1¼-in. domestic, $1.55, per ton at mine, Pittsburgh district.

Bituminous—If there is a "deadlock" between coke operators and blast furnacemen as to second-half furnace coke contracts, it is by no means strenuous. After the recent refusal of some furnaces to close at $2.25, when this had been named as a special price, the operators withdrew the figure and are now quoting $2.50 again as the minimum. There is a considerable tonnage, between 100,000 and 200,000 tons a month, in contracts which expire June 30. Furnacemen seem to expect to be able to renew at $2 or less and feel that they can buy in the prompt market from time to time until they obtain this figure. The operators, however, have for several months been committed to the policy of blowing out all ovens, which they do not need to operate for the filling of their contracts. The whole market situation today resolves itself into a question whether the operators will have courage to blow out ovens against the expiration of the first-half contracts mentioned. If they did this, they would run the risk of losing their operating forces, as labor is relatively scarce, but if they carried out the policy the large prompt demand created would undoubtedly stiffen the market. Meanwhile we quote as follows: Prompt furnace, $2.10@2.15; contract furnace (nominal) $2.25@2.50; prompt foundry, $2.85@3; contract foundry, $2.75@3, per ton at ovens.

NEW YORK

Bituminous—The local market on soft coal is firmer, alarming reports regarding the labor situation in West Virginia having caused prices to harden quite perceptibly. The consumption continues large in all directions, but the movement is almost entirely on contract. Further contracts are being delayed pending a return of more settled conditions in West Virginia; at the present moment operators would not consider entering into any further agreement for tonnage.

Production at the mines continues at a high rate. While the labor supply is not up to full requirements, it is still fairly plentiful, the chief difficulty being the numerous holidays which the miners insist on taking. The car supply is fair and fully up to the requirements of the mines. The local market is not quotably changed, and we continue previous quotations with prices firm in every respect as follows: West Virginia steam, $2.55@2.60; fair grades of Pennsylvania, $2.65@2.70; good grades of Pennsylvania, $2.75@2.80; best Miller Pennsylvania, $3.05@3.15; George's Creek, $3.25@3.30.

Local water freights are firm with tonnage difficult to obtain.

Anthracite—The last week of the month naturally sees some activity in hard coal as dealers and consumers are anxious to buy before the next reduction in the discount. Aside from this temporary activity the general trade is dull and flat. Furthermore, this condition will no doubt prevail now until September, since the discount during the intervening months is too small to interest the buyers generally.

On the whole, however, the market is in a fairly strong position, considering the period of the year, and is fully as good, if not better than is to be expected at this time. Stove coal is still in rather short supply, while dealers are becoming overstocked with chestnut and buckwheat. The domestic sizes of all kinds are dull, but as a rule are not so flat as the steam grades. Some companies report that they are entirely cleaned up on rice coal, but there is no doubt that plenty of this could be obtained for reasonably prompt shipment.

The New York hard coal market is quotable about on the following basis:

		Individual		
	Circular	Lehigh	Scranton	Schuylkill
Broken	$5.00	$5.00	.	.
Egg	5.25	4.55	.	.
Stove	5.25	4.85	.	.
Chestnut	5.50	.	.	$4.90
Pea	3.50	3.60	.	.
Buckwheat	2.75	. .	$2.50	2.35
Rice	2.25	. .	2.25	1.80
Barley	1.75	. .	. .	1.15

PHILADELPHIA, PENN.

The anthracite coal trade is beginning to show additional signs of slowing up in this particular vicinity. All the dealers are complaining about lack of business, although admitting that the conditions are not abnormal, but the contrast between what they were doing last year and now is so marked, that they are inclined to feel somewhat dissatisfied. Last year, the market was absorbing everything from broken to barley, but this year being a normal one, with no strike demand, the dealers find the situation hardly to their liking.

The tidewater business to the East still continues good. Every week sees large sailings of barges en route for the New England market, and while the demand here is not so insistent, there seems to be another order ready as soon as the last one is shipped. All the mines are still continuing operations, although it is understood that partial suspensions are looked for during the coming month. Outside of the small sizes, very little coal has as yet gone into stock, and the demand may be such, with the curtailed mining during July and August, that the market will be able to take care of the output. There is talk of some cutting on the part of the individual operators, although confined to certain sizes. Stove coal seems to be about the only grade in this market that finds a ready sale.

The pressure for bituminous coal seems to have shaded off somewhat during the week, and in some quarters, operators are inclined to believe that the change for the better is not to be as lasting as many expected. Prices are well maintained, however, and the softening of the market is commented on by many as being only temporary.

BALTIMORE, MD.

The possibilities of a protracted shutdown in the West Virginia mining regions, because of the labor troubles there, is having its effect on the local market. A number of consumers who have heretofore consistently refused to contract signed up at the increased prices asked during the week, rather than face the possibility of being caught in a short market. The situation in the New River and Pocahontas fields, which supply much of the fuel here, is openly regarded with alarm.

As a consequence the local market remains firm in every particular. The demand for all grades is quite persistent, and reports are current that some of the large operators have such an excess of orders that they are being forced to buy from competitors in order to make prompt delivery. Line business is particularly heavy, while shipments at the piers have been active all week, and low-grade coals are in ready demand at 95c. to $1. There has been a slight improvement in the car situation, but still more equipment could be used, were it available; the lake movement continues as heavy as ever.

One of the interesting features at the moment is the coming announcement of the award of the municipal coal contract for 45,000 tons during the current year, on which a dozen or more companies are competing. The hot spell has eliminated any further interest in the anthracite market, and coke continues weak, with production still further reduced.

BUFFALO, N. Y.

Bituminous dealers are, in some cases, advising an advance in quotations. There is no surplus coal anywhere and it is difficult to get up an extra cargo or fill a rush order. Pittsburgh is steadily reporting that contracts are taking the entire output and such is also the case to a great extent in the Allegheny Valley; this in spite of the reports of shut downs by the iron furnaces, a sort of contradiction that coal men do not try to reconcile. Coal sells briskly and that is enough. So much coal is going to the lakes to make up the annual demand for 12 million tons that it is hard to get enough to go around in other parts of the market. Cases are reported where Lake Ontario shippers have paid more for coal than they are to get for it, being obliged to borrow and buy all they could find to make out a cargo.

Still, the conservative side of the trade is against any direct recognition of the stiffness and it may be well to wait another week before quotations are changed. It is becoming evident that the actions of Congress are not being taken seriously. If the crops are as good as they now promise to be the present activities will go on, regardless. At the same time it is uncertain what the markets will be in the near future. A state institution is asking for bids on a lot of slack to be furnished for a year beginning with next October, but the jobbers are not prepared to gamble to that extent. It looks as if big prices will have to be paid if a contract is made at all, as was the case with the city water-works contract.

Quotations will therefore remain strong at $2.80 for Pittsburgh lump, $2.65 for three-quarter, $2.55 for mine-run and $2.15 for slack. Coke, however, is not at all strong at former figures, $4.85 for best Connellsville foundry. Allegheny Valley coal is about 25c. under Pittsburgh. There is no change in smithing coal, which is subject to few fluctuations.

A leading reason for the shortage of bituminous is the scarcity of men in the mines and a lesser scarcity of cars, the two often conspiring to spoil a week's mining; no improvement in either direction is looked for right away and only a falling off in demand can make coal plenty.

There is no stir in anthracite. Shipments by lake are heavy, being 191,000 tons for the week.

COLUMBUS, OHIO

Trade in all grades of coal in Ohio has been quite active during the past week. The demand is distributed among the domestic and steam grades and prices all along the list have been well maintained. On the whole the market is in good condition and operators as well as shippers believe that quotations will be raised in the near future.

One of the best features of the trade is the activity shown in domestic sizes. Dealers are stocking up in preparation of the expected demand from householders; it is believed that their stocking period will arrive sooner than usual and dealers are preparing for this. Dealers' stocks as a rule, are light because of the demand upon them incidental to the flood. The extra large harvest in Ohio is also expected to furnish a market for threshing purposes.

Steam business is steady in every way; manufacturing plants are taking a large tonnage and a few show a disposition to stock up to guard against the expected car shortage. Plants in the iron and steel trade are large users of fuel and in fact a marked improvement is reported in manufacturing circles generally, railroad fuel is also in good demand there being a large freight movement. Most of the railroad contracts have been made, although a few are still hanging fire.

The tonnage moving from Ohio and West Virginia fields to the Northwest via the lakes and the docks is heavy. No

congestion of consequence has taken place either at the docks or with the vessels.

Production in all Ohio fields has been large during the past few weeks. Excepting in Eastern Ohio, there is not much trouble over the car supply and all of the mines are working with a large force. Some trouble is experienced in certain districts from a labor shortage. In the Eastern Ohio district the output is estimated at 65 per cent. and in the Pomeroy Bend field it has been 75 per cent. In the Hocking Valley, where car shortage has not affected the output the production has been about 90 per cent. of capacity. In the strictly domestic fields the output is gradually increasing.

Quotations in the Ohio fields are as follows:

	Hocking	Pittsburgh	Pomeroy	Kanawha
Domestic lump	$1.50		$1 60	$1.50
2 inch	1.35	$1.20	1.35	1.30
Nut	1.20		1.25	
Mine-run	1.15	1.10	1.15	1.10
Nut, pea and slack	0.65		0 65	0.60
Coarse slack	0.55	0.55	0.55	0.50

HAMPTON ROADS, VA.

Although there has been a continued scarcity of coal at all Tidewater piers, at the same time the dumpings have been fair and, with coal coming in daily, the end of this week finds conditions practically the same as they have been for the past month. The majority of the suppliers are taking care of contracts but are not soliciting new business or making outside sales; $2.90 has been about the prevailing price offered by buyers for spot coal but operators are preferring to hold what coal they have for contract tonnage about due and early July shipment.

Two of the largest shipments made during the week went into the U. S. Naval Colliers "Orion" at Lamberts Point and the "Proteus" at Newport News. This latter vessel is just from the Newport News shipbuilding and drydock plant and the 12,500 tons which went into her was the first cargo she had taken. She is now on her trial trip and it is expected she will be formally turned over to the Government during the next week or ten days.

BIRMINGHAM, ALA.

There is a slight heaviness noticeable in the local steam market, so that some operators are pushing their sales agents for more business. No serious alarm is felt over the situation, however, as similar conditions appear every summer; as a matter of fact they have been less frequent so far this season than ever before.

Prices on Alabama foundry and furnace coke remain unchanged, although there has been a considerable reduction on the West Virginia cokes which enter into competition with the local product in certain of the Southern markets. Reports on business conditions in the South are encouraging, and indications point to a highly profitable business the coming fall.

DETROIT, MICH.

Bituminous—Full list prices are being obtained on contract shipments with fairly substantial premiums being offered for spot delivery. Buyers are now finding that it is not so easy to place orders as they had anticipated it would be. The domestic grades are the feature of the situation at the present time, the inquiry being heavy, and a good stiff asking price prevailing; dealers are unanimous in the belief that these coals will bring from 75c. to $1 more than during last season, and all are anxious to obtain a good stock and assure themselves of a steady supply through the winter.

The local market is quotable on about the following basis:

	W. Va. Splint	Gas	Hocking	Cambridge	No. 8 Ohio	Pocahontas	Jackson Hill
Domestic lump	$1.70	..				$2 25	$2 00
Egg	1 70	..				2 25	2 00
Steam lump	1.40	..					
2-in. lump	1.25	$1 25	$1 25	$1 25	$1 25		
Mine-run	1 10	1 10	1 10	1 10	1 10	1 50	
Slack	0.85	0.85	0.85	0 85	0 85		

Anthracite—Orders for hard coal are coming in fully as fast as last month, and there does not seem to be any easing off likely to occur at any time in the immediate future. The movement is quite heavy, and many dealers are unable to obtain prompt shipments, due apparently to the scarcity of cars at the mines.

Coke—The local coke market has not been active during the week, because several of the large local foundries have been compelled to suspend operations; this, of course, had an immediate effect on the trade. The market is now quotable about as follows: Connellsville, $2.25; Sement Solvay, $2.85 and Gas House, $2.75, f.o.b. ovens.

LOUISVILLE, KY.

The continued hot weather during the past week has had little effect upon the market, inasmuch as all the domestic business is confined to storage for next winter; however, the orders showed a tendency to slacken up during the week. The heavy movement into the North and Northwest continues unabated; there are also considerable orders from points in Iowa and Nebraska, indicating that the Kentucky product is steadily enlarging its field. Favorable prices are being made in this new trade, in some cases as much as 25c. below quotations offered the Southern consumer. On the other hand, prices made at some of the large southern competitive points, such as Louisville and Knoxville, where competition is keen, are often 25 to 30c. below those prevailing in more competitive districts.

There has been little change in the steam coal situation, the market remaining rather weak. Production is still running considerably ahead of consumption, and dealers are having considerable difficulty in placing these grades. Western Kentucky pea and slack continue to lead in excess supply, and are being freely offered at 35c. f.o.b. mines, with the better grades of nut and slack at 75c., and second grades at 50 to 60c. per ton.

The domestic grades for July shipments are holding fairly strong, some Jellico producers maintaining a minimum for June delivery of $1.90 on block, with indications that they may continue at this same figure through July; block and lump are held at $1.60 to $1.65, and round at $1.35. Most of the mines in the Eastern part of the State have had sufficient orders to keep them working full time, and indications are that this will continue until the customary fall demand opens up.

INDIANAPOLIS

Consumers are watching the market closely for the advance that now seems to be inevitable. It is said some of the local wholesalers are ready to make their first ante-winter raise but they have not been able to get unanimous action. They have not been any too successful in getting their orders filled at the Eastern mines, even when offering a premium. Their own customers have been taking coal from the yards liberally and they are not accumulating the surpluses they would like to have in the face of the present demand. The wheat harvest is on in Indiana and there is the threshing machine demand to fill now also.

There seems to be growing confidence that the basis for business—good crops—is assured. Indiana mines are not losing ground but instead are making slight gains. The factory situation is steadily becoming better, not in a very marked way, but enough to show it is moving in the right direction. Coal dealers in this city are beginning to talk about a difficulty in getting coal similar to that in effect last fall and consumers are deciding they will run no risk, so are ordering summer deliveries. All this causes a general strain that tends to advance prices. There are no changes in prices yet at Indiana mines, or with wholesalers and retailers.

The summer schedule in the retail yards of this city still prevails, quotations being as follows:

Anthracite, chestnut	$8.00	Hocking Valley lump	$4.50
Anthracite, stove and egg	7.75	Luhrig lump	4.50
Anthracite, grate	7.50	Luhrig washed egg	4.75
Pocahontas, forked lump	5.50	Cannel	6.50
Pocahontas, shoveled lump	5.00	Linton No. 4 lump	3.25
Pocahontas, mine run	4.00	Linton No. 4 egg	3.25
Pocahontas, nut and slack	3.50	Indiana washed egg	3.50
Blossburg	5.50	Brazil block	4.00
Jackson (Ohio)	5.25	Indianapolis lump coke	6.00
Kanawha lump	4.50	Indianapolis crushed coke	6.00
Kanawha egg, nut	4.50	Connellsville lump	7.00
Pittsburg lump	4.50	Citizens' egg coke	6.00
Raymond lump	4 50	Citizens' nut coke	6.00
Winifrede lump	4 50		

ST. LOUIS, MO.

Local conditions are improving slightly on the high grade fuels, but the Standard coals are still trying to reach a low record price. Retailers who are buying coal on contract are able to sell it to manufacturing plants at 75c. f.o.b. the mines for 2-in. lump coal.

Anthracite conditions are improving, while the smokeless demand is lagging back with no coal to take care of what little demand there is. The coke market has been brisk, but the chances are that it will slacken up some now, and coke will be plentiful in July.

Owing to the large number of mines shut down in the Carterville and Franklin County fields, such coal as is coming in is bringing a good price. There are a few inferior qualities, however, that are still hanging around the dollar price, but even then it is largely a matter of poor salesmanship that accounts for lack of a better figure.

It is understood that the Consolidation Coal Co. of Cin-

has just secured the coke contract from the Laclede Gas Light Co. running until Jan. 1, 1915. From now until Jan. 1, 1914 there will be about 10,000 tons of gas house coke, and for the following twelve months the production will be about 90,000 tons. This is about 20,000 tons more than the St. Louis market is able to take care of, and the price at which the contract went, it is rumored, is so high that cheaper outside cokes will give the local product brisk competition.

	Carterville and Franklin Co.	Big Muddy	Mt Olive	Standard
2-in. lump				$0.80@0 85
3-in. lump			$1.20	
6-in. lump	$1 15 @ 1 25		1.20	0 85@0 90
Lump and egg		$2 00		
No. 1 nut	1.10 @ 1 20			
Screenings	0 80 @ 0 85			0 75@0 80
Mine-run	1 00 @ 1 10			0 75@0 80
No. 1 washed nut	1 40 @ 1 50			
No. 2 washed nut	1 25 @ 1 30			
No. 3 washed nut	1 25 @ 1 30			
No. 4 washed nut	1 25 @ 1 30			
No. 5 washed nut	1 00 @ 1 05			

St. Louis prices on June anthracite are: Chestnut, $7.15; stove and egg, $6.90; grate, $6.65. Smokeless lump and egg is $4.65 and mine-run $4. Byproduct coke is $5.10 and gas house $4.85.

PORTLAND, ORE.

While business is not now active, the season for placing orders for next winter will soon be open and hence dealers are looking for considerable activity in the near future. The market is steady and it is believed the demand for next winter will be greater than a year ago. Wood, which takes an important part in the local fuel situation, is selling at $5.50 per cord, which is about as low as it has been at this time for some years. This naturally has an effect on the coal trade for domestic purposes.

FOREIGN MARKETS

GREAT BRITAIN

June 13—Business is slow and as supplies are plentiful, an easy tone prevails in all sections.

Best Welsh steam	$4 80@5.04	Best Monmouthshires	$4 26@4.32
Best seconds	4 62@4.74	Seconds	4.08@4.20
Seconds	4 44@4.56	Best Cardiff smalls	2 40@2 52
Best dry coals	4 76@4 80	Seconds	2.28@2 40

British Exports—The following is a comparative statement of British exports for May and the first five months of the last three years, in long tons:

	May			5 Months	
	1912	1913	1911	1912	1913
Anthracite	196,423	251,117	986,525	784,220	1,188,283
Steam	4,659,433	4,318,911	19,138,316	14,791,968	21,636,454
Gas	1,120,763	929,955	4,215,605	3,326,247	4,523,898
Household	140,711	128,856	613,181	485,999	710,583
Other sorts	331,706	301,108	1,301,439	1,028,645	1,460,607
Total	6,449,036	5,929,747	26,255,066	20,416,679	29,589,825
Coke	48,765	71,944	392,889	336,969	424,334
Manufactured fuel	131,446	145,723	717,655	526,634	837,070
Grand total	6,629,247	6,147,614	27,365,610	21,280,282	30,781,229

PRODUCTION AND TRANSPORTATION STATISTICS

The Car Situation

American Ry. Association reports surpluses and shortages of coal equipment for two weeks ended June 14, as follows:

	Surplus	Shortage	Net*
New England Lines	6	85	79
N. Y.; New Jersey, Del.; Maryland, Eastern Penn	715	0	715
Ohio; Indiana; Michigan; Western Pennsylvania	1,756	135	1,621
West Virginia, Virginia, North & South Carolina	939	1,202	263
Kentucky, Tenn.; Miss.; Alabama, Georgia, Florida	425	280	145
Iowa, Illinois, Wis., Minn.; North & South Dakota	1,706	152	1,554
Montana, Wyoming, Nebraska	398	0	398
Kansas, Colorado, Missouri, Arkansas, Oklahoma	2,000	128	1,872
Texas, Louisiana, New Mexico	263	4	259
Oregon, Idaho, California, Arizona	2,694	0	2,694
Canadian Lines	196	47	142
Totals	11,098	2,033	9,065
Greatest surplus in 1912 (Apr. 25)	94,692	2,144	92,548
Greatest shortage in 1912 (Oct. 10)	6,491	14,897	8,406

*Bold face type indicate a surplus

NORFOLK & WESTERN RY.

The following is a statement of the tonnages shipped over this road during May, 1913, and for the five months ending May 31, as compared with corresponding periods of 1912 in short tons:

Destination	May 1912	May 1913	5 Months 1912	5 Months 1913
Coal				
Tidewater, foreign	123,380	165,695	712,582	700,906
Tidewater, coastwise	379,303	340,073	1,516,662	1,640,744
Domestic	1,452,812	1,625,977	6,847,814	7,027,891
Coke				
Tidewater, foreign	12,687	5,857	37,834	22,841
Domestic	93,862	132,391	603,781	693,860
Total	2,062,044	2,269,993	9,718,673	10,086,422

PENNSYLVANIA RAILROAD

The following is a statement of shipments over the P. R.R. Co.'s lines east of Pittsburgh and Erie for May, and first five months of this year and last year in short tons:

	May		Five Months	
	1913	1912	1913	1912
Anthracite	967,898	109,341	4,641,994	3,688,943
Bituminous	4,178,271	3,495,016	20,092,450	18,956,936
Coke	1,238,083	1,150,080	6,225,387	5,340,912
	6,384,252	4,754,437	30,959,831	27,986,791

COAL SECURITIES

The following table gives the range of various active coal securities and dividends paid during the week ending June 21.

Stocks	Week's Range High	Week's Range Low	Week's Range Last	Year's Range High	Year's Range Low
American Coal Products	87	87	87	87	87
American Coal Products Pref.	109¼	109¼	109½	109¾	109¼
Colorado Fuel & Iron	28	26⅜	26⅜	41⅞	24⅛
Colorado Fuel & Iron Pref.			155	155	150
Consolidation Coal of Maryland	102¼	102¼	102¼	102¼	102¼
Lehigh Valley Coal Sales	195	185			
Island Creek Coal Com.	50	48	48		
Island Creek Coal Pref.	82	81	81		
Pittsburgh Coal	16⅛	15⅝	15⅝	24⅜	14⅛
Pittsburgh Coal Pref.	76½	74½	74½	95	73
Pond Creek	17⅛	17¼	17¼	23¼	17¼
Reading	159½	154¼	155	168⅝	151¼
Reading 1st Pref.			86	92½	86
Reading 2nd Pref.			86	95	84
Virginia Iron, Coal & Coke	41½	41½	41½	54	37½

Bonds	Closing Bid	Closing Asked	Week's Range or Last Sale	Year's Range	
Colo. F. & I. gen. s.f.g. 5s	93⅝	97	97 May '13	95	99¼
Colo. F. & I. gen. 6s			107½ June '12		
Col. Ind. 1st & coll. 5s. gu	78⅝	79¾	77½ June '13	77½	85
Cons. Ind. Coal Mc 1st 5s			85 June '11		
Cons. Coal 1st and ref. 5s		94	93 Oct. '12		
Gr. Riv. Coal & C. 1st g 6s		100	102½ April '06		
K. & H. C. & C. 1st s f g 5s			98 Jan. '13	98	98
Pocah. Con. Coll. 1st s f 5s		87⅝	86 June '13	86	87½
St. L. Rky. Mt. & Pac. 1st 5s	70	76	76 June '13	76	80
Tenn. Coal gen. 5s		99⅞	100 May '13	100	103
Birm. Div. 1st consol. 6s	100½	102½	101 April '13	101	103
Tenn. Div. 1st g 6s		102	102 Feb. '13	102	102
Cah. C. M. Co. 1st g 6s		104	110 Jan. '09		
Utah Fuel 1st g 5s					
Victor Fuel 1st s f 5s		80	80 May '13	79¾	80
Va. I. Coal & Coke 1st g 5s	92	97	92 June '13	92	98

DIVIDENDS

Lykens Valley R.R. & Coal Co.—Dividend of 2%, payable July 1 to holders of record June 15.

Mine Hill & Schuylkill Haven—Dividend of $1.50 payable July 15 to holders of record June 20.

Reading Co.—Regular quarterly dividend of 2% on the common stock payable Aug. 14 to holders of record July 29. Regular quarterly on the first preferred of 1% payable Sept. 11 to holders of record Aug. 26. Regular quarterly on the second preferred of 1% payable July 10 to holders of record June 28.

St. Louis, Rocky Mountain & Pacific—Quarterly dividend No. 4 on preferred of 1¼% payable June 30 to holders of record June 21.

Central Coal & Coke Co.—Dividend of 1½% on the common and 1¼% on the preferred, both payable July 15 to holders of record July 1.

Island Creek Coal Co.—Regular quarterly on the common of 50c., and an extra dividend on the common of $3, payable Aug. 1 to holders of record July 15. Also regular quarterly on the preferred of $1.50 payable July 1 to holders of record June 25.

American Coal—In 1903 this company paid a 20 per cent. extra dividend from the proceeds of a sale of real estate and in 1907, a 25 per cent. distribution was declared from the sale of their railroad.

INDEX OF COAL LITERATURE

We will furnish copy of any article (if in print) in the original language for the price quoted. Where no price is quoted, the cost is unknown. Inasmuch as the papers must be ordered from the publishers, there will be some delay for foreign papers. Remittance must be sent with order.

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